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ARTICLE

Mapping the Spatio-Temporal Potential of Offshore Wind Energy in Baja California (Mexico) Using MERRA-2

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ABSTRACT: To support offshore wind planning, this study assesses and maps the wind resource around Baja California (Mexico) using MERRA-2 reanalysis. Detailed mean wind speed (MWS), wind power density (WPD) and coefficient-of-variation (CoV) are mapped for the recent 2014–2023 period, whereas long-term wind-speed trends are assessed over a complete 1980–2023 record. The analysis employs a geographic information system (GIS) framework and a 140-node spatial grid. Hourly moist-air density is calculated and linear trends are accompanied by autocorrelation-consistent confidence intervals and significance tests. Moreover, wind-speed variability is characterized using CoV, which is compared with a median absolute deviation (MAD)-based robust CoV and complementary Weibull and persistence diagnostics. Spatial interpolation using inverse distance weighting (IDW) is evaluated by spatial block cross-validation, parameter sensitivity, coastline-aware neighbourhoods, and comparison with alternative interpolation methods. The 2014–2023 maps illustrate pronounced wind-resource patterns along the western and northeastern regions of Baja California, providing a regional-scale resource screening framework rather than a project-specific feasibility assessment. A full-period sensitivity analysis identifies 36 baseline resource candidates; after accounting for temporal, reanalysis-product, air-density, and spatial uncertainties, 19 are classified as robust candidates, 17 as sensitivity-dependent, 28 nodes as uncertain, and 76 as robust non-candidates. The results provide a spatially and temporally resolved screening of the Baja California wind resource and quantifies the sensitivity of candidate locations to key methodological and data uncertainties.

KEYWORDS: Geomatics; GIS modelling; IDW; maritime spatial planning; offshore wind energy; Baja California; spatio-temporal analysis

1 Introduction

Renewable energy is central to international efforts to combat climate change, as the Paris Agreement aims to limit global temperature rise to below 2°C, ideally to 1.5°C, which requires rapid reductions in greenhouse gas emissions [1]. For that purpose, it emphasises the need for renewable energy sources (RES) as cleaner alternatives to fossil fuels [2–5]. This reduction is crucial for mitigating climate change and improving air quality, which is beneficial for both the environment and public health [6–8]. Moreover, during the 28th United Nations Climate Change Conference (COP28), global targets, including a tripling of renewable energy capacity by 2030, were set. This is considered to be an ambitious but achievable goal, given the record annual deployment, the remarkable momentum of the sector, and the increasing competitiveness against fossil fuels, especially in the case of solar PV and wind [9].

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In this regard, various countries have made significant commitments to increasing their renewable energy capacities [10]. India committed to enhancing its renewable energy capacity to 500 GW by 2030 and achieving 50% of its power from renewable resources [11]. Similarly, the European Union aims for climate neutrality by 2050, with the ambitious renewable energy targets of achieving a minimum of 42.5% of its energy consumption from renewable sources by 2030 [12,13]. Furthermore, individual country targets reflect the aspiration to achieve a 39% increase in total renewable capacity from 2022 to 2030, reaching approximately 450 GW. In particular, Brazil, Chile, Argentina, and Mexico contribute almost 80% of this target, with Brazil alone accounting for almost half of the regional ambition. Chile stands out with plans to expand its renewable energy capacity by 2.5 times, marking the most substantial growth trajectory in the region [9].

Among the numerous RES that contribute to this worldwide transition, wind energy is one of the fastest growing, with significant potential for scalability and rapid deployment [14,15]. Hence, wind energy deployment will be essential for achieving both zero emissions by 2030 and carbon neutrality by 2050 [16–18]. As of 2023, the global installed wind energy capacity has reached approximately 920.736 GW [19] including onshore and offshore facilities. Despite relying on the same RES, onshore and offshore wind deployment experiences different development rates. Onshore wind is a consolidated and mature technology, with an installed capacity of 774.3 GW in 2021. In contrast, offshore wind represented only 44.7 GW worldwide in the same year, a 17-times-smaller figure. However, offshore wind capacity is expected to experience a high growth rate, with capacity expected to be between 160 and 230 GW in 2030 [20,21].

Offshore energy development is expected to grow significantly due to its various advantages over onshore wind, particularly due to the unique characteristics of the marine environment [22]. One of its most notable benefits lies in the superior wind conditions found in offshore environments. Wind speeds at sea are generally stronger and more consistent compared to those onshore, which enhances wind power potential and reduces turbulence effects [23]. This results in higher and more stable energy production, contributing to the overall efficiency and reliability of offshore wind farms (OWFs). Additionally, the open ocean provides ample space for the installation of larger turbines, a feature that is often constrained by logistical and spatial limitations on land. These larger turbines significantly increase power output, making OWFs a highly effective solution for meeting large-scale energy demands [24].

Beyond technical efficiency, offshore wind energy also offers substantial environmental and social benefits [25]. The remote location of offshore installations minimises visual and noise pollution, issues that frequently generate public opposition to onshore wind projects [26,27]. Moreover, the absence of land-use conflicts represents a critical advantage, particularly in densely populated regions where land competition for agriculture, urban development, and other purposes is intense [28]. By utilising the vast spaces at sea, OWFs enable large-scale development without encroaching on terrestrial resources. This scalability not only supports the growing demand for renewable energy but also aligns with global sustainability goals [29,30]. Coupled with innovations such as floating platforms, which expand deployment possibilities in deeper waters, offshore wind energy emerges as a promising frontier for renewable energy advancement [31].

Coupled with these environmental and social advantages, Mexico stands out for an estimated offshore wind generation of 12,688 TWh annually within its Exclusive Economic Zone (EEZ) which is equivalent to 33 times the country's current electricity consumption. This unparalleled resource not only positions Mexico as a potential leader in offshore wind development but also offers a unique opportunity to address its growing energy demands sustainably while reducing reliance on fossil fuels. In addition, the technological feasibility and economic viability of offshore wind energy further strengthen its potential in Mexico. Both fixed-bottom and floating wind technologies are applicable in the country's EEZ, with 42% of the area suitable for fixed-bottom installations and 58% for floating platforms, which are particularly advantageous in deeper waters [32].

While these national considerations are crucial, understanding localised potential is essential to maximise offshore wind energy contributions. Hence, several regions within Mexico have been identified as having significant potential for offshore wind development. The north coast of Tamaulipas offers a promising site for fixed-bottom turbine installations due to its relatively shallow waters. Similarly, the northwest coast of Yucatan provides favourable conditions for floating wind technologies, given its deeper waters and steady wind patterns [33]. The Gulf of Tehuantepec, known for its powerful and consistent winds, stands out as another key area for offshore energy projects [34]. Expanding beyond these regions, Baja California emerges as a critical focus area due to its exceptional wind resource potential, strategic location along the Pacific Ocean, and proximity to key energy markets. Furthermore, the Pacific coast of Mexico has been noted for its lower risk from tropical cyclones compared to the Gulf of Mexico, making it a potentially safer location for OWFs [35]. Its unique characteristics and reduced risks make it an ideal candidate for advancing offshore wind development in Mexico. Hence, studying offshore wind resources in Baja California could significantly contribute to both Mexico's energy needs and global climate goals [36].

Despite the considerable potential for offshore wind energy development in Baja California, no operational wind farms currently exist in the region, which not only reflects the region's untapped potential but also underscores the urgent need for detailed resource assessments to unlock this opportunity [36]. Conducting such research is crucial to optimise site selection and develop tailored strategies for offshore wind planning. Hence, the aim of this study is to address these gaps in order to establish a stronger foundation for resource screening and subsequent site-specific assessment of offshore wind potential in the region, providing critical insights that align with both Mexico's renewable energy objectives and global climate commitments.

The unresolved methodological issue is not simply the absence of another regional wind map, but the limited quantification of uncertainty in long-term offshore screening. Baja California also requires coast-aware treatment because the peninsula separates Pacific and Gulf nodes that are geographically close but influenced by different atmospheric regimes. The methodological contribution of this study is therefore the validation and uncertainty testing added to the original spatio-temporal workflow, while keeping the native-node resource assessment as its central contribution.

To achieve this, a structured methodology that integrates both spatial and temporal analyses of the offshore wind resource is adopted. Firstly, effective offshore wind resource assessment requires the calculation of two critical parameters: mean wind speed (MWS) and wind power density (WPD) over at least ten years. This is crucial for assessing the wind power potential of Baja California, due to the high dependence of wind energy production on wind speed. Furthermore, long-term data helps in understanding the variability and reliability of the wind resource [37,38], critical for OWF development. MWS provides a preliminary indication of the wind energy potential [39], helping identify areas with consistently strong winds, while WPD serves as a direct measure of energy potential [40], quantifying the available wind power per unit area. These two parameters are indispensable for identifying areas with the greatest wind resource potential, providing inputs to subsequent turbine and site-specific assessments [41,42].

Further analysis involves studying wind-speed trends and variability at Baja California. The importance of this assessment lies in the fact that wind speed is subject to long-term trends and interannual variation [43,44], impacting the analysis of the wind energy resource [45,46]. Long-term wind-speed trend involves studying wind speed throughout decades, while wind-speed variability is assessed through the coefficient of variation (CoV), a normalized measure of relative dispersion for annual, monthly, and seasonal MWS values. These latter analyses are essential for enhancing the accuracy and reliability of wind energy assessments [47]. All results are presented spatially to transform complex datasets into accessible visual representations and facilitate the interpretation and communication of numerical findings. CoV is used as a

descriptor of relative dispersion rather than as a measure of turbulence intensity, and robust and persistence diagnostics are employed to assess the stability of its spatial interpretation.

2 Methods

2.1 The MERRA-2 System

The Modern-Era Retrospective Analysis for Research and Applications, Version 2 (MERRA-2), is an advanced atmospheric reanalysis developed by NASA's Global Modeling and Assimilation Office (GMAO). The analysis used the M2T1NXSLV collection (tavg1_2d_slv_Nx), which provides hourly, single-level, time-averaged diagnostics. The corresponding MERRA-2 data collection is identified by DOI 10.5067/VJAFPLI1CSIV [48]. Building upon its predecessor, MERRA, this system integrates additional satellite observations, refines data assimilation processes, and enhances the representation of atmospheric phenomena [49]. Spanning the satellite era from January 1980, MERRA-2 provides a comprehensive and high-resolution dataset, making it invaluable for climate and atmospheric studies.

MERRA-2 benefits from the updated Goddard Earth Observing System (GEOS) model (Version 5.12.4), which enhances spatial resolution by processing data on a 0.5° latitude by 0.625° longitude grid [50]. The temporal resolution of MERRA-2 involves hourly data on meteorological parameters such as wind speed (m/s) at 50 m, wind direction (degrees), temperature at 10, and 2 m (°C), and surface pressure (kPa) [51]. The MERRA-2 dataset spans over four decades, from January 1980 to December 2023, providing 385,704 hourly records per location. The revised density calculation additionally uses 2-m specific humidity (QV2M), 2-m temperature, and surface pressure.

Accuracy and data coverage are the main reasons for using MERRA-2 for wind resource assessment, including offshore wind design. This system provides high resolution in representing wind-speed characteristics [52] which, after validation against *in-situ* measurements, show good reliability for offshore wind assessments [53]. Furthermore, MERRA-2's data spans more than four decades, allowing for reduced uncertainties, robust statistical analysis [54], long-term trend identification and understanding wind variability [55–57]. These considerations are crucial for both wind and financial assessment over extended periods of time [58,59].

To support the assessment of offshore wind-resource variability and long-term trends, data were extracted for 140 geographic nodes across Baja California for the period 1980–2023. Each of the 140 nodes was assigned a unique identifier (ID) in the format Y-X. Y represents the latitude index (from 22° N to 33° N in 0.5° intervals, numbered from 1 to 23 from north to south), while X indicates a sequential counter for longitudes, incremented westward. Both latitude and longitude belong to datum WGS 84. For example, the node at 22.5° N and 110.625° W is labelled as 22-1, while adjacent nodes at 22.5° N and 110.000° W and 109.375° W are identified as 22-2 and 22-3, respectively. The gathered geographic nodes are shown in Fig. 1 and further detailed in Table 1, providing a clear identification and visualisation of the spatial grid used for the wind analysis.

2.2 Methodology

To comprehensively evaluate the offshore wind resource in Baja California, a structured methodology was adopted. It first characterised current offshore wind resource through MWS and WPD and then analysed long-term wind-speed trends and variability through CoV. To do so, the methodology leveraged the rich MERRA-2 dataset along with computational tools such as Matlab® and Excel to derive deep insights into wind energy assessment. This methodological approach is further illustrated in Fig. 2.

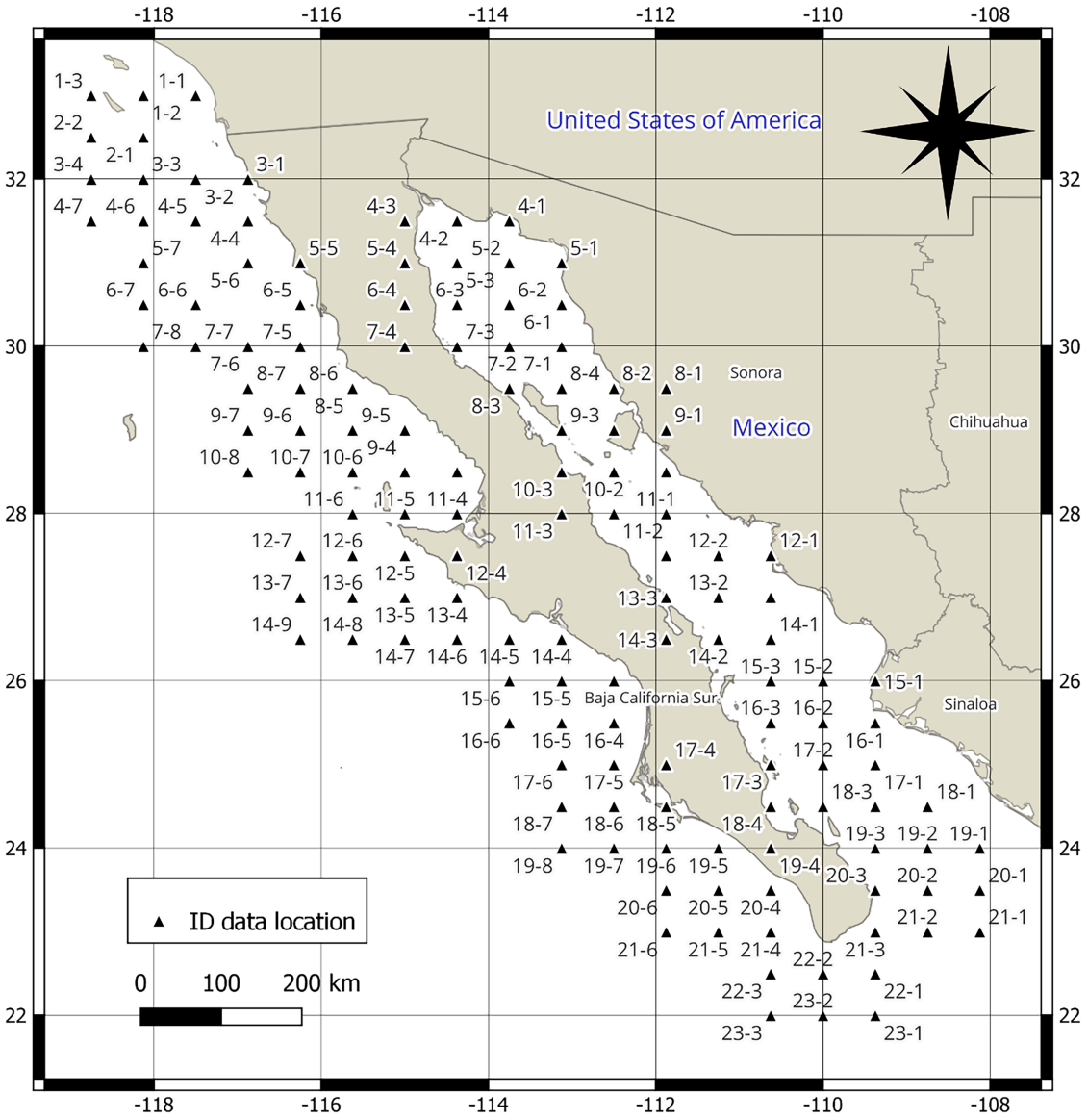


Figure 1: ID data location in Baja California (Mexico).

Table 1: Latitude and longitude of each studied location (ID) shown in Fig. 1.

ID	Latitude (° N)	Longitude (° W)
23-1	22.0	109.375
23-2	22.0	110.000
23-3	22.0	110.625
22-1	22.5	109.375
22-2	22.5	110.000
22-3	22.5	110.625
21-1	23.0	108.125
21-2	23.0	108.750

(Continued)

Table 1 (continued)

ID	Latitude (° N)	Longitude (° W)
21-3	23.0	109.375
21-4	23.0	110.625
21-5	23.0	111.250
21-6	23.0	111.875
20-1	23.5	108.125
20-2	23.5	108.750
20-3	23.5	109.375
20-4	23.5	110.625
20-5	23.5	111.250
20-6	23.5	111.875
19-1	24.0	108.125
19-2	24.0	108.750
19-3	24.0	109.375
19-4	24.0	110.625
19-5	24.0	111.250
19-6	24.0	111.875
19-7	24.0	112.500
19-8	24.0	113.125
18-1	24.5	108.750
18-2	24.5	109.375
18-3	24.5	110.000
18-4	24.5	110.625
18-5	24.5	111.875
18-6	24.5	112.500
18-7	24.5	113.125
17-1	25.0	109.375
17-2	25.0	110.000
17-3	25.0	110.625
17-4	25.0	111.875
17-5	25.0	112.500
17-6	25.0	113.125
16-1	25.5	109.375
16-2	25.5	110.000
16-3	25.5	110.625
16-4	25.5	112.500
16-5	25.5	113.125
16-6	25.5	113.750
15-1	26.0	109.375
15-2	26.0	110.000
15-3	26.0	110.625
15-4	26.0	112.500

(Continued)

Table 1 (continued)

ID	Latitude (° N)	Longitude (° W)
15-5	26.0	113.125
15-6	26.0	113.750
14-1	26.5	110.625
14-2	26.5	111.250
14-3	26.5	111.875
14-4	26.5	113.125
14-5	26.5	113.750
14-6	26.5	114.375
14-7	26.5	115.000
14-8	26.5	115.625
14-9	26.5	116.250
13-1	27.0	110.625
13-2	27.0	111.250
13-3	27.0	111.875
13-4	27.0	114.375
13-5	27.0	115.000
13-6	27.0	115.625
13-7	27.0	116.250
12-1	27.5	110.625
12-2	27.5	111.250
12-3	27.5	111.875
12-4	27.5	114.375
12-5	27.5	115.000
12-6	27.5	115.625
12-7	27.5	116.250
11-1	28.0	111.875
11-2	28.0	112.500
11-3	28.0	113.125
11-4	28.0	114.375
11-5	28.0	115.000
11-6	28.0	115.625
10-1	28.5	111.875
10-2	28.5	112.500
10-3	28.5	113.125
10-4	28.5	114.375
10-5	28.5	115.000
10-6	28.5	115.625
10-7	28.5	116.250
10-8	28.5	116.875
9-1	29.0	111.875
9-2	29.0	112.500

(Continued)

Table 1 (continued)

ID	Latitude (° N)	Longitude (° W)
9-3	29.0	113.125
9-4	29.0	115.000
9-5	29.0	115.625
9-6	29.0	116.250
9-7	29.0	116.875
8-1	29.5	111.875
8-2	29.5	112.500
8-3	29.5	113.750
8-4	29.5	113.125
8-5	29.5	115.625
8-6	29.5	116.250
8-7	29.5	116.875
7-1	30.0	113.125
7-2	30.0	113.750
7-3	30.0	114.375
7-4	30.0	115.000
7-5	30.0	116.250
7-6	30.0	116.875
7-7	30.0	117.500
7-8	30.0	118.125
6-1	30.5	113.125
6-2	30.5	113.750
6-3	30.5	114.375
6-4	30.5	115.000
6-5	30.5	116.250
6-6	30.5	117.500
6-7	30.5	118.125
5-1	31.0	113.125
5-2	31.0	113.750
5-3	31.0	114.375
5-4	31.0	115.000
5-5	31.0	116.250
5-6	31.0	116.875
5-7	31.0	118.125
4-1	31.5	113.750
4-2	31.5	114.375
4-3	31.5	115.000
4-4	31.5	116.875
4-5	31.5	117.500
4-6	31.5	118.125
4-7	31.5	118.750

(Continued)

Table 1 (continued)

ID	Latitude (° N)	Longitude (° W)
3-1	32.0	116.875
3-2	32.0	117.500
3-3	32.0	118.125
3-4	32.0	118.750
2-1	32.5	118.125
2-2	32.5	118.750
1-1	33.0	117.500
1-2	33.0	118.125
1-3	33.0	118.750

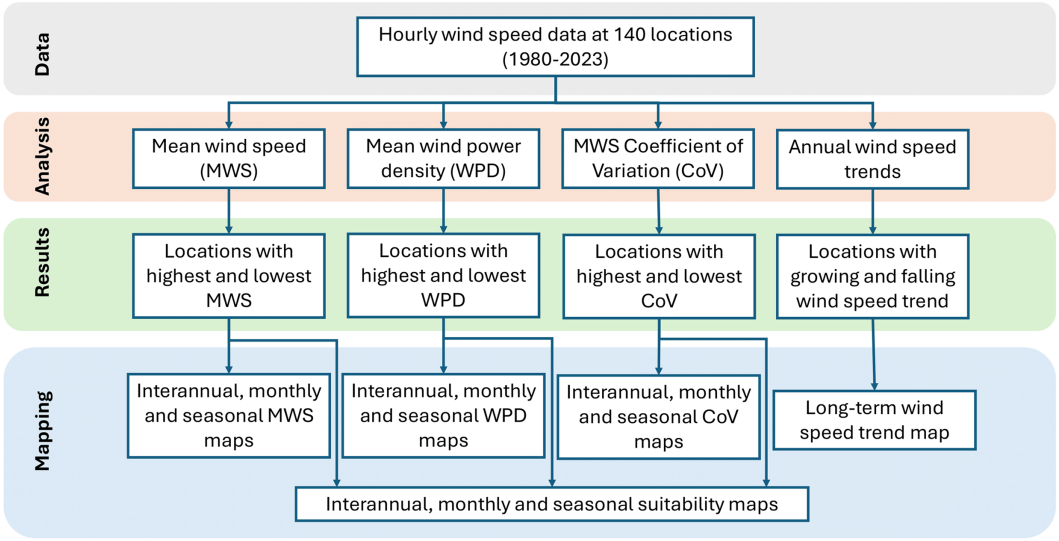


Figure 2: Methodology for offshore wind energy assessment in Baja California (Mexico).

MWS was measured in m/s and served as the foundation for estimating the energy potential of a site. It was calculated as annual, monthly, and seasonal averages at each of the 140 locations. For this purpose, winter covered the months between December and February; spring between March and May; summer between June and August; and autumn between September and November.

WPD was measured in W/m^2 and calculated at each of the 140 locations using Eq. (1) [60].

$$WPD = \frac{P}{A} = \frac{1}{2} \cdot \rho \cdot v^3 \tag{1}$$

where WPD, often denominated as P/A, represents the available wind power (P), measured in W, per area unit (A), measured in m^2. As mentioned before, further parameters involved v as wind speed in m/s and ρ as the air density in kg/m^3. Similarly to MWS calculations, WPD was calculated as annual, monthly, and seasonal averages per location.

Two considerations were taken when calculating mean WPD. First, because WPD depends cubically on wind speed, hourly WPD was calculated before temporal averaging so that averaging wind speed did

not underestimate energy potential [61,62]. Secondly, the revised analysis did not retain a constant density. Hourly moist-air density at 50 m was calculated from MERRA-2 2-m temperature, surface pressure and 2-m specific humidity, using Eq. (2), where Rd = 287.05 J kg^{-1} K^{-1} and p_{50} is surface pressure adjusted hydrostatically to 50 m [63,64]. WPD was also recalculated with dry-air density and with 1.225 kg/m^3 to quantify sensitivity.

$$\rho = \frac{p_{50}}{R_d T_{2m} (1 + 0.6078 q_{2m})} \tag{2}$$

The last step of this methodology examined wind-speed trend over the full 44-year dataset (1980–2023) along with wind-speed variability. Wind-speed trend was assessed as an absolute value in m/s per year, accounting for interannual wind-speed increment or decrement. For this purpose, first-degree polynomial regression was employed to calculate interannual wind-speed variation at each of the 140 studied locations. This approach was selected as it identifies increasing, decreasing, or stable wind-speed trends over time while avoiding overfitting and maintaining data robustness [65]. The choice of a first-degree linear regression model was guided by its simplicity and ability to capture long-term trends without overfitting random fluctuations in the data, which could lead to misleading interpretations. Revised inference reports ordinary-least-squares slopes with Newey–West heteroskedasticity- and autocorrelation-consistent standard errors, 95% confidence intervals, p-values, and R^2; Benjamini–Hochberg false-discovery-rate correction was applied across nodes and Theil–Sen slopes were used as a sensitivity check.

Additionally, wind-speed variability was assessed by calculating its CoV shown in Eq. (4). CoV represented the percentage ratio of the standard deviation, Eq. (3), to the MWS [56,66] for each of the 140 locations. As a standardised measure of variability, CoV facilitated variability comparison across different locations [47,67]. Because standard deviation can be sensitive to extremes, median absolute deviation (MAD) and robust CoV (RCoV = 100 × 1.4826 × MAD/median) were calculated in parallel.

$$\sigma = \sqrt{\left[(1/(N-1)) \sum_{i=1}^{N} (x_i - \overline{x})^2\right]} \tag{3}$$

$$CoV = \frac{\sigma}{\overline{x}} \cdot 100 \tag{4}$$

Since CoV was calculated for annual, monthly, and seasonal values, its parameters' interpretation varied between different approaches. For instance, when calculating MWS CoV for the ten-year timespan N meant the number of computed items, x_i represented monthly MWS for each of the 120 months between 2014 and 2023, and $\overline{x}$ showed the MWS for the overall ten-year time span per location. Similarly, when calculating interannual MWS CoV for each of the ten years since 2014 to 2023 individually, x_i represented monthly MWS in a year, and $\overline{x}$ the MWS for each year of the ten years independently. Correspondingly, when calculating monthly MWS CoV, x_i represented monthly MWS in a specific year, e.g., January 2014, and $\overline{x}$ the overall MWS for all Januarys from 2014 to 2023. Lastly, when calculating seasonal MWS CoV, x_i represented seasonal MWS in a specific year, e.g., spring 2014, and $\overline{x}$ represented overall MWS for all springs from 2014 to 2023. Weibull shape parameter, hourly lag-1 autocorrelation, the fraction of hours above 5 m/s and consecutive-run duration were added as complementary distributional and persistence diagnostics. Turbulence intensity was not estimated because hourly reanalysis does not resolve turbine-scale high-frequency fluctuations.

2.3 Mapping

Mapping played a pivotal role in this study, providing a robust framework for analysing and visualising the spatial distribution of wind resources across Baja California. Through geographic information system (GIS) integration, data derived from MERRA-2 was transformed into accessible visual outputs via precise

spatial analyses, enabling effective communication and comprehensive understanding of regional wind dynamics [68,69]. For this purpose, QGIS was employed, leveraging its inverse distance weighting (IDW) interpolation and hotspot mapping functionalities to elucidate spatial patterns and trends within the dataset [70].

The use of IDW interpolation was particularly suited for this study due to its simplicity, flexibility, and effectiveness in estimating values based on spatial proximity [71,72]. IDW low computational intensity turned it into an efficient option for processing large datasets, as those provided by MERRA-2, over geostatistical methods such as kriging [73,74]. This efficiency was vital for timely and scalable analyses, particularly when working with high-resolution data over extended temporal and spatial domains.

Another advantage of IDW over kriging lies in its simpler, deterministic weighting scheme, in which weights are assigned directly according to the distance between known data nodes and the location being estimated, without requiring variogram modeling [75]. This lack of assumptions made IDW highly effective in scenarios with complex data distribution and unavailable detailed information about spatial trends [76].

IDW aligned well with natural phenomena such as wind speed [71,77] as it operated on the principle that closer nodes exert greater influence on the estimated values than distant ones. By incorporating a distance-power parameter (P), IDW allowed for precise control over how spatial proximity influences the interpolation.

For the original maps, P = 3 was retained as the baseline IDW setting. It is not assumed to be universally optimal: the revised validation tests P = 1–5 and several neighbourhood sizes, reports prediction errors and compares the baseline with the cross-validated optimum. Quantitative conclusions remain anchored to the 140 native nodes rather than to interpolated pixels.

To improve the robustness of the spatial analysis, a buffer zone of 0.5° was applied around the convex polygon formed by the 140 geographical nodes. This buffer minimised edge effects during interpolation and ensures that the influence of neighbouring nodes was adequately captured, resulting in more reliable spatial estimates and avoiding distortions at the periphery of the study area.

2.4 Validation and Sensitivity Analysis

The validation tested the sensitivity of the original IDW maps rather than assuming that P = 3 was optimal, and results are summarised in Table 2. Spatial block cross-validation evaluated P = 1–5, neighbourhoods of 4, 8, 12 or all nodes, and a coastline-aware restriction that prevented influence across the peninsula. Nearest-neighbour, linear and natural-neighbour interpolation were assessed under the same withheld-block design. Screening uncertainty combined temporal bootstrap resampling (5000 replicates), MERRA-2–ERA5 product agreement, hourly air-density treatment, and the tested spatial scenarios.

Table 2: Spatial block cross-validation summary for the 2014–2023 fields.

Variable	Best P = 3 RMSE	Best IDW Setting	Best IDW RMSE	Best Alternative RMSE
MWS	0.417 m/s	P = 5, 4 nodes	0.403 m/s	Nearest: 0.438 m/s
WPD	28.990 W/m^2	P = 5, 8 nodes	27.580 W/m^2	Nearest: 28.910 W/m^2
CoV	2.136 pp	P = 5, all nodes	2.102 pp	Natural neighbour: 2.029 pp
RCoV	2.992 pp	P = 4, all nodes	2.982 pp	Natural neighbour: 2.698 pp

Note: P: IDW distance-power parameter; IDW: inverse distance weighting; RMSE: root-mean-square error; pp: percentage points. For P = 3, the reported values correspond to the lowest RMSE obtained among the tested neighbourhoods.

3 Results

3.1 Mean Wind Speed (MWS)

Offshore MWS assessment involves interannual, monthly, and seasonal calculations for the 140 studied locations during the last ten years (2014–2023) using hourly wind-speed data. This approach minimises errors and provides a robust assessment of the offshore wind resource. MWS is first calculated as a mean for the ten-year period and illustrated in both Fig. 3 and Table A1, which lists the numerical MWS values for each of the 140 studied locations at Baja California. This recent decade was selected for the detailed resource maps and for direct ERA5 comparison; the complete 1980–2023 record was retained for trend inference and a separate full-period resource-sensitivity calculation. Conclusions now state explicitly which period supports each result.

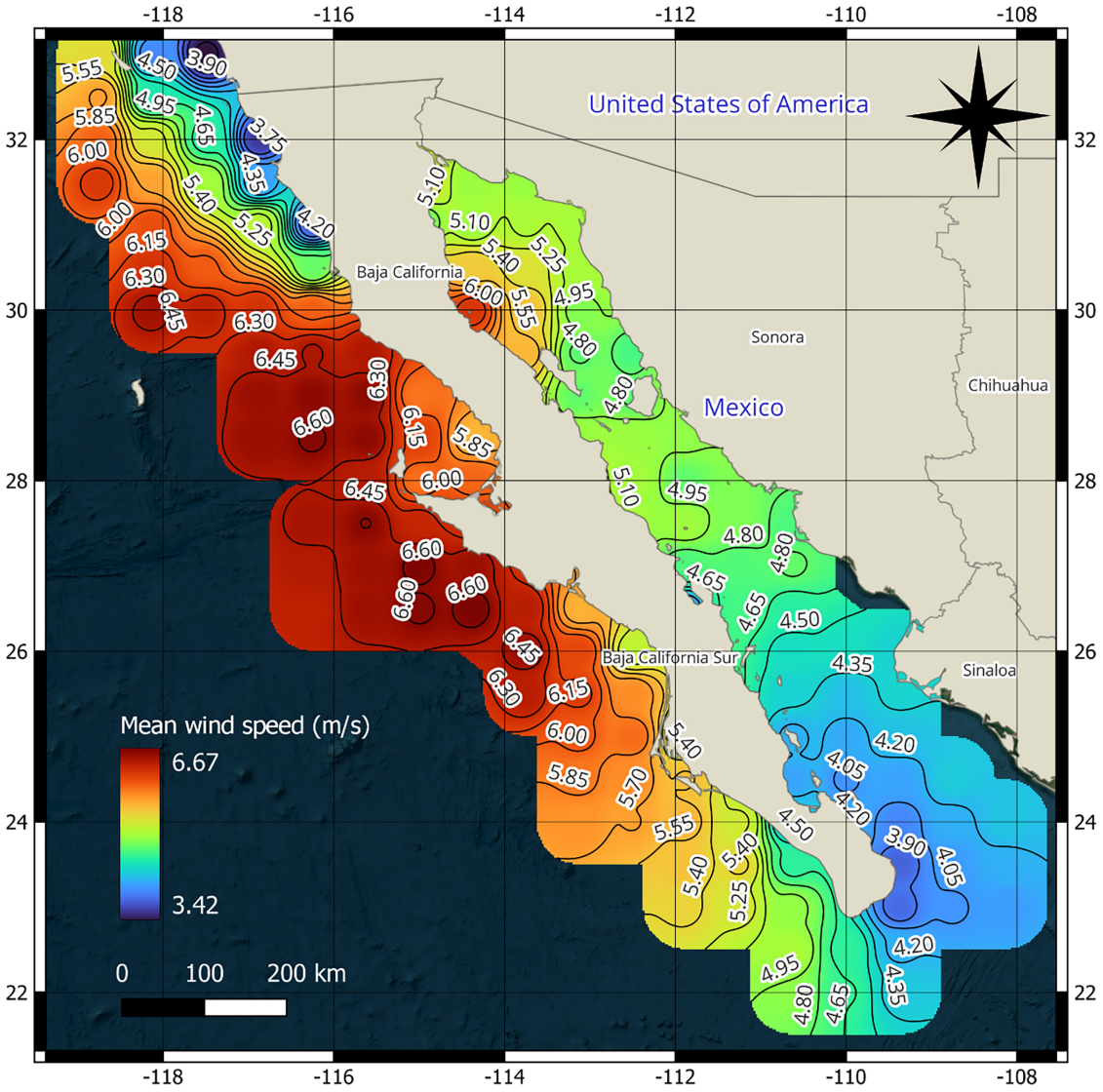


Figure 3: Mean wind speed (MWS) in Baja California (Mexico).

The results indicate significant spatial variability in wind speeds across the studied area, with the highest MWS observed in the western regions. Notably, the highest recorded MWS of 6.67 m/s was found at latitude

26.5° N and longitude 114.375° W (ID: 14-6). This location shows the highest offshore wind resource in the study area, given its consistently strong wind conditions. Other high MWS values, ranging between 6.55 and 6.62 m/s, were recorded at nearby locations, reinforcing the promising wind resource in this region. Conversely, the lowest MWS values were identified in both northwestern and southeastern areas, particularly at latitude 33° N and longitude 117.5° W (ID: 1-1), where an MWS of 3.42 m/s was recorded.

Further results show a clustering of high wind speeds along the Pacific coast, with a general trend of increasing MWS from east to west and from south to north. Locations with moderate wind speeds, ranging between 4 and 5.5 m/s, were predominantly observed in central regions, while southern locations near latitude 22° N and longitude 110° W (ID: 23-2) exhibited MWS values closer to the lower threshold of the spectrum.

Continuing the interannual analysis, MWS is calculated as an annual mean for each of the studied years. Results are illustrated in both Fig. 4 and Table A2. They show a relatively stable MWS ranging from 3 to 7 m/s for the overall region throughout the decade. Maximum MWS values experience a slight rise throughout the decade while minimum values maintain a more stable nature.

Additionally, interannual monthly MWS is calculated at each location and results are illustrated in Fig. 5 and Table A3. They reveal that the highest wind speeds occur from March to June, with some areas reaching more than 7 m/s MWS. Although there is a wide range of five continuous months with high wind speeds, maximum values are spotted in different areas. While the highest MWS from March to May are observed in western regions, maximum wind-speed values from May to June are shown in the northeastern area, specifically around latitude 30° N and longitude 114.375° W (ID: 7-3). Hence, locations with the highest MWS in March, April, May and June are latitude 29° N and longitude 115.625° W (ID: 9-5) with 7.47 m/s, latitude 29° N and longitude 116.25° W (ID: 9-6) with 7.83 m/s, latitude 26° N and longitude 113.75° W (ID: 15-6) with 7.68 m/s, and latitude 30° N and longitude 115° W (ID: 7-4) with 7.37 m/s, respectively.

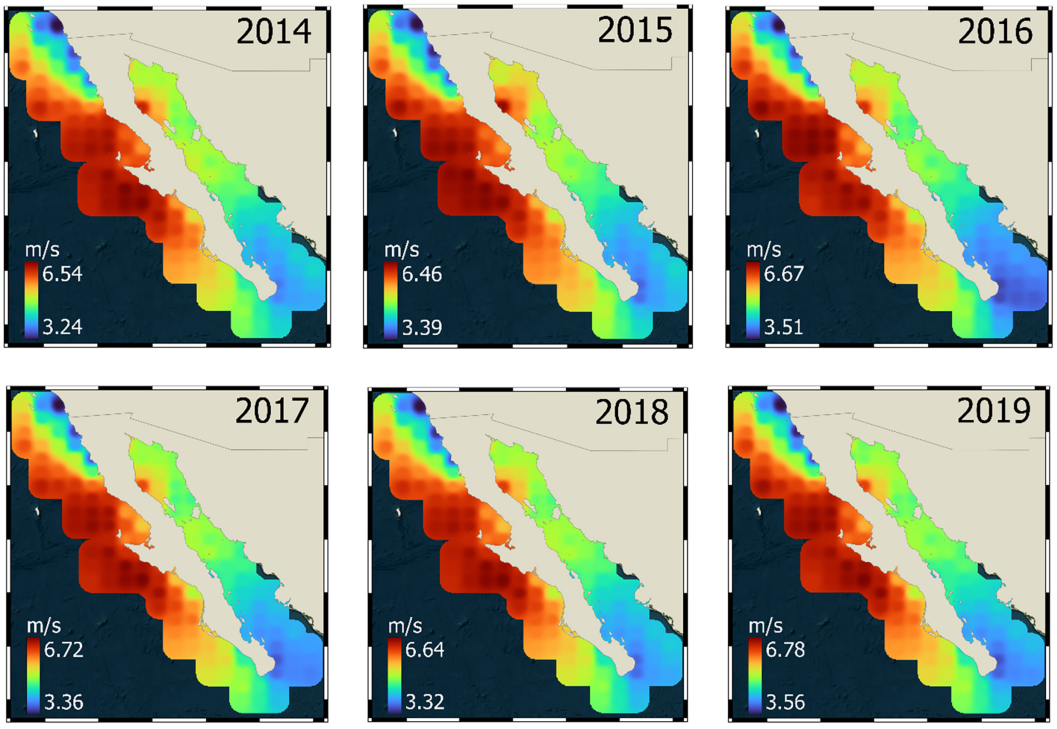


Figure 4: (Continued)

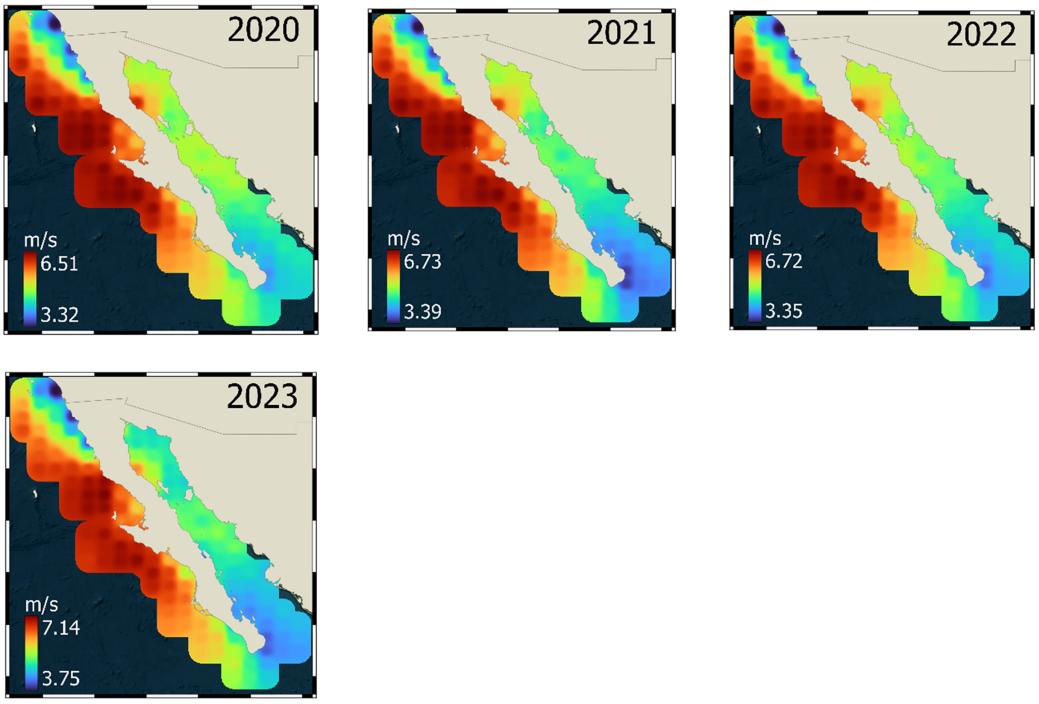


Figure 4: Interannual mean wind speed (MWS) in Baja California (Mexico).

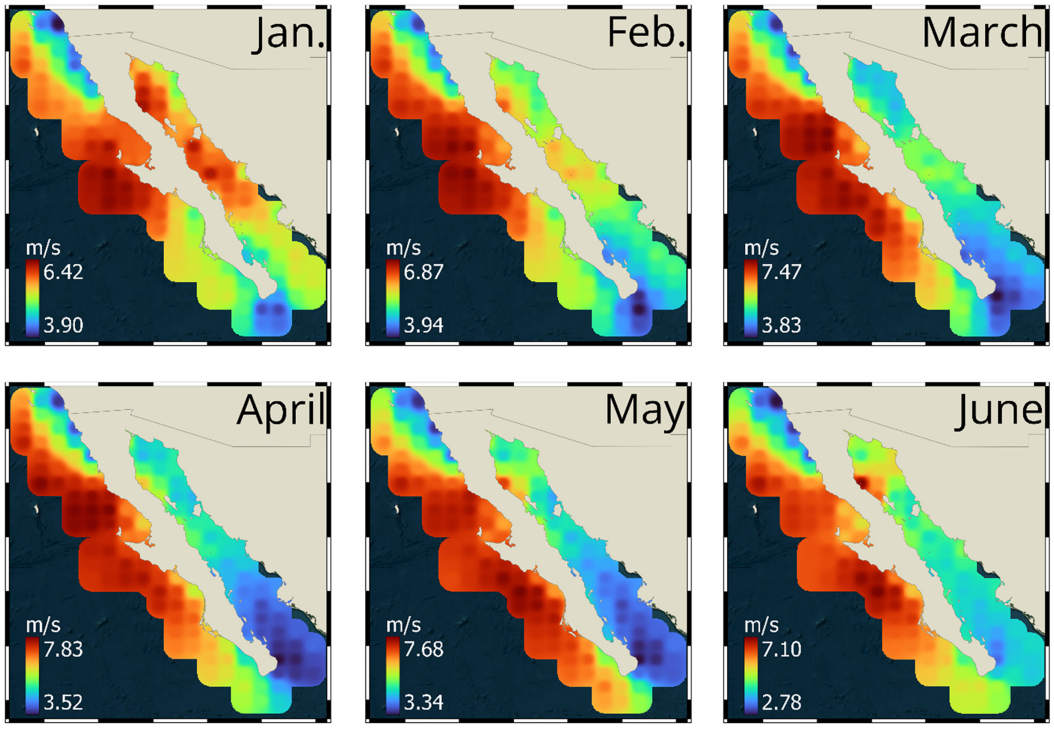


Figure 5: (Continued)

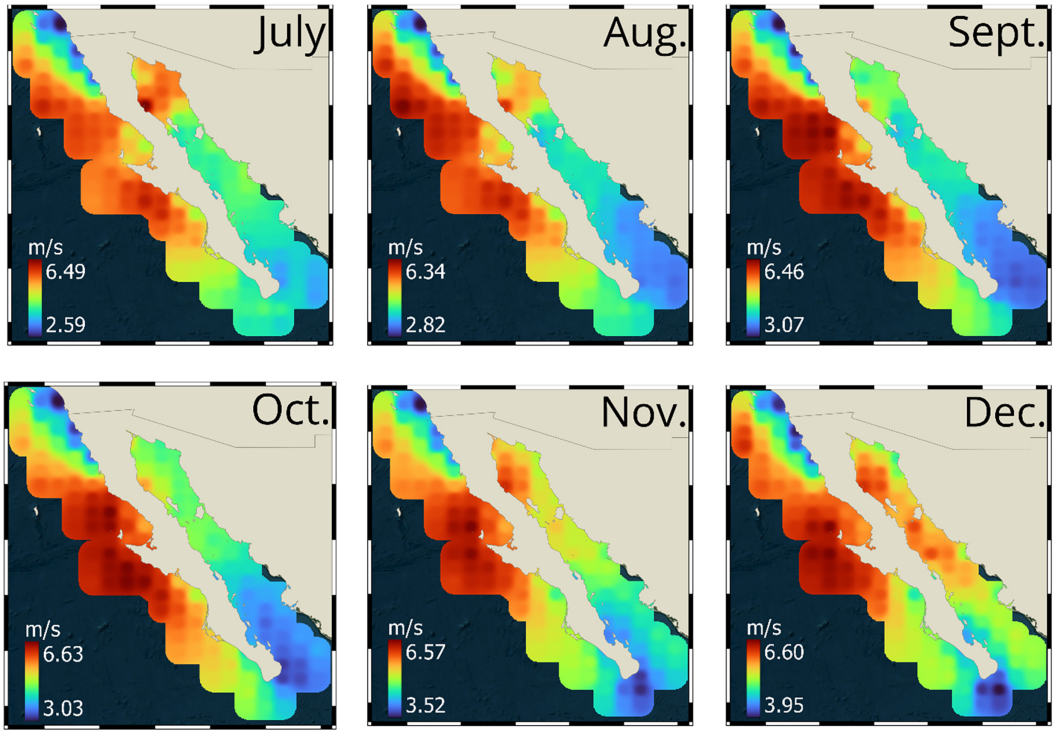


Figure 5: Monthly mean wind speed (MWS) in Baja California (Mexico).

In contrast, the lowest monthly MWS occurs from July to September with values lower than 3 m/s predominantly in northwestern and southeastern areas. Location at latitude 33° N and longitude 117.5° W (ID: 1-1) stands out with the lowest MWS for this period of months, e.g., 2.59 m/s in July. Moreover, an interesting phenomenon is observed during the winter months of January and February. Even though these months do not account for the maximum or minimum overall MWS of Baja California, they do show maximum MWS values for eastern areas. For latitude 29° N and longitude 113.125° W (ID: 9-3), January stands out as the windiest month with a MWS of 5.71 m/s while, for latitude 29° N and longitude 111.875° W (ID: 9-1) it is February with 5.50 m/s.

Further analysis involves considering wind seasonal behaviour gathering monthly data and calculating interannual seasonal MWS for each location at Baja California. Results are shown in both Fig. 6 and Table A4, revealing a significant seasonal pattern and a dominance of spring and winter as the windiest seasons for almost every location. In winter, locations with the highest and lowest MWS are latitude 27.5° N and longitude 115.625° W (ID: 12-6) with 6.63 m/s and latitude 22.5° N and longitude 109.375° W (ID: 22-1) with 3.99 m/s, respectively. In spring, locations with the highest and lowest values are latitude 29° N and longitude 115.625° W (ID: 9-5) with 7.58 m/s and latitude 23.5° N and longitude 109.375° W (ID: 20-3) with 3.64 m/s. In summer, locations with the highest and lowest MWS are latitude 30° N and longitude 115° W (ID: 7-4) with 6.65 m/s and latitude 33° N and longitude 117.5° W (ID: 1-1) with 2.73 m/s. Lastly, in autumn, locations with the highest and lowest MWS are latitude 29° N and longitude 115.625° W (ID: 9-5) with 6.49 m/s and latitude 33° N and longitude 117.5° W (ID: 1-1) with 3.21 m/s, respectively. For this reason, summer stands out as the windiest season for locations at latitude 30° N and longitude 114.375° W (ID: 7-3), at latitude 30.5° N and longitude 113.125° W (ID: 6-1), at latitude 31° N and longitude 113.125° W (ID: 5-1), and at latitude 31.5° N and longitude 113.750° W (ID: 4-1). Conversely, autumn is the only season that does not show as the windiest for any of the 140 studied locations.

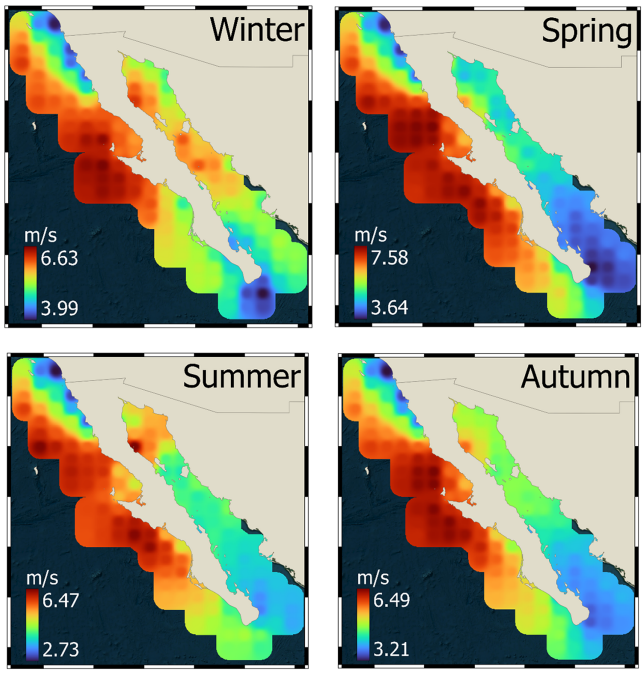


Figure 6: Seasonal mean wind speed (MWS) in Baja California (Mexico).

3.2 Mean Wind Power Density (WPD)

Similarly to MWS, offshore WPD analysis involves interannual, monthly, and seasonal calculations for the 140 study locations during a ten-year period (2014–2023). Hence, mean WPD is first calculated as a mean value for the studied decade using Eq. (1). By avoiding the use of probability density functions, this methodology minimises errors, ensuring a precise assessment of the wind energy potential. Results are illustrated in Fig. 7 and Table A1, which lists the numerical values for each of the 140 studied locations in Baja California.

As WPD is highly dependent on MWS for each location, high and low values of WPD correspond with high and low values of MWS. Similar to MWS results, WPD analysis reveals considerable spatial variability across Baja California. The highest mean WPD, 273 W/m^2, was recorded at latitude 30° N and longitude 114.375° W (ID: 7-3), corresponding to a location with high MWS. Other significant WPD values include 271 W/m^2 at latitude 30° N and longitude 115° W (ID: 7-4) and 248 W/m^2 at latitude 26.5° N and longitude 114.375° W (ID: 14-6).

Although WPD is closely tied to MWS, the highest WPD does not always occur at the location with the highest MWS. This discrepancy arises due to the cubic dependence of WPD on wind speed, as described by the formula (1). Slight increases in wind speed can lead to disproportionately large increases in WPD, amplifying the energy potential at locations with higher wind-speed variability or frequent strong wind events. Additionally, the methodology of calculating hourly WPD before averaging accounts for short-term variations and peak wind speeds, which may not significantly influence mean wind speed but have a substantial impact on mean WPD. This approach ensures a more accurate representation of the energy available at each location and highlights the importance of considering wind-speed distributions, not just mean values, in evaluating wind energy potential.

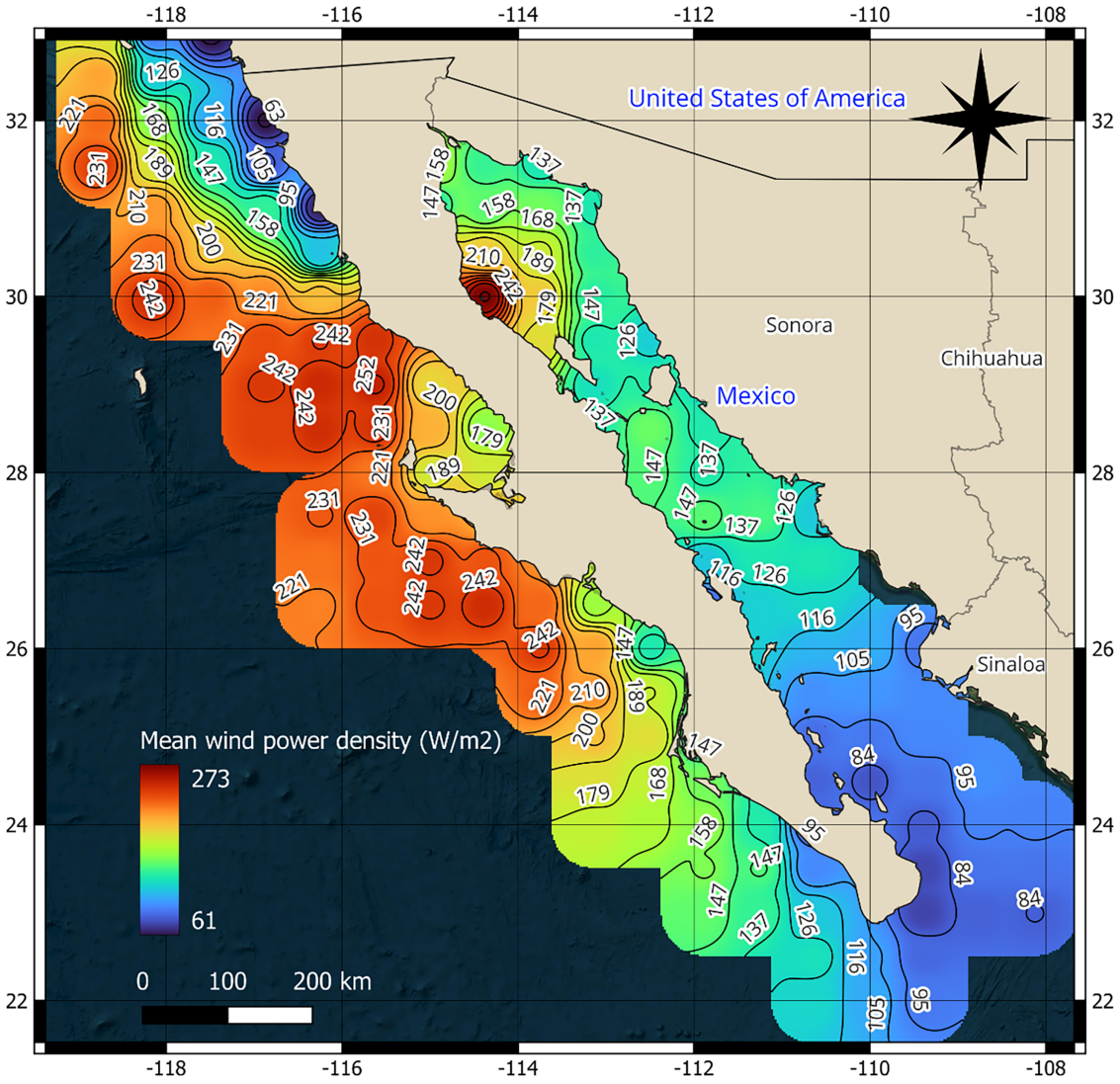


Figure 7: Wind power density (WPD) in Baja California (Mexico).

On the other hand, the lowest mean WPD, 61 W/m^2, was observed at latitude 33° N and longitude 117.5° W (ID: 1-1), corresponding with the location with the lowest MWS. Other low WPD values, such as 62 W/m^2 at latitude 32° N and longitude 116.875° W (ID: 3-1), are predominantly located in the northwestern parts of Baja California, correlating with lower wind speeds. The spatial distribution of WPD indicates that the highest values are concentrated along the northern and western coastal areas of Baja California. This pattern reflects the influence of favourable wind conditions in these regions, with a notable clustering of high WPD values near latitude 30° N. Moderate to low WPD values, ranging from 80 to 150 W/m^2, dominate the central and southern parts of the study area, where wind conditions are less intense.

Further interannual analysis involves calculating WPD as an annual mean for each of the studied years. Results are illustrated in both Fig. 8 and Table A5. Due to WPD high dependence on MWS, stable results in previous wind-speed assessment translate into stable outcomes in WPD analysis. Results show a stable WPD ranging from 50 to 300 W/m^2 for the overall region throughout the decade. In parallel with MWS calculations, maximum WPD values experience a slight rise throughout the decade.

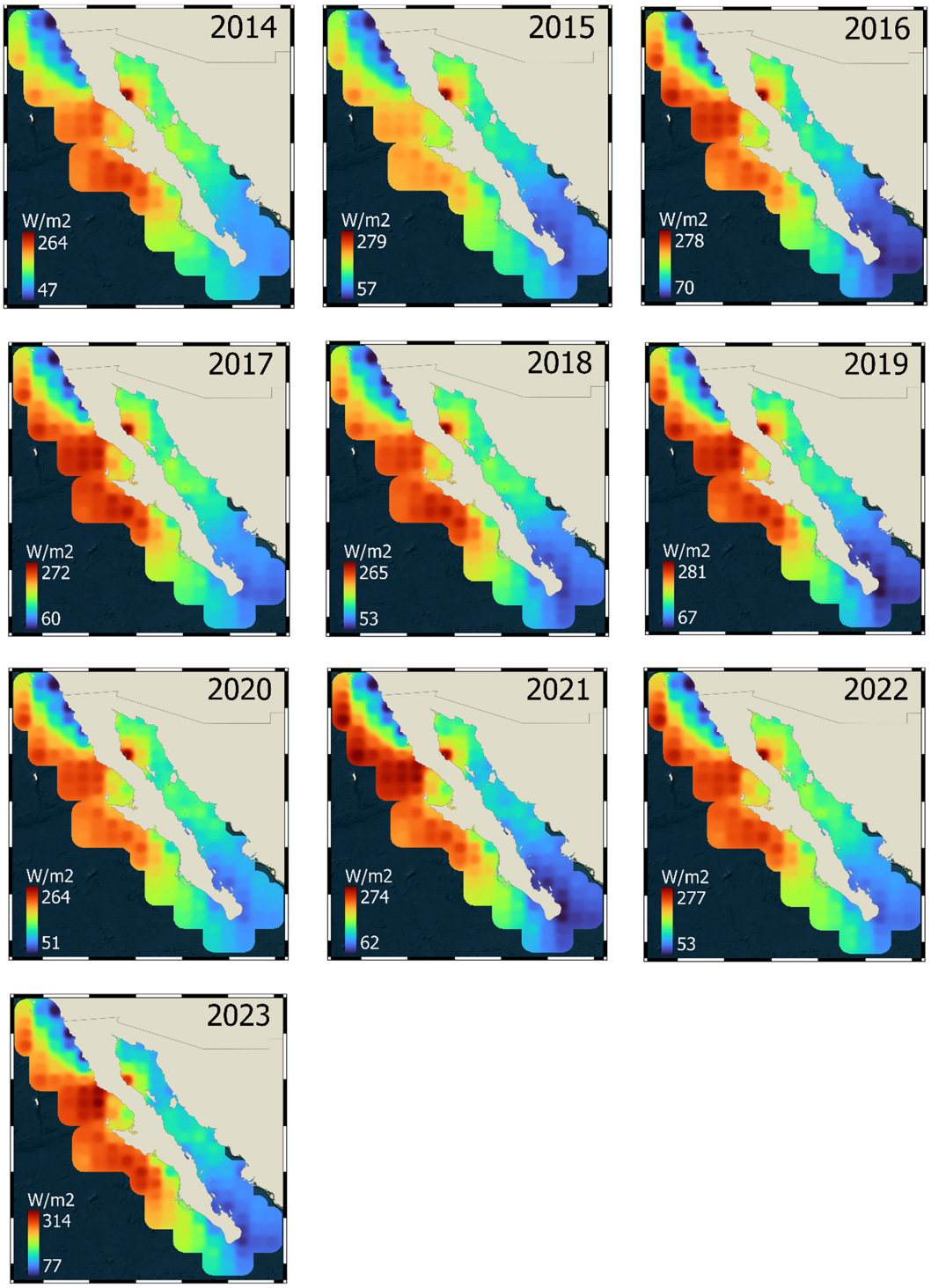


Figure 8: Interannual mean wind power density (WPD) in Baja California (Mexico).

Interannual monthly WPD results are illustrated in Fig. 9 and Table A6, revealing that the highest wind power density is obtained from March to June, with some areas reaching more than 380 W/m^2. Although there is a wide range of five continuous months with high wind speed, maximum values are spotted in different areas of Baja California. While the highest mean WPD from March to April is observed in western

regions such as latitude 29° N and longitude 115.625° W (ID: 9-5) with 348 W/m^2, the maximum WPD from May to August is notably merged in the northeastern area, specifically around latitude 30° N and longitude 114.375° W (ID: 7-3).

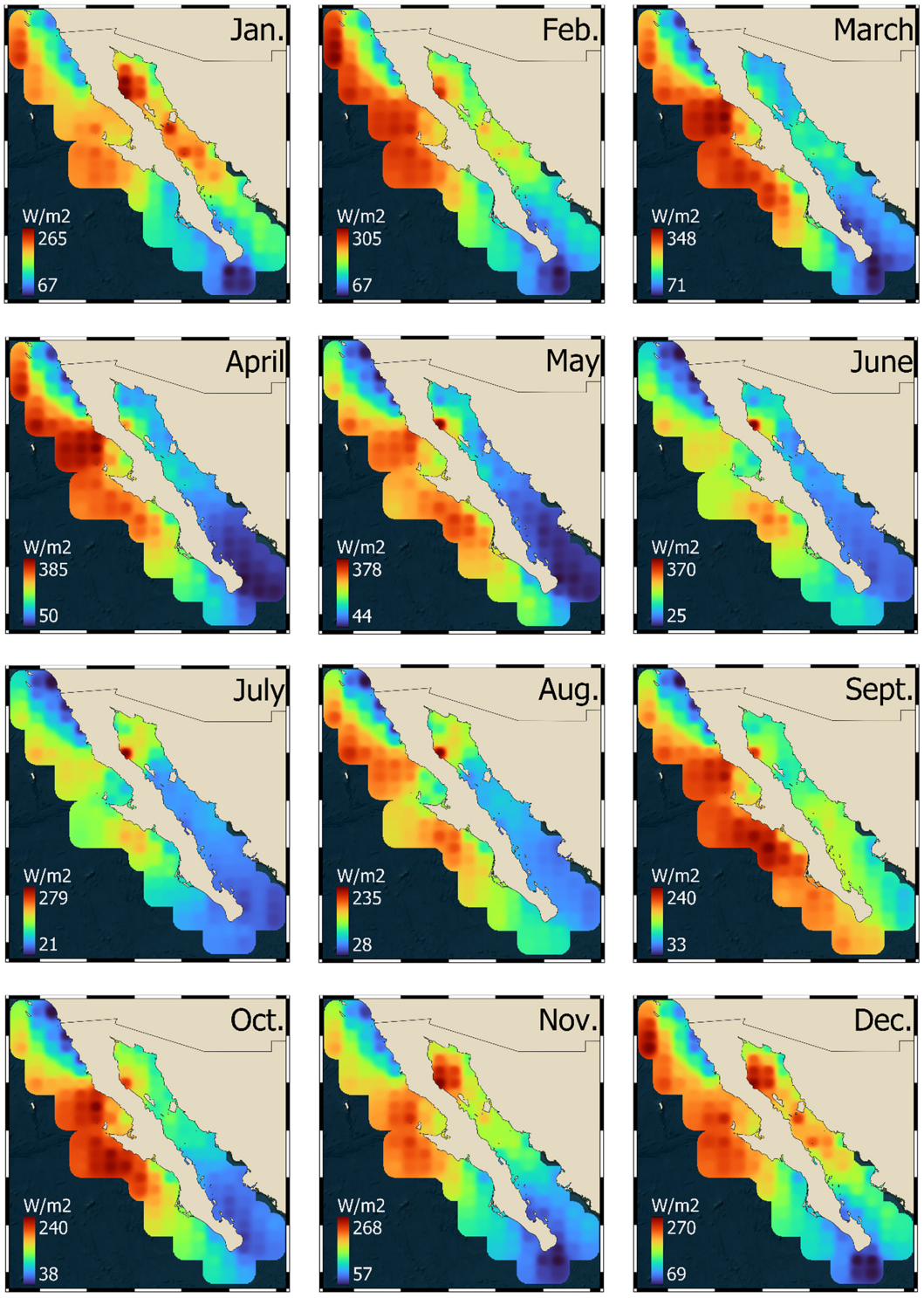


Figure 9: Monthly mean wind power density (WPD) in Baja California (Mexico).

On the other hand, the lowest monthly WPD is obtained from July to October with values around 20 W/m^2 predominantly in northwestern and southeastern areas. Location at latitude 33° N and longitude 117.5° W (ID: 1-1) shows the lowest WPD for all these months with a specific value of 20.9 W/m^2 for the month of July. Similarly to the MWS analysis, winter months of January and February show maximum mean WPD values of the eastern area even though these months do not account for the maximum or minimum overall WPD of Baja California.

Lastly, wind power seasonal assessment involves gathering monthly data and calculating interannual seasonal WPD for each of the 140 locations. Results are shown in both Fig. 10 and Table A7, revealing a significant seasonal pattern and a dominance of spring and winter as the windiest seasons for the overall region, paralleling previous MWS interannual seasonal analysis. Even though summer shows an equal maximum WPD to winter, the season also accounts for the lowest WPD values of all, reaching 25 W/m^2. In winter, locations with the highest and lowest WPD are latitude 30° N and longitude 115° W (ID: 7-4) with 294 W/m^2 and latitude 22.5° N and longitude 109.375° W (ID: 22-1) with 69 W/m^2, respectively. In spring, locations with the highest and lowest WPD are latitude 29° N and longitude 115.625° W (ID: 9-5) with 354 W/m^2 and latitude 23.5° N and longitude 109.375° W (ID: 20-3) with 61 W/m^2, respectively. In summer, locations with the highest and lowest WPD are latitude 30° N and longitude 114.375° W (ID: 7-3) with 294 W/m^2 and latitude 33° N and longitude 117.5° W (ID: 1-1) with 25 W/m^2, respectively. Lastly, in autumn, locations with the highest and lowest WPD are latitude 29° N and longitude 115.625° W (ID: 9-5) with 233 W/m^2 and latitude 33° N and longitude 117.5° W (ID: 1-1) with 49 W/m^2, respectively.

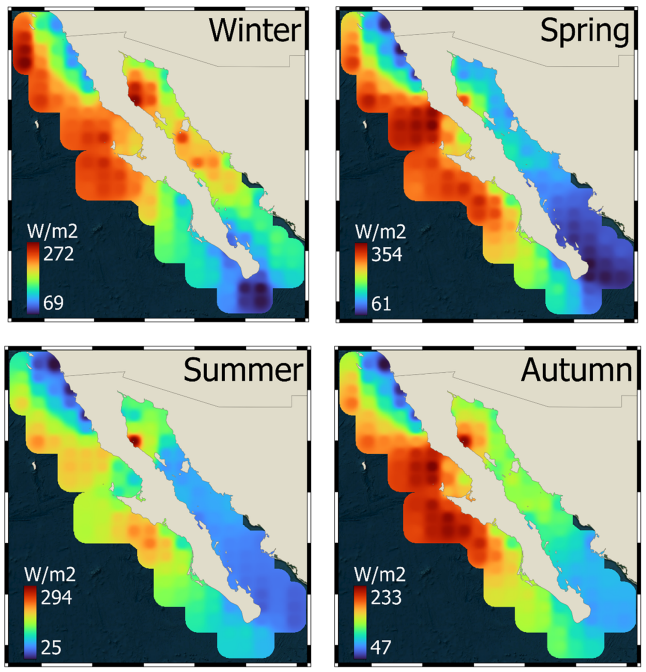


Figure 10: Seasonal mean wind power density (WPD) in Baja California (Mexico).

Hourly moist-air density averaged 1.1796 kg/m^3 across nodes. Relative to the conventional constant value of 1.225 kg/m^3, constant density overestimated full-period WPD by 3.29% on average (node range: 1.08%–8.99%). Humidity alone changed WPD by approximately 0.65% relative to dry-air density. Two WPD-only threshold classifications changed, but neither affected the joint primary resource-candidate set.

For 2014–2023, paired ERA5 values were 3.93% higher for MWS and 17.30% higher for WPD than MERRA-2, while density differed by only 0.23%. WPD threshold agreement was 81.4% (114 of 140 nodes), showing that reanalysis-product choice contributes more classification uncertainty than humidity treatment.

3.3 Wind Stability and Variability

Wind-speed stability is analysed through the calculation of the wind-speed trend along the 44-year dataset (1980–2023) using a first-degree linear regression model for each of the 140 locations. Wind-speed trend is expressed in absolute terms, m/s, per year. Results reveal a slight spatial variability in wind-speed stability across Baja California, highlighting areas with both increasing and decreasing wind-speed trends. Numerical results for each location are summarised in Table A1, while Fig. 11 illustrates these trends on a map.

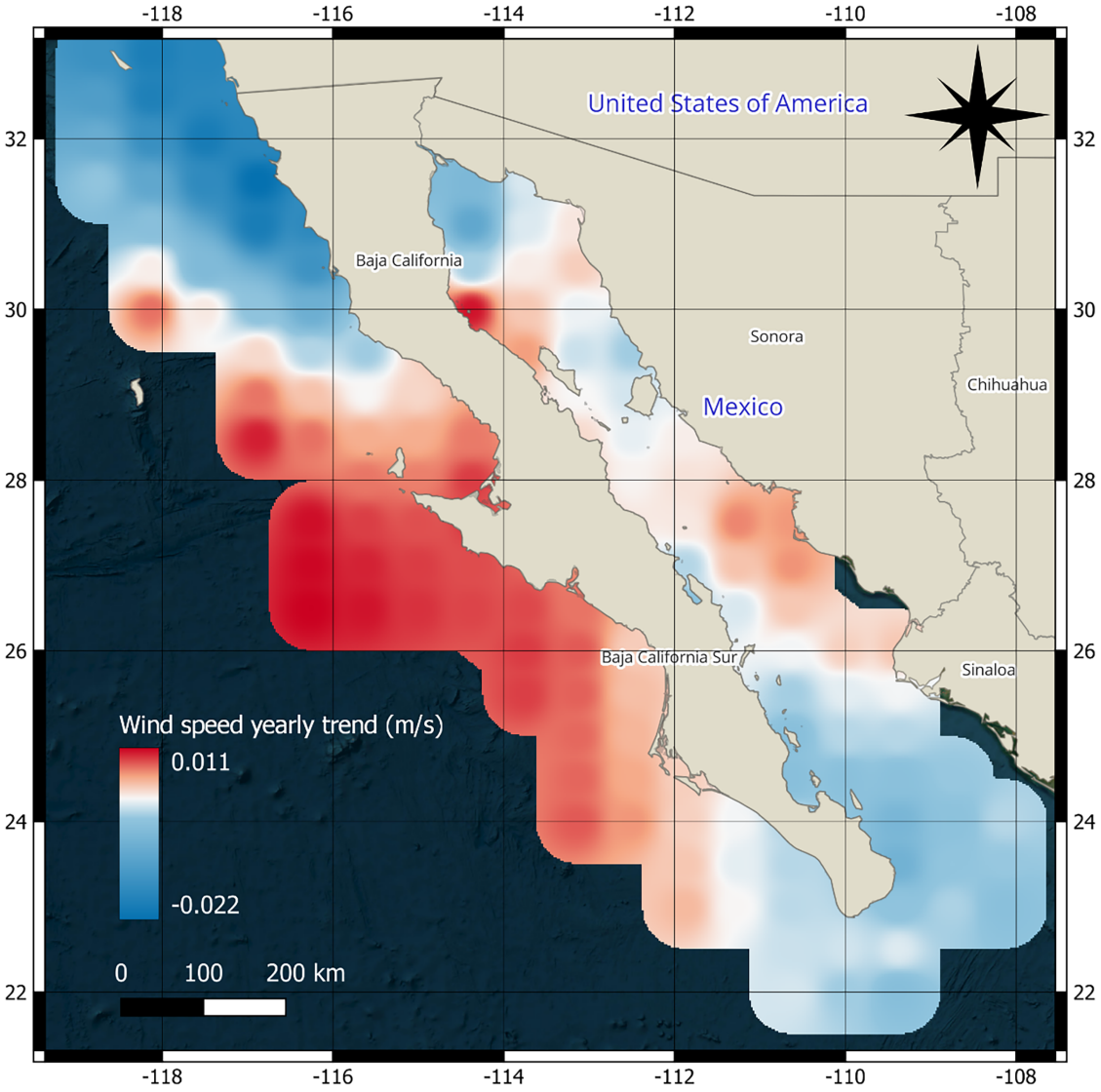


Figure 11: Annual wind-speed trend in Baja California (Mexico).

Overall, the trends indicate a mixture of increasing, stable, and decreasing wind speeds over the 44-year period. The most pronounced positive trend is observed at latitude 26.5° N and longitude 116.25° W

(ID: 14-9), with an annual increase of 0.011 m/s. Other notable locations with increasing trends include those near latitude 26.5° N and longitude 115.625° W (ID: 14-8), showing an annual increase of 0.010 m/s per year. These locations are descriptive slope estimates; their statistical support is evaluated below.

On the contrary, the steepest negative trend is observed at latitude 31.5° N and longitude 116.875° W (ID: 4-4), with a wind-speed slope of −0.022 m/s per year. Other negative slopes occurred near latitude 31° N and longitude 116.875° W (ID: 5-6), with a trend of −0.019 m/s per year, and latitude 32° N and longitude 117.5° W (ID: 3-2), which had a slope of −0.019 m/s per year. These are descriptive estimates; their statistical support is evaluated below.

Further spatial distribution of trends reveals that northern and northwestern coastal areas generally display stable to increasing trends, while southeastern regions show predominantly decreasing wind-speed trends. The slope maps show positive and negative local values; however, slope magnitude alone does not establish regional stability, predictability or reliability.

Significance testing changes the interpretation of these slopes. The regional 1980–2023 MWS trend was +0.0034 m/s per decade (95% HAC confidence interval: −0.0280 to +0.0348; $p = 0.829$; $R^2 = 0.001$), and the regional WPD trend was +1.04 W/m^2 per decade (95% HAC confidence interval: −1.29 to +3.36; $p = 0.373$; $R^2 = 0.015$). Neither regional trend was statistically distinguishable from zero. After false-discovery-rate correction, 55 node-level MWS slopes and 57 WPD slopes remained significant, demonstrating local heterogeneity without supporting a uniform regional trend.

Additional analysis includes MWS variability assessment using its CoV, calculated from Eqs. (2) and (3) and expressed as a percentage. Interannual wind-speed variability is calculated similarly to previous analyses, including overall, interannual, and seasonal CoV. The overall variability is illustrated in Fig. 12 and Table A1, showing that overall CoV in Baja California ranges between 10.0% and 21.3%, with the northwestern and southeastern areas showing the highest wind-speed variability.

The lowest CoV values indicate more reliable wind resource conditions and are observed in northeastern regions such as latitude 31° N and longitude 113.125° W (ID: 5-1) with a 10.0% wind-speed variability. The central regions are also notable for lower CoV values, with the Pacific coast having slightly lower CoV than eastern areas. Conversely, the highest CoV values are identified in southeastern areas, particularly at latitude 24° N and longitude 108.750° W (ID: 19-2) with a 21.3% CoV.

Additionally, interannual wind-speed variability is calculated for each year of the studied decade and results are depicted in both Fig. 13 and Table A2. Interannual variability shows stable values over the decade and, consistent with the overall CoV results, lower interannual CoV values are observed in both central and northeastern regions while higher interannual wind-speed variability is observed in southeastern areas. It is also noticeable that interannual overall calculations show smoothed CoV results whereas year to year analysis displays a wider range of wind-speed variability. While interannual overall CoV ranges from 10.0% to 21.3%, the sharpest year-to-year CoV is observed in 2019, ranging from 5.3% to 27.8%.

Interannual monthly wind speed CoVs are illustrated in Fig. 14 and Table A8, revealing that the lowest variability is scattered through the months of April, May, June, October and December. Furthermore, each month exhibits a minimum level of wind-speed variability at different regions. For instance, southeastern regions account for the lowest CoV in April, central regions in May, eastern areas in June and December, and western regions in October. Specifically, location at latitude 24° N and longitude 111.875° W (ID: 19-6) shows the lowest variability in April with value of 3.1%, latitude 26.5° N and longitude 111.25° W (ID: 14-2) in May with a 4.5% CoV, latitude 30° N and longitude 113.125° W (ID: 7-1) in June with a value of 3.1%, latitude 27° N and longitude 115° W (ID: 13-5) in October with a 3.4% CoV, and latitude 27.5° N and longitude 110.625° W (ID: 12-1) in December with a variability of 4.6%.

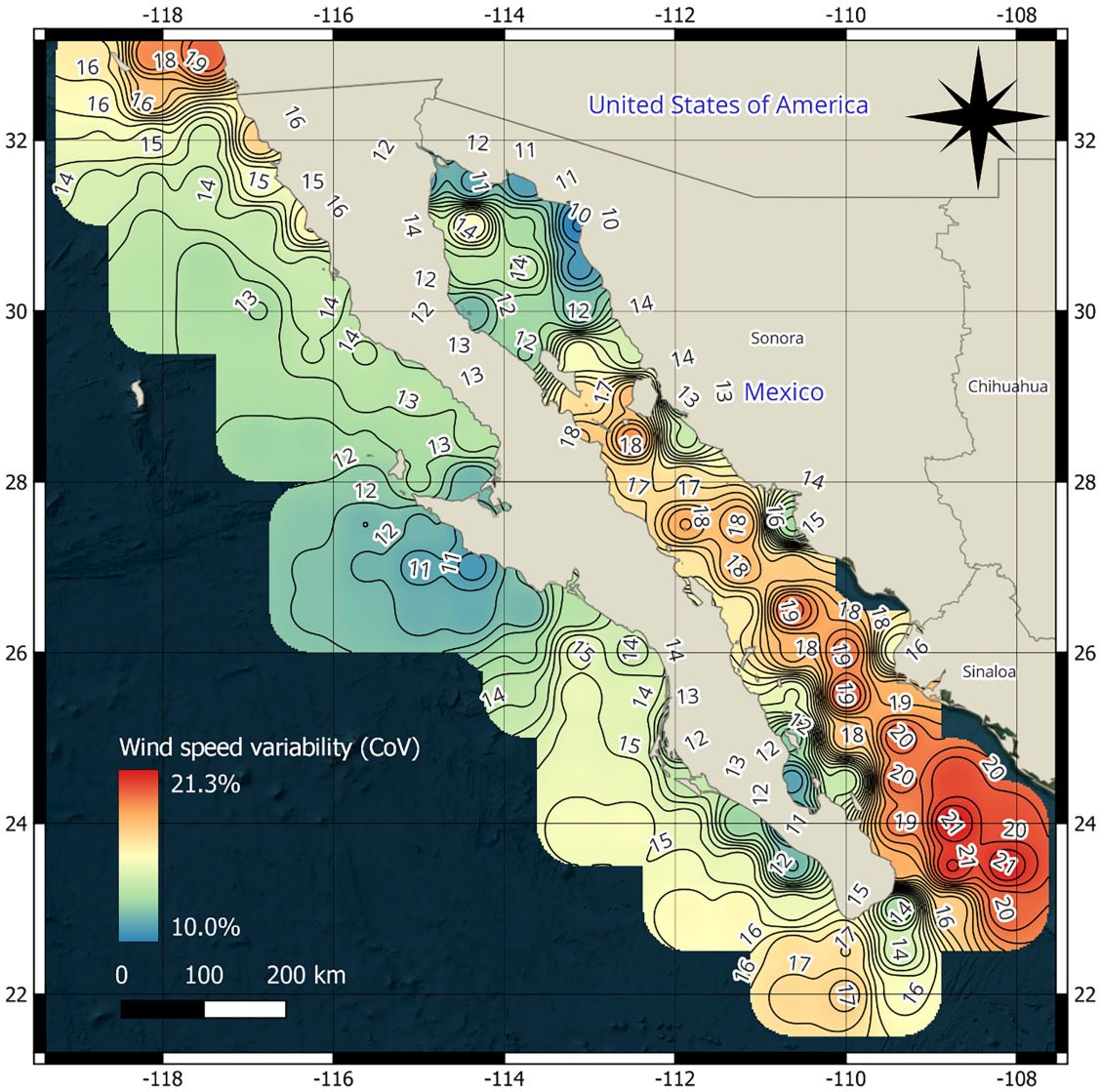


Figure 12: Wind-speed variability through the coefficient of variation (CoV) in Baja California (Mexico).

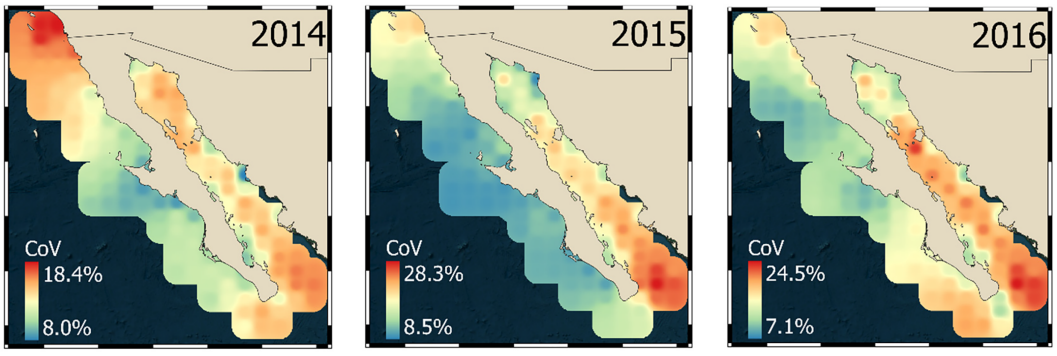


Figure 13: (Continued)

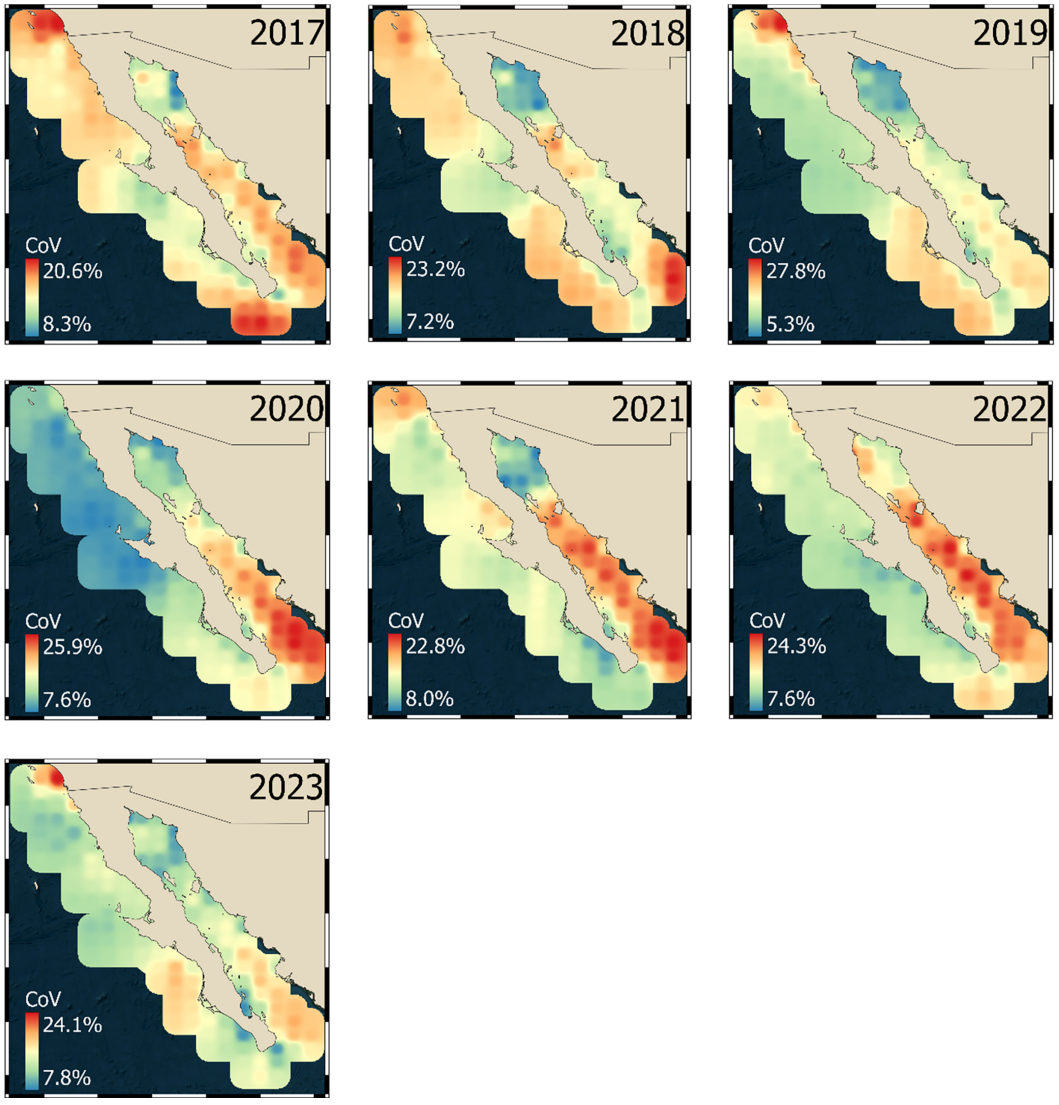


Figure 13: Interannual wind-speed variability through the coefficient of variation (CoV) in Baja California (Mexico).

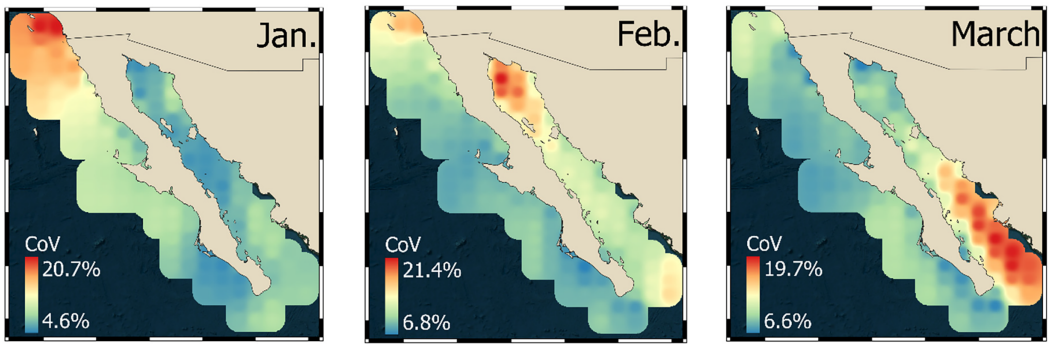


Figure 14: (Continued)

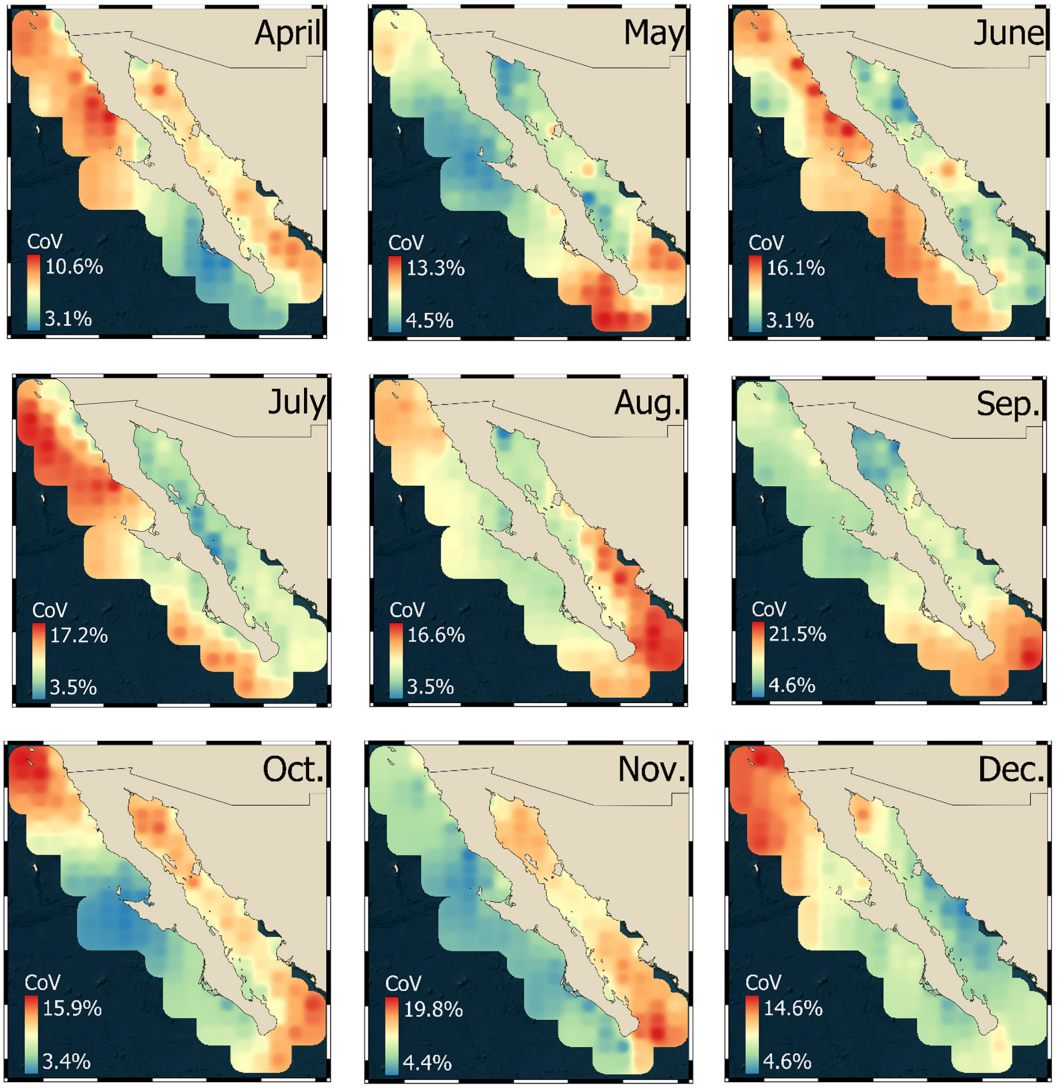


Figure 14: Monthly wind-speed variability through coefficient of variation (CoV) in Baja California (Mexico).

In contrast, the highest variability is observed in January, February, March, September, and November, spotted at northwestern areas in January, northern regions in February, southeastern areas in March and November, and southern regions in September. Specifically, location at latitude 33° N and longitude 117.5° W (ID: 1-1) shows the highest variability in January with value of 20.7%, latitude 31° N and longitude 114.375° W (ID: 5-3) in February with a 21.4% CoV, latitude 25° N and longitude 109.375° W (ID: 17-1) in March with a value of 19.7%, latitude 23° N and longitude 108.125° W (ID: 21-1) in September with a 21.5% CoV, and latitude 23° N and longitude 108.75° W (ID: 21-2) in November with a variability of 19.8%.

Further analysis involves calculating wind-speed seasonal variability. Results are shown in both Fig. 15 and Table A4, revealing winter as the season with the lowest conventional relative variability; the robust cross-check identified summer, rather than autumn, as the season with the highest typical relative variability. In winter, locations with the lowest and highest variability are latitude 25° N and longitude 111.875° W (ID: 17-4) with a CoV of 5.9% and latitude 33° N and longitude 118.125° W (ID: 1-2) with a value of 17.4%, respectively. In spring, locations with the lowest and highest variability are latitude 31.5° N and longitude

114.375° W (ID: 4-2) with a CoV of 5.7% and latitude 24° N and longitude 108.75° W (ID: 19-2) with a value of 18.5%, respectively. In summer, locations with the lowest and highest variability are latitude 29.5° N and longitude 113.125° W (ID: 8-3) with a CoV of 6.6% and latitude 22° N and longitude 110.625° W (ID: 23-3) with a value of 18.1%, respectively. Lastly, in autumn, locations with the lowest and highest variability are latitude 27.5° N and longitude 115.625° W (ID: 12-6) with a CoV of 6.3% and latitude 23.5° N and longitude 108.75° W (ID: 20-2) with a value of 21.4%, respectively.

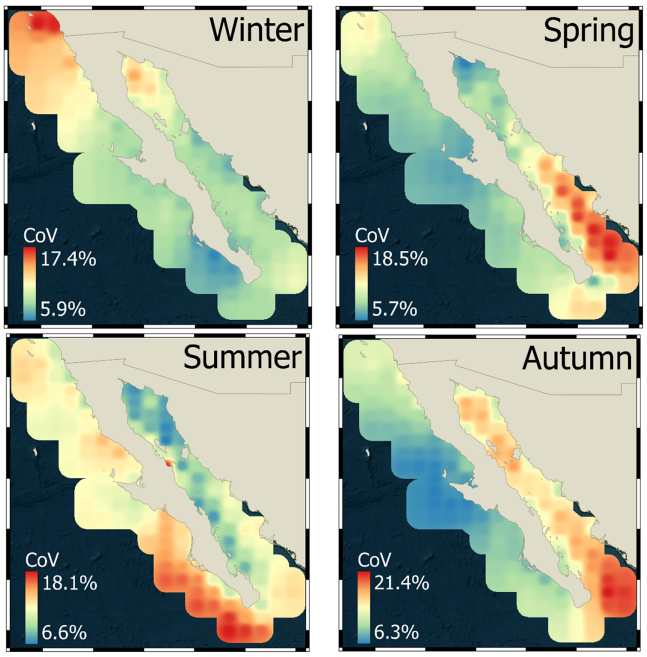


Figure 15: Seasonal wind-speed variability through coefficient of variation (CoV) in Baja California (Mexico).

Across nodes, median CoV and RCoV were 14.02% and 14.55%, respectively; their Spearman correlation was 0.925. Twenty-eight of the 35 lowest-variability nodes overlapped between both measures (Jaccard index 0.667), indicating a robust broad pattern but sensitivity near ranking cut-offs. Median Weibull shape was 2.260, median hourly lag-1 autocorrelation was 0.978, 50.70% of hours exceeded 5 m/s and the median above-threshold run lasted 16.16 h.

4 Discussion

Primarily, understanding and addressing the limitations inherent in this research is essential to ensure its reliability and applicability. Such considerations include data and GIS limitations from both the MERRA-2 dataset and IDW interpolation.

Although MERRA-2 provides a high-resolution, long-term dataset invaluable for atmospheric and climate studies, it is not free from limitations when it comes to assessing missing data. Errors in hourly wind data, inherent to reanalysis systems, stem from several factors including model approximations, the data assimilation process, and variations in the quality and availability of observational inputs [78,79]. These limitations were quantified rather than assumed negligible: over 2014–2023, paired ERA5 means were 3.93% higher for MWS and 17.30% higher for WPD than MERRA-2.

Further considerations include the use of proximity-based interpolation for GIS visualisation. Spatial block cross-validation showed that P = 3 was close to, but not always equal to, the lowest-error IDW setting.

Coast-aware best-case RMSE was 0.403 m/s for MWS and 27.58 W/m^2 for WPD. Nearest-neighbour, linear and natural-neighbour tests did not identify a universally superior method: performance depended on the mapped variable. Because 25.7% of withheld predictions lay outside the training convex hull, interpolated surfaces are treated as visual representations, while numerical conclusions and classifications are based on native nodes.

MWS and WPD results reveal areas of Baja California with both high and low wind-resource values. Northwestern and southeastern regions show lower resource-screening values, including locations around IDs 1-1, 3-1, 22-1, and 20-3. For example, location 1-1 shows the lowest wind energy potential for various analyses, such as the lowest interannual MWS and WPD, the lowest interannual monthly MWS and WPD from July to September and the lowest interannual seasonal MWS and WPD in both summer, and autumn, which are, in turn, the least windy seasons of Baja California. Furthermore, location 22-1 shows the lowest MWS and WPD in winter while location 20-3 displays the lowest MWS and WPD in spring. On the other hand, northeastern and western areas ranging from latitude 25° N to 30° N show higher resource potential, including regions around IDs 9-6, 9-5, 9-4, 7-3, and 14-6. Even though overall the highest MWS and WPD appear at locations 14-6, and 7-3, monthly, and seasonal analysis reveal deeper insight into high-potential areas. Interannual monthly calculations show that the highest wind speeds occur from March to June. During these months, locations 9-5, 9-6, 15-6, and 7-3 account for the greatest MWS and WPD offshore values. Moreover, even though January and February do not account for the highest MWS, they do show its highest values at locations 9-3 and 9-1, respectively. Further seasonal analysis reveals location 9-5 as the one with the highest MWS and WPD for both spring and autumn, location 12-6 as the one with the highest MWS in winter and location 7-3 as the one with the highest WPD in summer.

In-depth analysis reveals that the regions with the greatest offshore wind potential, northeastern and western areas, show complementary MWS and WPD distribution. This complementarity is relevant to future OWF planning as geographically distributed resource areas could potentially increase energy supply stability and reduce seasonal variability at the regional scale [80]. Western areas of Baja California are spotted as the windiest, with locations around 9-6, 10-6, 12-6, 13-6, 14-8, 15-6 and 16-6 showing the highest MWS values from September to May. On the contrary, northeastern locations around 7-3 show the greatest MWS values in June and July. However, when it comes to analysing WPD, western locations account for the highest values in March, April, September and October while northeastern locations account for the greatest WPD in the remaining months. Hence, northeastern and western areas complement each other, representing the highest monthly WPD values during a year.

This situation occurs due to the influence of wind-speed variability. Although wind values at a location may be higher, it is crucial to know whether they are occasional or stable values over time. Relative variability complements, but does not determine, WPD, which remains calculated from the hourly cubic wind-speed term [81]. The phenomenon of wind-speed variability is studied by analysing wind-speed trends and CoV. For example, location 7-3 is known to have lower variability than the mentioned western areas during January, June, July, and September, which may account for its greater WPD values. Further analysis on wind-speed CoV reveals that other regions noted for their low offshore wind energy potential, such as locations near 1-1, 20-1, 21-2, and 23-3, also show unfavourable CoV values from a resource-screening perspective. These locations exhibit the highest values of wind-speed variability for the months of January, September, and November, as well as for winter, autumn, and summer seasons.

Moreover, long-term wind-speed trends at Baja California show annual variations ranging from −0.022 to 0.011 m/s per year over the 44-year record. Slope sign alone was not interpreted as reliability because confidence intervals, p-values, and temporal autocorrelation must also be considered [82]. When comparing wind-speed trend results with MWS and WPD ones, it is noticed that increasing and decreasing trends occur

at locations with high and low wind energy potential, respectively. Some higher-resource sectors also contain positive local slopes, but this spatial coincidence is descriptive and does not establish future project suitability.

These findings highlight the importance of interpreting long-term wind-resource stability against commonly cited resource-screening thresholds. On the one hand, wind energy projects generally consider mean wind speeds above 5 m/s optimal for modern wind turbine operation [83–85]. These wind speeds are associated with efficient energy production and economic feasibility when supported by favourable site-specific factors such as WPD, stability, and accessibility [86,87]. While sites with MWS slightly below this threshold may still be viable, their feasibility should be evaluated based on other contributing factors. On the other hand, WPD values above 200–250 W/m^2 are commonly used in the literature as an indicative lower bound for a promising wind resource, and values above 400 W/m^2 indicate a substantially stronger resource [86,88–90]. Additionally, lower CoV indicates more stable wind resource conditions and is therefore favourable from a resource-screening perspective [91]. These values are used here only as resource-screening thresholds. Resulting output would depend on project-level factors such as offshore observations, hub-height profiles, high-frequency turbulence and gust measurements, extreme winds, turbine power curves, wakes, bathymetry, environmental constraints, and economic analysis.

Based on these resource-screening thresholds, locations with an MWS above 5 m/s, a WPD above 200 W/m^2, and low wind-speed variability were identified. The original 2014–2023 three-criterion screen identified 38 locations; this baseline is shown in Fig. 16 and is not interpreted as project feasibility. In line with previous results, these locations are gathered in western and northeastern areas, showing high MWS and WPD together with low wind-speed variability, as illustrated in Fig. 16. Further insight into monthly distribution shows that the windiest months, March, April, May and June, gather 55, 54, 61 and 36 locations that meet the resource-screening criteria, respectively. However, April and June experience higher variability at the Pacific coast than March and May, which must be considered in any subsequent resource assessment for this period. Other months with numerous resource-screening candidates are February and December, with 51 and 48 locations, respectively. Moreover, July and August, two of the least windy months, only account for one and two locations that meet the resource-screening criteria, respectively, locations 7-3 and 7-8, as illustrated in Fig. 17. This situation makes location 7-3 the only candidate meeting the resource-screening criteria every month, although it does not have the highest MWS and WPD in most months. Furthermore, despite the fact that summer months have at least one resource-screening candidate, these locations show high wind-speed variability, as illustrated in Fig. 18.

As an additional full-period sensitivity analysis, 36 nodes met the joint MWS above 5 m/s and moist-air WPD above 200 W/m^2 resource thresholds. Propagating temporal, reanalysis-product, density and spatial-scenario uncertainty classified 19 nodes as robust resource-screening candidates, 17 as sensitivity-dependent candidates, 28 as uncertain and 76 as robust non-candidates (Fig. 19).

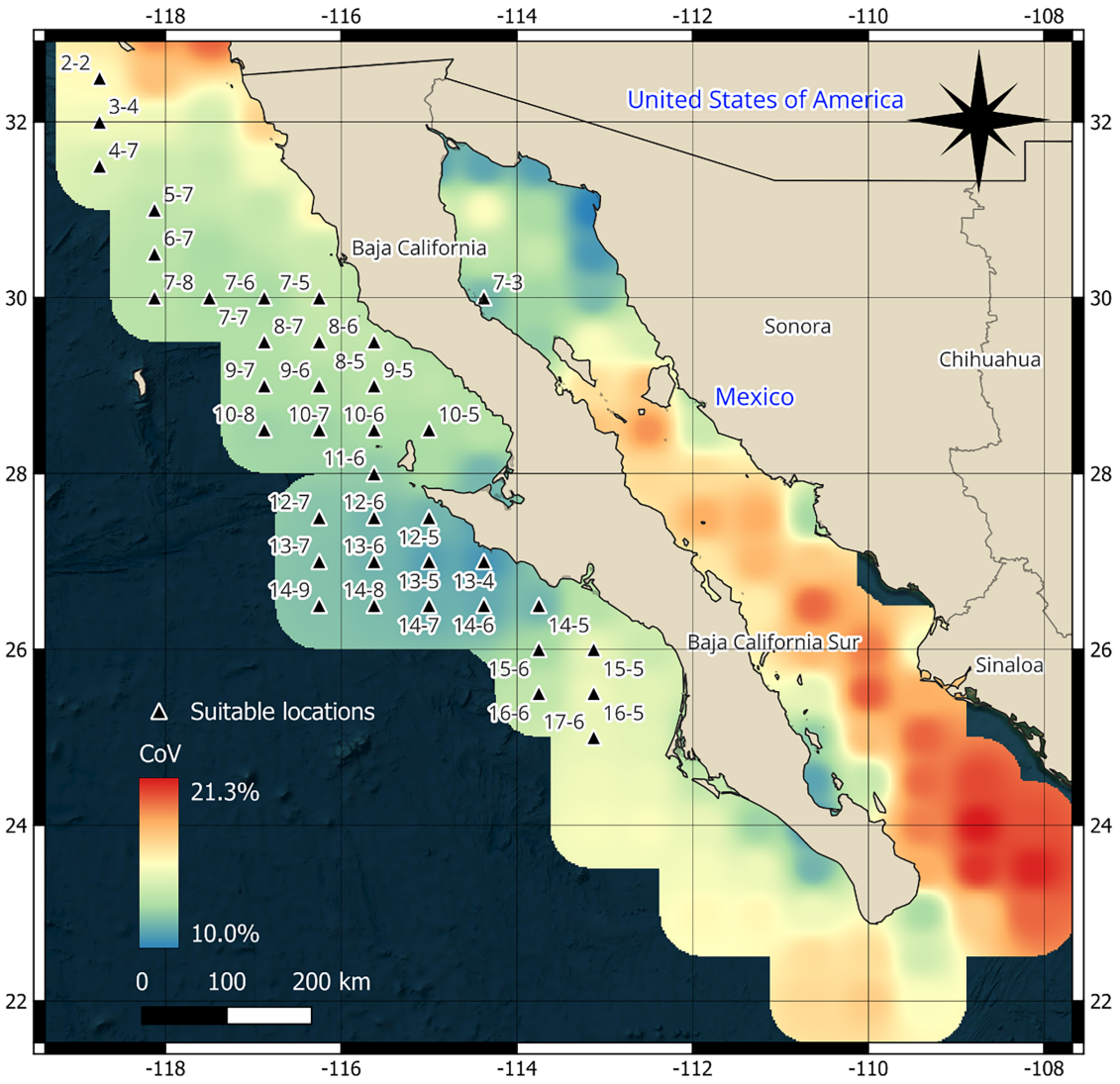


Figure 16: Baseline 2014–2023 resource-screening locations in Baja California (Mexico).

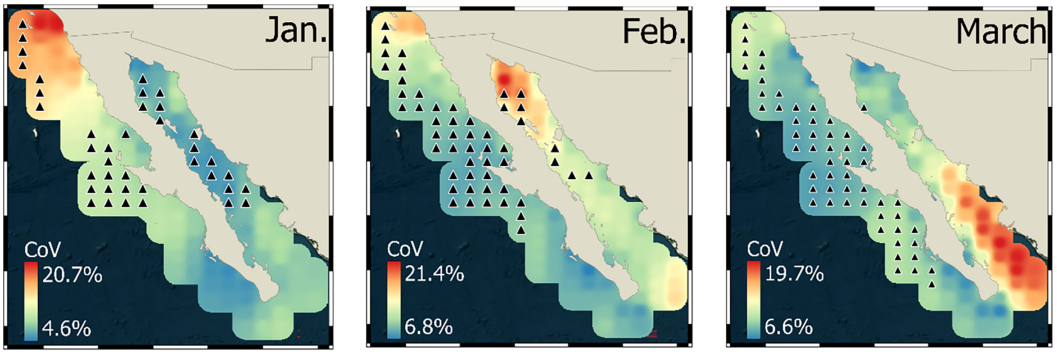


Figure 17: (Continued)

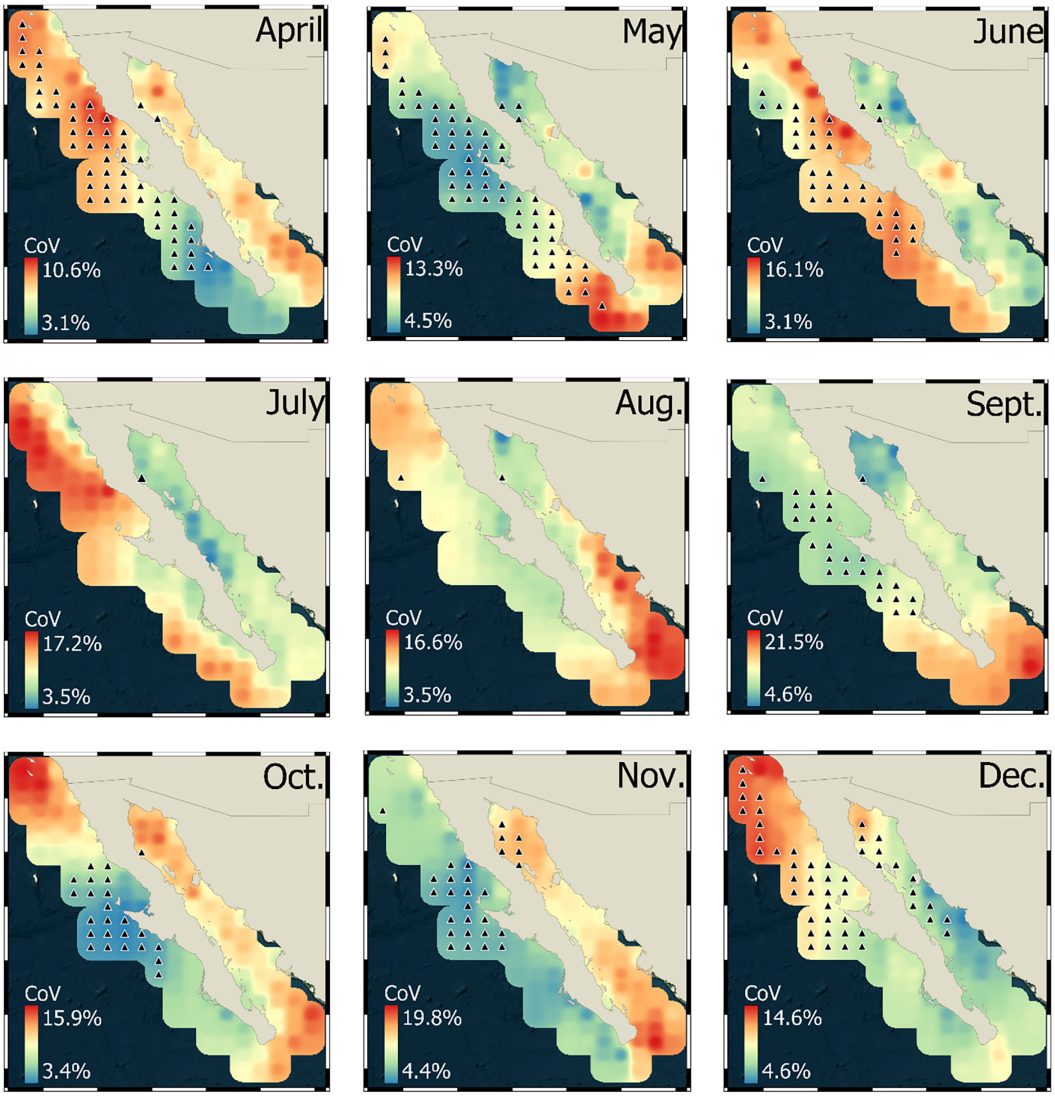


Figure 17: Monthly baseline resource-screening locations in Baja California (Mexico).

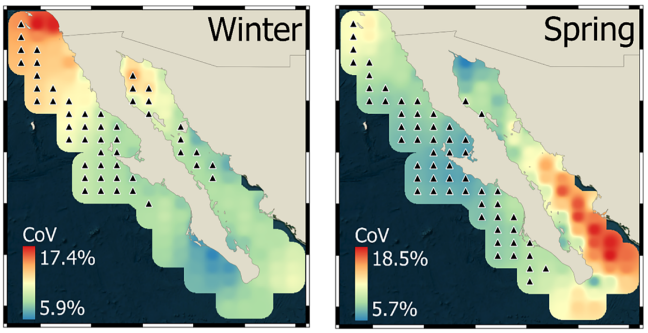


Figure 18: (Continued)

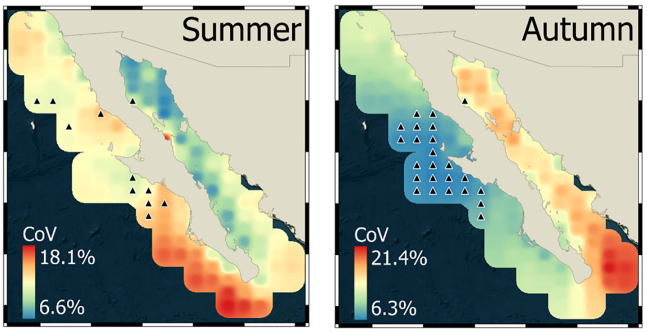


Figure 18: Seasonal baseline resource-screening locations in Baja California (Mexico).

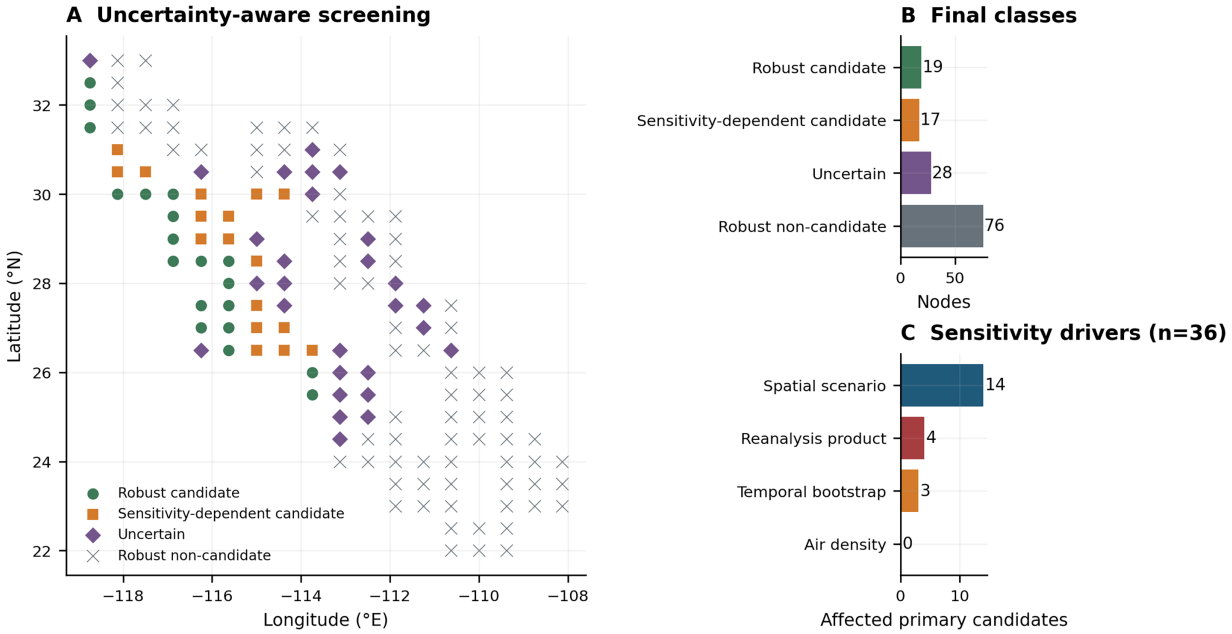


Figure 19: Uncertainty-aware resource screening (**A**) and sensitivity drivers (**B**,**C**) at the 140 native nodes in Baja California (Mexico).

5 Conclusions

The analysis of over four decades of hourly data at 140 different locations in Baja California (Mexico), involving 385,704 matched hourly observations per location, provides an internally consistent basis for regional resource assessment of the wind energy potential of the region. Interannual, monthly, and seasonal calculations of mean wind speed (MWS), wind power density (WPD), long-term wind-speed trends, and wind-speed variability through the coefficient of variation (CoV) emerge as critical for characterising the offshore wind resource in the region. MWS offers a foundational measure of wind potential, while WPD quantifies the wind power available per unit area. Long-term trend analysis reveals trend magnitude and uncertainty, which is informative for the long-term interpretation of the resource. Meanwhile, CoV highlights the predictability of wind resources, identifying areas with stable conditions conducive to consistent power generation. Together, these metrics provide a multidimensional framework for evaluating offshore wind energy at Baja California. Detailed MWS, WPD, and CoV maps use 2014–2023, whereas trend inference

uses 1980–2023; the full period was additionally used to test resource-screening sensitivity under temporal, reanalysis-product, density and spatial uncertainty.

Insights into the results emphasise the strategic importance of northeastern and western regions of Baja California, which exhibit complementary wind speed and power density distributions. This complementarity suggests that a geographically distributed set of resource areas could reduce seasonal variability in the aggregate resource, potentially stabilising energy supply. From September to May, western regions emerge as the windiest areas while northeastern regions stand out as the windiest during June and July. This interplay suggests a synergistic approach to OWF planning, subject to site-specific technical, environmental, infrastructure, and economic constraints, where multiple sites can be operationally coordinated to maximise output and reduce seasonal fluctuations.

Long-term trends require a more cautious interpretation than the original slope maps alone suggested. Neither the regional MWS nor regional WPD trend was statistically significant after accounting for temporal autocorrelation, although significant positive and negative local trends remained after false-discovery-rate correction. These local patterns should guide further investigation rather than be treated as evidence of uniform future reliability.

By providing detailed numerical data for interannual, monthly, and seasonal MWS, WPD, and CoV across 140 studied locations, results allow for geographically explicit resource screening and subsequent site prioritisation. The full-period uncertainty analysis further converts this screening into a four-level classification: of the 140 nodes, 19 were identified as robust resource-screening candidates, 17 as sensitivity-dependent candidates, 28 as uncertain nodes, and 76 as robust non-candidates. The 19 robust candidates represent the highest-priority resource-screening locations as their classification remained stable across the tested temporal, reanalysis-product, density and spatial scenarios. The 17 sensitivity-dependent candidates indicate locations where apparent resource potential depends on the assumptions or datasets used and therefore warrants targeted validation, while the 28 uncertain nodes require additional evidence before their classification can be resolved. In contrast, the 76 robust non-candidates provide a data-supported basis for deprioritising these nodes in subsequent resource-led screening and maritime spatial-planning analyses. This classification provides a structured roadmap that can be used by researchers, policymakers, and developers for prioritising and further investigating the region's offshore wind-resource potential in support of global and national energy goals. The resulting maps are resource-screening products, not definitive declarations of offshore-project suitability. Additionally, the interpolated maps should be interpreted as spatial visualisations of the native-node results.

Future research could focus on the specific locations identified as higher-resource-screening candidates, calculating their wind probability distribution, refining energy yield forecasts and informing turbine selection compatible with local characteristics. Detailed studies examining the compatibility of wind resources across these locations could inform the design of a spatially coordinated set of OWFs, potentially maximising regional energy output. The resulting output would depend on project-level factors such as hub-height profiles, high-frequency turbulence and gust measurements, extreme winds, turbine power curves, wakes, bathymetry, environmental constraints, and economic analysis.

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Availability of Data and Materials: MERRA-2 M2T1NXSLV data are available from the NASA Goddard Earth Sciences Data and Information Services Center (GES DISC) under DOI 10.5067/VJAFPLI1CSIV, subject to the applicable data-use terms. The MERRA-2 data analysed in this study were accessed through WindNavigator. ERA5 data are available from the Copernicus Climate Data Store, subject to its applicable terms. Processed node-level tables, validation outputs and analysis scripts accompany the revised submission; these will be provided on request.

Ethics Approval: Not applicable.

Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

COP28	28th United Nations Climate Change Conference
CoV	Coefficient of Variation
EEZ	Exclusive Economic Zone
ERA5	Fifth-Generation ECMWF Reanalysis
GEOS	Goddard Earth Observing System
GIS	Geographic Information System
GMAO	Global Modeling and Assimilation Office
GW	Gigawatt
ID	Unique Identifier
IDW	Inverse Distance Weighting
HAC	Heteroskedasticity- and Autocorrelation-Consistent
MAD	Median Absolute Deviation
MERRA-2	Modern-Era Retrospective Analysis for Research and Applications, Version 2
MWS	Mean Wind Speed
OWF	Offshore Wind Farm
RCoV	Robust Coefficient of Variation
RES	Renewable Energy Sources
RMSE	Root-Mean-Square Error
QV2M	2-m Specific Humidity
WPD	Wind Power Density
N	Number of Computed Items
P/A	Wind Power per Area Unit
P	IDW Distance-Power Parameter
$\overline{x}$	Mean Value
x_i	Single Value
v	Wind Speed
ρ	Air Density
σ	Standard Deviation

Appendix A

Table A1: Summary of wind speed trend in m/s, mean wind power density (WPD) in W/m^2, mean wind speed (MWS) in m/s for the ten-year timespan and both the seasonal and monthly maximum MWS followed by their respective coefficient of variation (CoV) expressed as a % in Baja California (Mexico).

ID	Trend	WPD	MWS	CoVMWS	Season with Maximum MWS			Month with Maximum MWS		
					Season	MWS	CoVMWS	Name	MWS	CoVMWS
23-1	−0.004	91.7	4.30	15.5	Spring	4.82	13.6	May	5.43	12.3
23-2	−0.002	108.6	4.66	17.3	Spring	5.51	13.7	May	6.20	13.0
23-3	0.000	124.8	4.95	17.0	Spring	5.85	12.1	May	6.40	13.3
22-1	0.000	86.6	4.18	14.1	Spring	4.50	11.7	May	5.03	9.3
22-2	0.000	105.4	4.62	16.8	Spring	5.43	13.1	May	6.14	11.1
22-3	−0.001	130.0	5.09	16.8	Spring	6.04	11.7	May	6.63	12.5
21-1	−0.004	83.9	4.08	19.8	Winter	5.01	11.2	January	5.18	8.3
21-2	−0.002	84.4	4.04	17.4	Winter	4.79	10.5	January	5.01	8.2
21-3	−0.003	75.6	3.83	12.8	Winter	4.21	9.6	January	4.39	8.0
21-4	−0.001	119.1	4.98	15.1	Spring	5.79	10.9	May	6.26	12.7
21-5	0.001	141.3	5.30	15.9	Spring	6.22	10.4	May	6.64	12.3
21-6	0.004	151.4	5.42	15.9	Spring	6.39	9.7	May	6.77	11.0
20-1	−0.002	90.5	4.17	21.1	Winter	5.19	10.8	January	5.34	8.0
20-2	−0.003	90.4	4.07	20.8	Winter	5.09	10.3	January	5.28	8.0
20-3	−0.007	76.5	3.79	18.4	Winter	4.63	9.3	January	4.81	7.3
20-4	−0.001	97.4	4.62	11.6	Spring	5.08	9.3	May	5.33	12.3
20-5	0.000	147.4	5.42	15.1	Spring	6.37	9.9	May	6.84	11.3
20-6	0.004	157.9	5.54	15.3	Spring	6.52	9.2	May	6.91	10.1
19-1	−0.001	95.3	4.29	20.2	Winter	5.23	10.4	January	5.32	7.8
19-2	−0.003	95.4	4.17	21.3	Winter	5.23	9.7	January	5.36	8.0
19-3	−0.006	82.6	3.97	19.3	Winter	4.90	8.7	January	5.02	7.5
19-4	−0.001	80.2	4.22	10.1	Spring	4.48	8.7	May	4.78	9.4
19-5	0.001	136.0	5.27	12.5	Spring	6.05	9.4	May	6.53	9.9
19-6	0.003	163.1	5.60	15.0	Spring	6.60	9.3	May	7.07	9.3
19-7	0.006	170.9	5.70	15.5	Spring	6.77	8.6	May	7.11	8.9
19-8	0.008	176.9	5.76	15.4	Spring	6.83	8.4	May	7.08	8.6
18-1	−0.002	99.5	4.32	20.4	Winter	5.33	9.2	January	5.41	7.8
18-2	−0.004	90.1	4.11	19.7	Winter	5.09	9.2	January	5.19	8.7
18-3	−0.004	80.8	4.03	13.8	Winter	4.66	8.2	January	4.73	7.6
18-4	−0.004	84.8	4.11	11.0	Winter	4.48	7.7	January	4.55	7.1
18-5	0.003	156.0	5.56	13.7	Spring	6.46	9.6	May	6.98	9.7
18-6	0.005	177.6	5.80	15.1	Spring	6.88	8.4	May	7.23	8.6
18-7	0.007	186.5	5.88	15.2	Spring	6.97	8.2	May	7.20	8.3
17-1	−0.001	97.1	4.26	19.9	Winter	5.25	9.3	January	5.35	9.0
17-2	−0.001	91.9	4.14	17.9	Winter	5.03	9.4	January	5.16	8.6
17-3	−0.004	88.2	4.17	12.2	Winter	4.73	8.4	January	4.83	6.9
17-4	0.002	116.9	5.04	10.9	Spring	5.66	8.8	May	6.06	9.5

(Continued)

Table A1 (continued)

ID	Trend	WPD	MWS	CoVMWS	Season with Maximum MWS			Month with Maximum MWS		
					Season	MWS	CoVMWS	Name	MWS	CoVMWS
17-5	0.004	187.3	5.94	14.8	Spring	7.02	8.4	May	7.41	8.1
17-6	0.007	200.0	6.04	14.9	Spring	7.13	8.1	May	7.36	7.9
16-1	0.001	97.8	4.38	18.4	Winter	5.28	8.6	January	5.37	8.5
16-2	0.000	101.4	4.25	20.0	Winter	5.29	9.6	January	5.43	9.0
16-3	−0.002	99.9	4.36	14.8	Winter	5.13	8.8	January	5.26	6.5
16-4	0.004	178.6	5.80	14.7	Spring	6.83	9.1	May	7.29	8.6
16-5	0.008	215.0	6.19	15.1	Spring	7.30	8.3	May	7.58	7.6
16-6	0.009	229.7	6.40	13.6	Spring	7.42	7.9	May	7.56	7.0
15-1	0.004	90.5	4.36	15.3	Winter	5.02	8.0	January	5.06	8.1
15-2	0.003	109.6	4.44	19.4	Winter	5.45	9.3	January	5.56	9.1
15-3	0.001	111.7	4.43	18.1	Winter	5.43	9.4	January	5.60	7.1
15-4	0.003	133.8	5.16	13.9	Spring	6.00	9.6	May	6.46	9.6
15-5	0.008	209.8	6.11	14.9	Spring	7.17	8.8	May	7.54	7.8
15-6	0.009	242.7	6.55	12.7	Spring	7.50	7.8	May	7.68	6.6
14-1	0.004	125.8	4.59	19.8	Winter	5.70	9.2	January	5.85	7.6
14-2	0.000	121.9	4.71	16.2	Winter	5.67	9.2	January	5.84	5.8
14-3	−0.004	85.0	4.09	14.6	Winter	4.81	8.5	January	4.89	7.2
14-4	0.007	165.4	5.62	13.3	Spring	6.43	8.3	May	6.69	8.2
14-5	0.008	226.9	6.40	11.6	Spring	7.22	7.5	May	7.41	6.4
14-6	0.008	248.2	6.67	11.3	Spring	7.51	7.1	May	7.60	5.8
14-7	0.009	242.7	6.62	11.4	Spring	7.43	7.4	April	7.56	7.9
14-8	0.010	233.4	6.52	11.8	Spring	7.29	7.5	April	7.44	8.3
14-9	0.011	219.4	6.37	12.0	Spring	7.11	7.7	April	7.30	8.7
13-1	0.006	133.3	4.81	17.5	Winter	5.74	8.1	January	5.82	7.5
13-2	0.004	133.6	4.75	18.1	Winter	5.82	8.7	January	5.96	5.3
13-3	−0.001	119.1	4.74	16.5	Winter	5.68	9.0	January	5.80	5.7
13-4	0.008	233.0	6.53	10.7	Spring	7.30	6.8	April	7.38	6.6
13-5	0.009	243.7	6.65	11.0	Spring	7.44	6.9	April	7.56	7.5
13-6	0.010	232.4	6.52	11.5	Spring	7.28	7.2	April	7.43	8.1
13-7	0.010	224.0	6.42	12.0	Spring	7.18	7.5	April	7.37	8.6
12-1	0.006	119.7	4.74	12.7	Winter	5.26	7.3	March	5.30	12.5
12-2	0.006	145.8	4.90	18.4	Winter	5.94	8.2	January	6.03	5.9
12-3	0.002	149.8	5.03	18.4	Winter	6.11	9.0	January	6.26	5.5
12-4	0.009	207.9	6.27	11.0	Spring	7.03	6.9	May	7.10	5.8
12-5	0.008	215.2	6.34	11.5	Spring	7.09	6.9	April	7.18	7.6
12-6	0.009	238.9	6.60	11.6	Spring	7.39	7.1	April	7.55	8.1
12-7	0.010	231.3	6.50	12.0	Spring	7.27	7.5	April	7.49	8.7
11-1	0.002	135.1	4.80	16.8	Winter	5.74	8.5	January	5.84	5.4
11-2	0.001	148.5	5.04	16.9	Winter	5.94	9.1	January	6.02	5.4
11-3	0.004	140.0	5.20	15.9	Spring	5.88	7.0	May	6.08	6.7

(Continued)

Table A1 (continued)

ID	Trend	WPD	MWS	CoVMWS	Season with Maximum MWS			Month with Maximum MWS		
					Season	MWS	CoVMWS	Name	MWS	CoVMWS
11-4	0.009	181.7	5.96	11.6	Spring	6.73	6.9	May	6.82	6.3
11-5	0.007	181.5	5.91	12.9	Spring	6.67	7.4	April	6.76	7.9
11-6	0.007	222.6	6.41	12.3	Spring	7.24	7.3	April	7.41	8.4
10-1	0.002	134.7	4.96	13.9	Winter	5.66	7.5	January	5.71	5.6
10-2	0.001	153.5	5.01	19.0	Winter	6.11	9.9	January	6.24	6.0
10-3	0.003	135.9	5.00	17.7	Winter	5.69	9.5	January	5.73	6.4
10-4	0.007	161.0	5.59	13.3	Spring	6.24	7.1	May	6.38	7.4
10-5	0.005	205.4	6.14	12.9	Spring	7.02	7.5	April	7.14	8.2
10-6	0.005	245.3	6.58	12.8	Spring	7.47	8.0	April	7.68	9.2
10-7	0.007	247.4	6.62	12.5	Spring	7.54	7.8	April	7.80	9.1
10-8	0.010	240.3	6.55	12.5	Spring	7.47	7.7	April	7.77	8.5
9-1	0.000	127.4	4.96	12.1	Winter	5.46	6.9	February	5.50	9.4
9-2	0.000	136.2	4.78	17.8	Winter	5.70	9.5	January	5.83	6.3
9-3	0.001	129.1	4.80	16.7	Winter	5.59	10.6	January	5.71	5.6
9-4	0.003	190.6	5.89	13.5	Spring	6.69	7.6	May	6.77	6.3
9-5	0.001	253.2	6.58	13.3	Spring	7.58	8.3	April	7.82	9.8
9-6	0.004	249.5	6.59	13.0	Spring	7.55	8.1	April	7.83	9.5
9-7	0.007	243.3	6.54	12.9	Spring	7.51	7.9	April	7.82	8.7
8-1	−0.001	152.7	5.31	13.8	Winter	6.02	7.3	January	6.09	6.2
8-2	−0.002	121.6	4.72	14.3	Winter	5.43	9.0	January	5.54	7.5
8-3	0.000	133.7	4.78	15.5	Winter	5.55	11.3	January	5.78	6.2
8-4	0.006	188.8	5.60	12.4	Winter	5.89	10.3	May	6.32	6.2
8-5	−0.002	245.8	6.44	13.6	Spring	7.43	8.8	April	7.61	10.6
8-6	−0.001	242.0	6.46	13.6	Spring	7.45	8.5	April	7.74	9.9
8-7	0.003	235.6	6.44	13.1	Spring	7.38	8.0	April	7.70	8.9
7-1	0.001	137.3	4.90	11.7	Winter	5.31	11.3	January	5.53	8.7
7-2	0.004	196.0	5.53	12.6	Winter	5.96	12.0	January	6.14	6.7
7-3	0.010	273.4	6.23	11.7	Summer	6.47	10.5	June	7.05	8.0
7-4	0.010	271.2	6.57	11.2	Spring	7.04	8.5	May	7.55	6.5
7-5	−0.008	201.5	5.99	13.8	Spring	6.91	8.8	April	7.18	10.3
7-6	−0.003	216.8	6.25	12.8	Spring	7.09	8.4	April	7.42	9.1
7-7	0.002	229.8	6.37	12.9	Spring	7.25	8.1	April	7.60	8.2
7-8	0.007	247.7	6.51	13.3	Spring	7.40	8.3	April	7.79	7.1
6-1	0.003	139.3	5.06	10.7	Summer	5.36	7.4	July	5.51	7.8
6-2	0.002	179.8	5.33	13.7	Winter	5.79	13.0	January	6.02	6.8
6-3	−0.002	195.0	5.47	13.5	Winter	6.08	13.0	January	6.23	5.5
6-4	0.007	205.2	5.53	12.4	Spring	5.88	8.6	May	6.13	7.8
6-5	−0.014	116.4	4.82	13.9	Spring	5.51	8.8	April	5.65	9.5
6-6	−0.005	198.7	6.01	12.8	Spring	6.76	8.6	April	7.12	8.5
6-7	0.002	225.5	6.24	13.3	Spring	7.06	8.7	April	7.46	7.6

(Continued)

Table A1 (continued)

ID	Trend	WPD	MWS	CoVMWS	Season with Maximum MWS			Month with Maximum MWS		
					Season	MWS	CoVMWS	Name	MWS	CoVMWS
5-1	0.002	133.2	5.05	10.0	Summer	5.33	7.5	July	5.50	7.4
5-2	0.000	154.8	5.08	12.8	Winter	5.40	12.2	July	5.63	9.4
5-3	−0.009	149.8	5.00	15.6	Winter	5.75	14.6	January	6.00	6.1
5-4	−0.003	131.9	4.75	14.7	Winter	5.29	11.5	February	5.39	15.0
5-5	−0.016	66.0	3.78	16.0	Winter	4.27	10.9	February	4.39	11.9
5-6	−0.019	140.1	5.15	13.7	Spring	5.79	9.6	April	6.10	9.5
5-7	−0.004	213.4	6.08	13.5	Spring	6.81	9.4	April	7.23	8.2
4-1	0.000	132.7	4.99	10.9	Summer	5.21	8.9	July	5.49	8.5
4-2	−0.005	141.8	5.00	11.1	Winter	5.32	12.8	January	5.48	5.2
4-3	−0.005	169.0	5.41	10.8	Winter	5.74	10.2	January	5.82	4.6
4-4	−0.022	82.7	4.08	15.4	Spring	4.57	9.6	April	4.76	8.7
4-5	−0.016	133.4	5.05	13.8	Spring	5.56	10.1	April	5.89	8.7
4-6	−0.009	184.9	5.70	13.9	Spring	6.33	10.3	April	6.74	8.8
4-7	−0.003	241.0	6.22	14.3	Spring	6.97	11.0	April	7.48	8.7
3-1	−0.017	62.4	3.60	17.1	Winter	4.19	12.8	February	4.33	12.0
3-2	−0.019	109.1	4.60	14.2	Spring	4.98	10.2	April	5.23	7.8
3-3	−0.014	158.8	5.28	15.1	Spring	5.84	11.5	April	6.24	9.0
3-4	−0.008	226.2	5.97	15.2	Spring	6.70	11.9	April	7.23	9.3
2-1	−0.018	119.9	4.53	17.8	Spring	5.07	12.6	April	5.39	9.0
2-2	−0.011	209.5	5.71	15.8	Spring	6.44	12.1	April	6.95	9.5
1-1	−0.017	60.9	3.42	19.9	Winter	4.02	17.2	February	4.13	17.7
1-2	−0.018	94.0	3.97	19.2	Spring	4.47	12.7	March	4.77	11.1
1-3	−0.014	187.9	5.38	16.4	Spring	6.13	12.0	April	6.62	9.3

Table A2: Interannual mean wind speed (MWS) in m/s and its respective coefficient of variation (CoV) expressed as a % in Baja California (Mexico).

ID	2014		2015		2016		2017		2018		2019		2020		2021		2022		2023	
	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV
23-1	4.20	15.2	4.33	16.0	4.22	16.6	4.23	19.2	4.14	13.8	4.42	15.3	4.40	16.3	4.16	11.6	4.25	17.3	4.69	14.1
23-2	4.48	15.2	4.62	15.4	4.62	20.2	4.61	20.5	4.47	17.3	4.79	20.5	4.67	17.7	4.60	12.1	4.60	19.0	5.10	16.4
23-3	4.73	13.3	4.91	14.8	4.93	20.3	4.85	20.1	4.79	18.2	5.05	21.5	4.92	16.6	4.99	12.1	4.89	17.8	5.44	14.8
22-1	4.08	14.6	4.17	15.6	4.06	11.7	4.14	17.1	4.06	14.4	4.31	12.6	4.33	16.2	4.02	12.4	4.16	15.7	4.49	11.0
22-2	4.42	15.7	4.55	15.4	4.56	18.4	4.65	18.7	4.45	17.3	4.76	19.2	4.66	18.1	4.56	12.6	4.58	17.9	5.04	16.0
22-3	4.81	14.5	5.03	14.4	5.06	20.0	5.03	18.6	4.91	18.6	5.20	21.2	5.01	17.3	5.15	11.6	5.03	16.7	5.63	14.2
21-1	3.97	16.3	4.15	25.8	3.84	23.1	3.89	16.8	4.05	22.1	4.14	18.3	4.25	22.1	3.95	20.0	4.15	18.2	4.41	16.7
21-2	3.92	15.0	4.03	25.6	3.82	21.3	3.92	14.3	4.00	16.6	4.11	16.1	4.22	17.9	3.87	16.2	4.13	16.6	4.35	13.9
21-3	3.80	12.7	3.79	19.6	3.75	12.8	3.78	10.4	3.74	12.0	3.92	11.0	3.99	13.7	3.59	11.0	3.81	13.0	4.12	8.8
21-4	4.70	13.7	4.97	12.4	4.98	18.8	4.96	16.0	4.79	17.2	5.08	18.9	4.87	15.6	5.01	10.2	4.93	14.6	5.50	12.1
21-5	5.02	12.7	5.26	12.4	5.29	19.2	5.23	17.0	5.12	18.7	5.41	20.2	5.16	16.8	5.44	12.2	5.20	15.4	5.85	13.0
21-6	5.16	11.1	5.36	11.9	5.39	18.5	5.33	16.5	5.24	19.1	5.53	20.4	5.32	16.3	5.61	13.8	5.33	15.3	5.94	14.3
20-1	4.09	16.7	4.21	26.4	3.94	23.5	3.96	18.0	4.15	23.2	4.26	19.5	4.31	24.7	4.06	22.7	4.25	19.5	4.50	19.0
20-2	3.95	16.6	4.03	28.3	3.86	24.5	3.94	17.2	4.04	19.3	4.14	19.7	4.21	23.7	3.93	20.5	4.18	21.1	4.41	19.2
20-3	3.74	14.8	3.75	25.4	3.74	19.3	3.69	14.6	3.71	16.0	3.83	17.1	3.90	21.6	3.60	18.2	3.80	20.9	4.12	16.4

(Continued)

Table A2 (continued)

ID	2014		2015		2016		2017		2018		2019		2020		2021		2022		2023	
	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV
20-4	4.44	10.8	4.66	10.3	4.65	14.6	4.61	11.8	4.44	12.5	4.70	13.7	4.54	11.3	4.55	9.1	4.57	11.4	5.00	8.7
20-5	5.15	12.6	5.35	11.3	5.42	17.9	5.42	15.2	5.26	18.0	5.53	19.9	5.26	15.5	5.56	11.6	5.30	13.7	5.93	13.6
20-6	5.28	11.6	5.46	11.2	5.49	17.4	5.49	15.0	5.39	18.5	5.66	19.8	5.40	15.8	5.73	13.5	5.42	13.9	6.05	15.2
19-1	4.23	16.3	4.31	24.3	4.09	21.0	4.06	17.8	4.25	22.4	4.38	18.2	4.40	24.8	4.19	22.8	4.34	18.8	4.61	18.6
19-2	4.05	16.7	4.10	27.0	3.99	23.1	4.02	18.9	4.11	19.7	4.27	19.2	4.32	25.9	4.06	22.4	4.26	22.3	4.53	20.0
19-3	3.86	16.0	3.90	24.7	3.91	20.0	3.84	16.4	3.90	15.7	4.04	17.4	4.06	23.3	3.81	20.9	4.01	22.0	4.33	18.3
19-4	4.15	9.2	4.20	11.8	4.24	12.1	4.21	12.0	4.12	9.7	4.36	9.7	4.17	11.5	4.10	8.0	4.20	8.1	4.48	8.1
19-5	5.09	11.4	5.19	10.1	5.30	14.7	5.30	12.0	5.17	14.3	5.39	17.2	5.13	12.0	5.33	9.5	5.16	11.0	5.61	12.3
19-6	5.37	11.8	5.51	11.0	5.58	16.5	5.57	14.1	5.49	17.8	5.73	19.9	5.44	15.4	5.79	13.0	5.47	12.8	6.08	16.0
19-7	5.47	11.7	5.61	11.0	5.63	16.7	5.66	15.1	5.59	18.6	5.84	19.6	5.54	16.0	5.91	14.5	5.59	13.4	6.19	17.0
19-8	5.56	11.2	5.64	11.1	5.67	16.1	5.72	15.7	5.67	18.7	5.87	18.6	5.62	15.0	5.97	15.1	5.68	13.8	6.25	17.7
18-1	4.20	16.1	4.22	24.5	4.17	21.0	4.17	19.0	4.23	19.3	4.43	17.7	4.46	25.8	4.24	22.6	4.41	21.4	4.67	19.1
18-2	3.95	16.2	3.98	24.7	4.02	20.7	3.99	17.3	4.03	15.4	4.22	17.6	4.22	24.7	4.01	20.8	4.19	22.1	4.49	18.9
18-3	3.87	12.7	3.93	19.0	3.99	13.8	3.98	12.2	3.96	9.9	4.12	11.7	4.06	16.6	3.92	14.2	4.11	15.1	4.31	12.6
18-4	4.05	9.9	4.03	14.2	4.11	11.6	4.11	13.6	4.02	10.3	4.22	9.0	4.11	11.6	3.99	10.5	4.08	11.2	4.40	8.3
18-5	5.37	10.9	5.44	10.4	5.58	15.0	5.55	13.0	5.48	16.3	5.70	19.5	5.39	13.3	5.68	11.4	5.44	11.0	5.95	14.7
18-6	5.59	11.6	5.67	11.0	5.73	15.9	5.77	14.1	5.72	17.9	5.95	19.5	5.62	14.8	6.01	14.3	5.68	12.5	6.28	17.4
18-7	5.67	11.5	5.72	11.0	5.78	15.6	5.85	14.8	5.81	18.3	6.00	18.3	5.73	14.2	6.09	15.1	5.79	13.4	6.38	18.1
17-1	4.08	15.5	4.09	24.3	4.13	21.0	4.14	18.1	4.16	15.8	4.38	18.3	4.42	24.8	4.23	20.7	4.37	22.1	4.62	18.8
17-2	3.93	14.4	3.99	22.7	4.05	19.3	4.05	15.5	4.05	13.1	4.26	16.9	4.25	21.7	4.09	18.4	4.26	19.9	4.45	16.9
17-3	4.06	10.3	4.10	15.6	4.18	12.1	4.16	13.3	4.08	10.3	4.26	10.8	4.18	14.3	4.07	13.1	4.19	13.8	4.46	9.4
17-4	4.98	8.9	4.99	8.5	5.08	12.9	5.04	11.7	4.95	13.0	5.16	15.4	4.88	10.7	5.07	9.2	4.95	7.6	5.30	10.3
17-5	5.77	11.7	5.74	11.3	5.86	15.4	5.95	13.1	5.89	17.0	6.08	19.3	5.73	13.2	6.12	14.2	5.81	12.5	6.41	17.9
17-6	5.84	11.4	5.83	11.3	5.92	15.0	6.02	14.0	5.97	17.8	6.17	17.7	5.87	13.6	6.23	15.2	5.96	12.9	6.54	18.5
16-1	4.20	14.5	4.20	22.0	4.24	18.7	4.25	17.3	4.27	15.5	4.51	16.5	4.55	22.4	4.41	19.7	4.46	21.1	4.69	17.0
16-2	4.04	15.7	4.07	24.5	4.13	21.6	4.13	17.9	4.14	14.9	4.39	18.9	4.43	23.9	4.24	21.1	4.36	23.3	4.61	18.9
16-3	4.18	12.1	4.23	18.8	4.33	16.2	4.32	13.9	4.26	11.6	4.47	13.3	4.41	17.6	4.30	15.9	4.43	16.6	4.63	12.9
16-4	5.73	11.4	5.60	11.9	5.74	16.2	5.79	13.7	5.76	16.6	5.92	19.6	5.56	12.7	5.94	13.8	5.69	12.2	6.25	17.6
16-5	6.03	11.7	5.94	11.9	6.06	14.8	6.17	13.8	6.14	17.7	6.34	17.8	6.00	13.4	6.37	15.5	6.13	12.8	6.70	19.2
16-6	6.21	10.8	6.16	10.7	6.26	12.9	6.42	13.7	6.35	16.1	6.55	15.1	6.28	11.5	6.53	14.3	6.38	12.5	6.86	17.2
15-1	4.23	12.1	4.17	18.3	4.19	14.7	4.26	14.7	4.29	13.9	4.50	13.1	4.53	17.6	4.42	17.0	4.40	18.2	4.61	13.6
15-2	4.25	15.0	4.23	23.4	4.29	20.3	4.30	17.9	4.30	15.0	4.58	17.4	4.64	22.6	4.48	20.9	4.51	23.4	4.80	18.3
15-3	4.24	15.0	4.26	22.6	4.36	20.2	4.35	15.3	4.31	13.7	4.56	16.4	4.53	21.2	4.42	19.5	4.55	21.5	4.73	16.7
15-4	5.18	9.7	5.04	10.8	5.17	15.5	5.11	14.6	5.12	16.7	5.28	19.6	4.92	11.9	5.22	13.5	5.10	10.0	5.52	14.8
15-5	5.99	11.5	5.85	12.1	6.01	14.5	6.07	13.9	6.09	17.4	6.28	18.2	5.91	12.7	6.23	15.4	6.08	12.4	6.61	19.1
15-6	6.37	10.4	6.27	10.7	6.41	11.4	6.58	12.2	6.53	14.8	6.71	14.3	6.42	10.3	6.65	13.6	6.55	11.5	6.98	16.7
14-1	4.41	15.7	4.38	23.7	4.48	21.5	4.47	17.6	4.47	15.2	4.70	18.1	4.75	22.5	4.61	21.7	4.67	24.3	4.98	18.4
14-2	4.57	13.2	4.59	19.5	4.69	19.0	4.64	13.8	4.68	13.1	4.76	15.7	4.73	19.1	4.65	18.0	4.85	19.4	4.94	13.9
14-3	4.13	10.9	4.08	15.9	4.12	16.6	4.04	16.8	4.01	12.9	4.19	14.0	4.06	15.5	3.97	17.4	4.11	17.3	4.16	13.0
14-4	5.58	8.7	5.43	11.0	5.55	13.3	5.53	14.1	5.60	15.1	5.76	16.3	5.44	11.2	5.64	14.9	5.64	10.4	6.04	15.9
14-5	6.27	9.1	6.14	10.2	6.30	10.3	6.41	11.0	6.39	13.1	6.56	13.3	6.24	9.1	6.45	12.9	6.43	10.0	6.81	15.4
14-6	6.52	9.5	6.42	9.9	6.57	9.8	6.72	11.7	6.64	12.5	6.78	12.1	6.50	8.3	6.73	12.7	6.70	11.1	7.06	14.3
14-7	6.49	9.3	6.42	9.7	6.53	10.7	6.66	13.5	6.59	12.9	6.68	11.3	6.49	8.2	6.68	13.3	6.66	12.0	7.01	13.2
14-8	6.39	9.7	6.37	9.8	6.45	12.1	6.53	14.8	6.46	13.3	6.55	11.2	6.43	9.1	6.56	14.2	6.58	12.4	6.89	12.3
14-9	6.23	10.2	6.29	9.7	6.29	12.6	6.37	15.6	6.30	13.6	6.41	11.0	6.30	9.6	6.38	14.8	6.44	12.3	6.70	11.8
13-1	4.67	12.7	4.57	20.1	4.68	17.6	4.68	17.1	4.71	15.0	4.92	15.5	4.99	19.1	4.84	20.6	4.80	21.5	5.23	15.9
13-2	4.62	14.9	4.64	21.1	4.67	21.0	4.67	15.6	4.73	14.5	4.80	16.6	4.82	20.9	4.70	20.7	4.79	22.8	5.07	16.0
13-3	4.70	11.6	4.64	19.0	4.77	19.3	4.73	16.0	4.76	15.2	4.81	15.4	4.70	18.9	4.62	19.3	4.75	20.3	4.88	13.5
13-4	6.43	8.7	6.28	9.7	6.46	9.6	6.57	11.0	6.51	11.4	6.66	11.4	6.36	7.6	6.54	12.7	6.60	10.5	6.89	13.2
13-5	6.54	9.4	6.44	9.8	6.60	10.2	6.69	13.0	6.60	12.3	6.73	10.7	6.50	7.9	6.68	12.9	6.72	11.2	7.02	12.5
13-6	6.40	10.2	6.39	9.7	6.48	11.8	6.54	14.6	6.44	12.9	6.57	10.9	6.42	8.7	6.54	13.8	6.58	12.1	6.89	11.6
13-7	6.27	10.7	6.34	9.7	6.39	12.4	6.44	15.6	6.33	13.5	6.48	10.7	6.32	9.4	6.42	14.8	6.47	12.5	6.77	11.5
12-1	4.65	8.0	4.55	14.3	4.65	10.6	4.62	13.0	4.66	12.9	4.85	11.7	4.90	12.4	4.74	16.6	4.69	15.5	5.10	11.0
12-2	4.78	15.0	4.72	20.5	4.85	19.5	4.86	17.1	4.87	16.8	5.04	15.0	5.00	20.3	4.80	21.9	4.82	24.2	5.31	15.9

(Continued)

Table A2 (continued)

ID	2014		2015		2016		2017		2018		2019		2020		2021		2022		2023	
	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV
12-3	4.97	14.3	4.89	21.4	5.03	21.5	5.08	17.3	5.04	18.2	5.10	17.0	5.01	20.3	4.86	21.2	5.04	22.6	5.26	15.1
12-4	6.21	8.7	6.06	9.8	6.21	10.1	6.25	11.5	6.24	11.6	6.42	11.8	6.08	7.7	6.23	13.8	6.35	10.8	6.60	13.2
12-5	6.24	9.7	6.17	10.9	6.30	11.4	6.33	13.7	6.27	12.4	6.44	10.9	6.17	8.6	6.32	14.5	6.42	11.6	6.71	12.2
12-6	6.46	10.7	6.46	10.1	6.58	11.6	6.62	14.6	6.50	13.3	6.65	10.8	6.47	8.4	6.62	14.2	6.66	11.9	6.99	11.1
12-7	6.32	11.4	6.40	10.1	6.49	12.3	6.51	15.6	6.38	14.2	6.57	10.4	6.38	8.9	6.50	14.9	6.54	12.3	6.87	11.1
11-1	4.73	14.1	4.73	20.2	4.78	19.9	4.85	15.6	4.82	15.9	4.94	13.7	4.79	17.7	4.59	19.7	4.76	20.7	5.03	14.2
11-2	5.07	13.9	4.93	20.2	5.06	20.1	5.07	17.5	5.05	17.5	5.14	17.0	4.94	17.0	4.86	18.8	5.08	19.0	5.20	12.5
11-3	5.33	13.5	5.14	15.5	5.14	17.5	5.15	17.7	5.15	17.2	5.32	18.2	5.04	15.4	5.12	18.6	5.24	16.6	5.40	12.4
11-4	5.94	9.4	5.84	10.7	5.95	10.6	5.89	12.7	5.90	12.0	6.13	12.5	5.76	8.6	5.91	14.9	6.03	11.6	6.27	13.6
11-5	5.82	11.0	5.78	12.4	5.88	12.5	5.87	15.4	5.82	14.0	6.04	12.2	5.72	9.6	5.86	16.3	5.97	13.1	6.29	13.0
11-6	6.25	11.3	6.24	10.9	6.41	11.8	6.43	15.3	6.30	14.4	6.50	11.1	6.26	8.5	6.43	15.1	6.44	12.7	6.83	11.4
10-1	4.92	10.9	4.88	16.1	4.94	16.0	4.98	12.9	4.96	14.2	5.08	11.0	5.02	12.5	4.77	17.9	4.87	18.6	5.21	10.9
10-2	4.96	15.8	4.97	21.9	5.01	23.4	5.10	18.1	5.01	20.2	5.11	17.0	4.97	18.6	4.81	21.0	5.02	23.5	5.11	15.4
10-3	5.06	16.0	4.97	18.8	4.96	20.2	4.97	18.7	4.94	19.2	5.13	18.6	4.89	16.5	4.87	20.1	5.04	20.9	5.16	12.6
10-4	5.61	10.3	5.57	13.5	5.60	12.9	5.49	14.8	5.48	13.1	5.75	13.4	5.39	11.1	5.48	17.6	5.63	14.2	5.87	14.2
10-5	6.07	11.1	5.98	11.2	6.14	11.6	6.10	15.2	6.00	14.6	6.29	12.5	5.92	8.9	6.14	16.4	6.20	13.4	6.58	13.9
10-6	6.40	11.9	6.35	10.9	6.61	11.7	6.59	15.9	6.45	15.8	6.68	11.4	6.43	7.9	6.64	15.7	6.63	13.3	7.05	12.5
10-7	6.39	12.6	6.40	10.1	6.67	11.0	6.64	15.8	6.49	16.0	6.73	10.8	6.50	7.9	6.69	15.4	6.67	12.8	7.04	12.2
10-8	6.32	13.5	6.38	9.8	6.60	10.4	6.56	15.8	6.43	16.0	6.67	11.0	6.44	8.3	6.62	15.3	6.57	13.2	6.87	12.1
9-1	4.96	9.9	4.91	13.7	4.98	13.3	4.90	11.9	4.92	13.1	5.02	9.1	5.05	9.4	4.81	15.9	4.89	17.1	5.16	8.8
9-2	4.73	14.7	4.79	21.0	4.77	21.5	4.83	17.0	4.75	19.0	4.94	14.3	4.77	17.0	4.59	20.2	4.75	23.0	4.90	14.9
9-3	4.80	15.7	4.81	20.7	4.80	20.6	4.79	16.6	4.77	17.0	4.93	14.2	4.70	15.4	4.66	17.9	4.88	20.7	4.89	12.2
9-4	5.86	10.5	5.76	12.1	5.88	12.4	5.77	16.1	5.73	14.5	6.06	12.7	5.68	9.3	5.88	17.8	5.96	13.6	6.36	14.2
9-5	6.37	12.3	6.24	9.8	6.62	10.7	6.58	16.4	6.41	16.1	6.69	12.0	6.42	8.4	6.71	15.5	6.63	14.1	7.14	14.7
9-6	6.32	13.1	6.31	10.2	6.65	10.4	6.61	16.5	6.44	16.8	6.68	11.4	6.51	7.8	6.71	15.2	6.65	13.0	7.06	13.6
9-7	6.27	14.1	6.32	10.4	6.62	9.8	6.56	16.0	6.40	16.7	6.64	11.6	6.46	8.6	6.67	15.0	6.59	13.6	6.89	12.9
8-1	5.29	12.1	5.32	14.2	5.36	15.5	5.27	14.2	5.22	14.9	5.33	11.4	5.45	12.2	5.19	17.2	5.25	18.7	5.39	10.2
8-2	4.63	13.3	4.77	17.3	4.72	17.1	4.68	13.6	4.67	13.2	4.87	10.7	4.74	14.2	4.62	16.1	4.78	17.6	4.71	13.4
8-3	4.71	15.3	4.85	21.4	4.79	19.3	4.72	14.8	4.75	13.8	4.93	10.6	4.66	14.7	4.71	15.1	4.92	18.9	4.79	12.5
8-4	5.57	14.5	5.65	15.6	5.62	12.9	5.49	12.7	5.55	11.3	5.66	10.9	5.45	12.4	5.60	9.8	5.69	16.4	5.66	9.6
8-5	6.22	11.3	6.06	10.4	6.45	10.1	6.35	16.9	6.24	16.5	6.56	12.2	6.32	8.8	6.61	16.3	6.51	13.4	7.06	15.4
8-6	6.15	13.4	6.10	10.7	6.54	10.3	6.48	17.1	6.27	17.5	6.53	12.0	6.42	8.8	6.65	14.7	6.51	13.4	6.99	15.0
8-7	6.12	14.4	6.17	11.1	6.53	9.5	6.46	15.8	6.27	17.1	6.51	11.6	6.39	9.0	6.63	14.3	6.51	13.5	6.84	13.1
7-1	4.75	15.5	5.02	16.5	4.90	14.4	4.77	9.3	4.86	7.2	5.06	6.5	4.79	10.6	4.95	10.1	5.11	14.3	4.84	9.7
7-2	5.43	14.8	5.68	17.2	5.60	15.4	5.42	12.2	5.50	9.3	5.58	8.3	5.40	12.4	5.58	8.5	5.72	16.5	5.44	10.5
7-3	6.20	14.7	6.37	12.7	6.28	11.5	6.14	12.6	6.15	10.0	6.27	10.7	6.17	11.8	6.22	8.0	6.25	16.6	6.21	10.5
7-4	6.62	14.5	6.59	9.4	6.52	7.1	6.38	10.0	6.43	12.4	6.71	9.7	6.56	10.6	6.56	10.4	6.53	15.2	6.79	12.7
7-5	5.64	13.0	5.60	11.0	6.09	10.3	6.00	16.8	5.79	17.1	6.04	12.3	5.95	9.7	6.24	14.0	6.03	13.7	6.55	15.3
7-6	5.89	14.0	5.91	11.6	6.35	9.3	6.28	15.3	6.05	16.8	6.28	11.0	6.23	8.9	6.48	13.1	6.31	12.9	6.69	12.2
7-7	6.02	14.7	6.13	12.1	6.48	9.3	6.37	15.0	6.17	16.9	6.46	11.4	6.33	9.6	6.61	13.5	6.47	14.4	6.70	11.9
7-8	6.22	15.3	6.33	13.4	6.63	9.6	6.45	15.1	6.28	16.9	6.66	11.8	6.46	10.1	6.71	13.9	6.63	15.8	6.71	12.1
6-1	4.88	15.9	5.18	12.0	5.09	11.2	4.91	8.3	5.01	8.3	5.16	7.4	4.99	9.9	5.18	9.2	5.26	13.5	4.95	9.2
6-2	5.15	16.1	5.53	17.5	5.44	17.3	5.24	14.5	5.28	9.5	5.38	8.8	5.20	12.0	5.43	10.5	5.51	16.1	5.11	13.8
6-3	5.39	13.7	5.63	15.4	5.63	17.0	5.43	13.9	5.39	10.1	5.46	8.4	5.43	12.6	5.44	10.5	5.57	19.8	5.33	13.7
6-4	5.61	15.1	5.70	9.8	5.54	10.4	5.46	11.4	5.39	8.3	5.59	10.6	5.55	12.5	5.41	11.2	5.45	18.6	5.63	16.3
6-5	4.52	12.2	4.54	13.8	4.91	12.3	4.74	16.7	4.63	16.6	4.86	14.2	4.77	9.0	5.04	14.0	4.83	12.6	5.35	12.7
6-6	5.63	14.6	5.73	12.3	6.12	10.0	6.02	14.5	5.78	17.0	6.08	11.0	6.01	9.3	6.29	12.8	6.11	13.7	6.37	10.9
6-7	5.91	15.4	6.02	13.5	6.35	10.1	6.18	14.8	5.98	17.0	6.37	11.5	6.23	10.0	6.50	13.7	6.40	15.2	6.50	11.5
5-1	4.95	14.1	5.20	9.2	5.11	11.3	4.88	8.5	4.97	8.4	5.06	7.4	5.01	9.2	5.18	8.1	5.21	13.4	4.90	8.7
5-2	4.89	15.7	5.27	16.2	5.24	14.8	5.00	14.6	5.04	8.5	5.16	7.8	4.92	9.2	5.23	11.6	5.20	14.2	4.86	13.6
5-3	4.92	14.1	5.10	20.4	5.17	19.3	4.98	16.1	4.91	14.6	4.98	11.5	4.95	14.5	5.00	13.0	5.12	19.1	4.87	14.8
5-4	4.73	13.0	4.78	13.8	4.83	15.4	4.81	12.7	4.62	13.1	4.77	12.2	4.75	11.3	4.66	16.8	4.76	23.4	4.84	16.2
5-5	3.67	14.7	3.70	18.2	3.85	17.7	3.70	16.4	3.61	16.2	3.79	20.2	3.75	11.6	3.82	16.8	3.76	16.3	4.10	13.1
5-6	4.76	14.6	4.76	13.1	5.28	12.5	5.20	15.9	4.92	17.4	5.15	12.8	5.16	8.9	5.40	11.9	5.18	13.7	5.65	10.2

(Continued)

Table A2 (continued)

ID	2014		2015		2016		2017		2018		2019		2020		2021		2022		2023	
	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV
5-7	5.68	15.5	5.80	14.2	6.17	10.9	6.01	14.8	5.80	17.2	6.18	11.4	6.09	10.0	6.36	13.6	6.26	14.5	6.41	11.1
4-1	4.88	14.1	5.18	11.6	5.18	12.8	4.88	12.3	4.92	7.9	5.04	5.3	4.84	7.6	5.16	10.0	5.07	12.7	4.77	11.6
4-2	4.89	12.2	5.09	15.4	5.18	13.0	4.99	12.2	4.93	8.6	4.97	6.1	4.90	9.2	5.08	10.1	5.09	13.0	4.89	10.2
4-3	5.37	10.3	5.30	12.1	5.47	9.6	5.44	11.0	5.35	8.5	5.41	8.9	5.45	8.8	5.39	13.2	5.46	18.0	5.49	7.8
4-4	3.83	15.7	3.79	16.1	4.21	14.9	4.09	17.1	3.91	16.9	4.10	19.3	4.01	9.4	4.25	13.7	4.07	14.3	4.52	12.2
4-5	4.66	15.7	4.71	15.0	5.16	13.1	5.10	14.7	4.85	17.4	5.09	13.6	5.07	8.3	5.27	11.5	5.10	13.9	5.46	10.5
4-6	5.26	15.8	5.39	15.3	5.78	12.5	5.64	14.9	5.43	17.6	5.79	12.4	5.73	9.6	5.98	13.5	5.88	14.1	6.09	10.7
4-7	5.83	15.8	5.90	16.4	6.27	12.6	6.11	14.9	5.91	16.9	6.32	12.4	6.24	10.7	6.47	15.3	6.54	15.3	6.56	11.4
3-1	3.52	17.1	3.48	18.3	3.74	17.5	3.59	17.2	3.47	14.8	3.65	22.1	3.53	12.0	3.63	16.7	3.55	18.2	3.89	18.3
3-2	4.29	16.5	4.33	16.2	4.71	13.8	4.62	14.3	4.44	16.2	4.68	15.8	4.56	8.1	4.76	12.0	4.60	14.0	4.98	12.5
3-3	4.85	16.4	4.99	17.2	5.35	14.8	5.23	15.9	5.04	18.8	5.35	14.9	5.31	9.5	5.53	15.0	5.43	14.2	5.69	11.7
3-4	5.56	16.1	5.63	17.8	5.99	14.2	5.87	15.8	5.68	17.9	6.06	14.2	6.01	11.0	6.26	16.2	6.30	15.2	6.38	11.6
2-1	4.15	18.1	4.28	19.6	4.58	17.7	4.51	18.9	4.33	20.9	4.63	20.7	4.55	11.0	4.70	18.6	4.62	16.1	4.94	15.6
2-2	5.29	16.2	5.38	18.6	5.73	15.0	5.64	16.6	5.42	18.3	5.78	15.5	5.75	11.3	5.99	17.3	5.99	15.4	6.13	11.9
1-1	3.24	18.4	3.39	21.4	3.51	18.1	3.36	20.6	3.32	16.4	3.56	27.8	3.32	13.6	3.39	18.9	3.35	16.7	3.75	24.1
1-2	3.68	18.3	3.80	20.6	4.04	17.9	3.97	20.1	3.85	19.9	4.09	25.2	3.97	10.8	4.08	20.1	3.94	18.0	4.33	19.6
1-3	5.01	16.4	5.09	18.6	5.43	15.7	5.35	17.8	5.13	18.4	5.42	17.2	5.44	11.1	5.62	18.6	5.57	16.5	5.74	13.0

Table A3: Monthly mean wind speed (MWS) in m/s in Baja California (Mexico).

ID	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
23-1	4.21	4.18	4.25	4.77	5.43	4.87	3.73	3.96	4.26	4.03	3.84	4.14
23-2	4.27	4.52	4.90	5.43	6.20	5.17	3.93	4.11	4.53	4.47	4.05	4.27
23-3	4.86	5.03	5.43	5.72	6.40	5.16	3.92	4.13	4.70	4.75	4.48	4.83
22-1	4.08	3.94	4.03	4.46	5.03	4.97	4.09	4.09	4.16	3.75	3.62	3.95
22-2	4.10	4.38	4.81	5.35	6.14	5.32	4.21	4.28	4.53	4.40	3.88	4.08
22-3	4.94	5.14	5.60	5.90	6.63	5.32	4.10	4.25	4.76	4.89	4.58	4.93
21-1	5.18	4.78	4.33	3.76	3.76	3.96	3.40	3.32	3.48	3.57	4.40	5.05
21-2	5.01	4.51	4.05	3.70	3.75	4.20	3.80	3.57	3.53	3.31	4.15	4.85
21-3	4.39	4.05	3.83	3.76	3.89	3.94	3.70	3.62	3.65	3.26	3.68	4.20
21-4	4.97	5.08	5.46	5.63	6.26	5.05	4.02	4.24	4.68	4.82	4.61	4.93
21-5	5.34	5.42	5.94	6.08	6.64	5.34	4.19	4.37	4.91	5.11	4.96	5.30
21-6	5.35	5.49	6.14	6.25	6.77	5.57	4.31	4.53	5.11	5.22	5.01	5.31
20-1	5.34	5.01	4.58	3.85	3.77	3.99	3.44	3.27	3.41	3.68	4.57	5.23
20-2	5.28	4.83	4.27	3.60	3.47	3.98	3.75	3.40	3.36	3.37	4.40	5.16
20-3	4.81	4.44	4.07	3.52	3.34	3.33	3.34	3.33	3.46	3.24	3.99	4.64
20-4	4.84	4.76	4.96	4.94	5.33	4.48	3.92	4.16	4.46	4.43	4.40	4.72
20-5	5.29	5.44	6.03	6.25	6.84	5.60	4.44	4.60	5.04	5.24	5.02	5.24
20-6	5.37	5.54	6.26	6.40	6.91	5.78	4.52	4.71	5.21	5.32	5.10	5.35
19-1	5.32	5.14	4.82	4.05	3.94	4.11	3.52	3.34	3.49	3.84	4.68	5.24
19-2	5.36	5.04	4.56	3.73	3.55	3.94	3.70	3.36	3.42	3.58	4.55	5.30
19-3	5.02	4.74	4.38	3.68	3.45	3.44	3.40	3.39	3.52	3.42	4.23	4.96
19-4	4.45	4.31	4.29	4.37	4.78	4.34	3.82	3.90	3.99	3.98	4.04	4.41
19-5	4.98	5.13	5.68	5.94	6.53	5.55	4.67	4.79	5.06	5.09	4.84	4.95

(Continued)

Table A3 (continued)

ID	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
19-6	5.27	5.50	6.25	6.48	7.07	5.99	4.72	4.84	5.28	5.40	5.15	5.29
19-7	5.36	5.64	6.54	6.66	7.11	6.06	4.75	4.86	5.37	5.50	5.20	5.39
19-8	5.42	5.70	6.65	6.77	7.08	6.08	4.80	4.93	5.44	5.60	5.25	5.46
18-1	5.41	5.20	4.87	4.00	3.84	4.06	3.73	3.41	3.55	3.77	4.68	5.38
18-2	5.19	4.90	4.55	3.75	3.60	3.71	3.61	3.43	3.53	3.52	4.39	5.17
18-3	4.73	4.52	4.30	3.85	3.85	3.81	3.64	3.62	3.70	3.52	4.07	4.72
18-4	4.55	4.40	4.20	4.10	4.41	4.20	3.68	3.66	3.86	3.78	4.00	4.51
18-5	5.19	5.41	6.06	6.34	6.98	5.98	4.84	4.93	5.26	5.35	5.14	5.23
18-6	5.34	5.68	6.62	6.79	7.23	6.23	4.99	5.05	5.47	5.57	5.26	5.42
18-7	5.44	5.78	6.79	6.92	7.20	6.24	4.99	5.09	5.53	5.72	5.35	5.54
17-1	5.35	5.08	4.76	3.87	3.73	3.98	3.87	3.45	3.57	3.64	4.55	5.33
17-2	5.16	4.82	4.50	3.79	3.69	3.85	3.90	3.58	3.58	3.44	4.26	5.10
17-3	4.83	4.62	4.41	4.08	4.16	4.02	3.79	3.70	3.88	3.73	4.13	4.75
17-4	4.92	5.01	5.38	5.53	6.06	5.27	4.55	4.58	4.74	4.80	4.74	4.91
17-5	5.24	5.66	6.69	6.96	7.41	6.54	5.38	5.37	5.67	5.68	5.29	5.34
17-6	5.46	5.86	6.94	7.10	7.36	6.49	5.27	5.30	5.72	5.87	5.45	5.62
16-1	5.37	5.15	4.94	4.12	3.95	4.15	3.94	3.45	3.65	3.83	4.67	5.34
16-2	5.43	5.06	4.70	3.85	3.65	3.90	3.95	3.45	3.61	3.58	4.51	5.39
16-3	5.26	4.95	4.68	4.22	4.15	4.08	3.98	3.78	3.88	3.75	4.38	5.17
16-4	5.09	5.50	6.43	6.76	7.29	6.42	5.32	5.31	5.57	5.55	5.14	5.19
16-5	5.47	5.92	7.04	7.28	7.58	6.83	5.60	5.51	5.91	6.00	5.49	5.63
16-6	5.87	6.27	7.25	7.44	7.56	6.84	5.70	5.67	6.08	6.29	5.79	6.03
15-1	5.06	4.96	4.89	4.34	4.18	4.33	3.93	3.46	3.68	3.91	4.59	5.05
15-2	5.56	5.26	4.96	4.13	3.88	4.10	4.05	3.51	3.75	3.82	4.74	5.54
15-3	5.60	5.20	4.81	4.15	3.95	4.02	4.09	3.76	3.82	3.72	4.60	5.51
15-4	4.91	5.11	5.66	5.88	6.46	5.58	4.56	4.54	4.79	4.91	4.71	4.87
15-5	5.43	5.82	6.83	7.14	7.54	6.88	5.64	5.49	5.78	5.88	5.40	5.53
15-6	5.96	6.34	7.28	7.53	7.68	7.10	6.08	5.93	6.24	6.41	5.90	6.11
14-1	5.85	5.49	5.10	4.30	3.91	4.05	4.20	3.76	3.91	3.90	4.90	5.77
14-2	5.84	5.51	5.07	4.57	4.36	4.26	4.19	4.06	4.11	4.07	4.83	5.67
14-3	4.89	4.77	4.33	4.15	3.96	3.83	3.45	3.43	3.70	3.68	4.11	4.77
14-4	5.50	5.64	6.23	6.37	6.69	6.03	4.95	4.88	5.14	5.34	5.23	5.47
14-5	5.94	6.25	7.00	7.24	7.41	6.91	6.01	5.85	6.07	6.24	5.85	6.04
14-6	6.20	6.58	7.34	7.60	7.60	7.00	6.18	6.08	6.35	6.58	6.16	6.32
14-7	6.32	6.71	7.38	7.56	7.36	6.68	5.85	5.93	6.35	6.62	6.29	6.43
14-8	6.37	6.78	7.28	7.44	7.14	6.44	5.57	5.74	6.22	6.50	6.30	6.50
14-9	6.26	6.70	7.08	7.30	6.95	6.30	5.44	5.62	6.07	6.26	6.13	6.38
13-1	5.82	5.64	5.46	4.72	4.29	4.42	4.35	3.87	4.17	4.19	5.06	5.77
13-2	5.96	5.64	5.19	4.52	4.17	4.10	4.21	4.01	4.15	4.19	5.06	5.87
13-3	5.80	5.60	5.26	4.79	4.43	4.19	3.91	3.92	4.11	4.31	4.91	5.65
13-4	6.20	6.55	7.16	7.38	7.38	6.76	6.01	5.93	6.16	6.43	6.14	6.27

(Continued)

Table A3 (continued)

ID	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
13-5	6.35	6.75	7.38	7.56	7.39	6.67	5.92	5.97	6.37	6.63	6.37	6.47
13-6	6.36	6.80	7.27	7.43	7.13	6.35	5.60	5.74	6.23	6.52	6.39	6.52
13-7	6.28	6.77	7.13	7.37	7.03	6.30	5.49	5.64	6.11	6.31	6.25	6.44
12-1	5.26	5.28	5.30	4.79	4.47	4.73	4.44	4.01	4.33	4.25	4.81	5.24
12-2	6.03	5.82	5.56	4.84	4.39	4.22	4.15	3.96	4.27	4.43	5.25	5.96
12-3	6.26	5.95	5.64	5.14	4.73	4.36	4.01	4.00	4.24	4.57	5.35	6.12
12-4	6.04	6.40	6.90	7.08	7.10	6.38	5.62	5.59	5.87	6.18	5.98	6.08
12-5	6.23	6.57	7.06	7.18	7.02	6.19	5.46	5.52	5.97	6.30	6.23	6.34
12-6	6.42	6.87	7.37	7.55	7.25	6.40	5.66	5.77	6.27	6.58	6.52	6.60
12-7	6.33	6.83	7.22	7.49	7.12	6.32	5.53	5.69	6.17	6.39	6.38	6.54
11-1	5.84	5.59	5.25	4.77	4.39	4.16	4.02	4.02	4.20	4.45	5.19	5.80
11-2	6.02	5.83	5.50	5.34	5.12	4.71	4.00	3.90	4.13	4.68	5.33	5.97
11-3	5.67	5.68	5.66	5.90	6.08	5.44	4.14	3.89	4.36	4.87	5.19	5.60
11-4	5.83	6.15	6.62	6.74	6.82	5.91	5.17	5.20	5.59	5.91	5.78	5.86
11-5	5.85	6.18	6.67	6.76	6.58	5.61	4.90	5.00	5.53	5.89	5.91	6.02
11-6	6.19	6.66	7.20	7.41	7.10	6.17	5.42	5.52	6.08	6.37	6.37	6.42
10-1	5.71	5.64	5.47	5.04	4.79	4.66	4.33	4.19	4.37	4.58	5.19	5.64
10-2	6.24	5.95	5.51	5.07	4.67	4.30	4.07	3.97	4.09	4.65	5.49	6.15
10-3	5.73	5.63	5.45	5.58	5.59	5.00	3.81	3.62	4.04	4.67	5.21	5.71
10-4	5.86	5.96	6.16	6.19	6.38	5.31	4.57	4.62	5.06	5.53	5.61	5.82
10-5	5.90	6.32	6.95	7.14	6.98	5.91	5.15	5.24	5.83	6.17	6.07	6.08
10-6	6.29	6.83	7.44	7.68	7.29	6.30	5.52	5.67	6.29	6.56	6.57	6.58
10-7	6.19	6.85	7.43	7.80	7.38	6.49	5.74	5.89	6.34	6.48	6.44	6.48
10-8	6.00	6.76	7.29	7.77	7.36	6.58	5.83	5.99	6.29	6.28	6.16	6.27
9-1	5.46	5.50	5.46	5.13	4.93	4.90	4.34	4.12	4.40	4.71	5.23	5.42
9-2	5.75	5.53	5.25	4.70	4.39	4.11	3.99	3.88	4.06	4.57	5.34	5.83
9-3	5.67	5.40	5.07	5.00	4.95	4.54	3.92	3.74	3.92	4.52	5.23	5.71
9-4	5.91	6.16	6.57	6.73	6.77	5.60	4.85	4.91	5.50	5.89	5.90	5.94
9-5	5.92	6.63	7.47	7.82	7.44	6.44	5.72	5.89	6.46	6.63	6.39	6.20
9-6	5.98	6.75	7.43	7.83	7.39	6.48	5.80	5.97	6.42	6.48	6.34	6.30
9-7	5.88	6.70	7.30	7.82	7.40	6.61	5.91	6.08	6.34	6.26	6.09	6.16
8-1	6.09	6.03	5.82	5.52	5.13	5.11	4.45	4.21	4.63	5.09	5.72	5.93
8-2	5.43	5.31	5.01	4.55	4.28	4.17	4.33	4.15	4.18	4.52	5.19	5.54
8-3	5.62	5.26	4.85	4.66	4.67	4.35	4.26	4.08	4.02	4.52	5.33	5.78
8-4	5.93	5.77	5.46	5.80	6.32	6.16	5.27	4.87	4.76	5.11	5.71	5.98
8-5	5.84	6.43	7.27	7.61	7.42	6.38	5.67	5.85	6.26	6.35	6.17	6.04
8-6	5.71	6.54	7.33	7.74	7.26	6.37	5.76	5.97	6.38	6.34	6.13	6.04
8-7	5.76	6.58	7.20	7.70	7.25	6.49	5.88	6.06	6.28	6.14	5.98	6.04
7-1	5.31	5.09	4.70	4.75	4.94	4.80	4.94	4.69	4.34	4.53	5.25	5.53
7-2	6.05	5.68	5.14	5.36	5.89	5.86	5.59	5.19	4.71	4.93	5.87	6.14
7-3	6.29	6.28	5.89	6.30	7.02	7.05	6.49	5.88	5.52	5.54	6.21	6.26

(Continued)

Table A3 (continued)

ID	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
7-4	6.59	6.67	6.61	6.96	7.55	7.37	6.53	6.05	5.99	5.89	6.32	6.34
7-5	5.23	6.03	6.78	7.18	6.78	5.89	5.42	5.68	5.98	5.81	5.63	5.55
7-6	5.67	6.42	6.96	7.42	6.90	6.21	5.73	5.93	6.10	5.90	5.85	5.93
7-7	5.79	6.54	7.01	7.60	7.13	6.54	5.92	6.13	6.15	5.89	5.82	6.01
7-8	5.87	6.60	7.06	7.79	7.36	6.88	6.11	6.34	6.27	5.95	5.80	6.10
6-1	5.01	5.07	4.77	5.06	5.37	5.43	5.51	5.13	4.61	4.53	5.12	5.12
6-2	5.89	5.46	4.82	4.90	5.33	5.38	5.75	5.30	4.62	4.68	5.76	6.02
6-3	6.23	5.93	5.21	5.27	5.45	5.31	5.57	5.05	4.64	4.94	5.99	6.08
6-4	5.77	5.92	5.73	5.78	6.13	5.87	5.42	4.86	5.01	4.94	5.50	5.51
6-5	4.55	5.03	5.50	5.65	5.39	4.46	4.18	4.43	4.65	4.55	4.70	4.77
6-6	5.65	6.28	6.65	7.12	6.53	5.97	5.52	5.77	5.80	5.50	5.61	5.82
6-7	5.80	6.42	6.82	7.46	6.90	6.41	5.78	6.06	5.99	5.64	5.67	5.99
5-1	4.98	5.13	4.85	5.07	5.34	5.37	5.50	5.10	4.68	4.51	5.09	4.95
5-2	5.47	5.18	4.74	4.73	4.99	4.98	5.63	5.23	4.55	4.47	5.43	5.55
5-3	6.00	5.41	4.75	4.57	4.61	4.43	5.00	4.64	4.33	4.65	5.76	5.86
5-4	5.38	5.39	5.18	5.07	4.84	4.32	4.20	3.87	4.06	4.52	5.15	5.12
5-5	4.26	4.39	4.32	4.12	3.86	3.14	3.02	3.14	3.38	3.49	4.08	4.17
5-6	4.88	5.46	5.78	6.10	5.47	4.76	4.54	4.90	5.00	4.79	5.00	5.09
5-7	5.79	6.35	6.69	7.23	6.52	6.06	5.57	5.87	5.79	5.46	5.65	5.98
4-1	5.20	5.13	4.87	4.85	5.07	5.05	5.49	5.08	4.51	4.40	5.16	5.11
4-2	5.48	5.10	4.70	4.73	4.91	4.83	5.36	5.00	4.54	4.59	5.38	5.39
4-3	5.82	5.75	5.61	5.70	5.58	5.23	4.92	4.73	4.88	5.34	5.76	5.63
4-4	4.18	4.56	4.68	4.76	4.28	3.57	3.41	3.78	3.80	3.67	4.08	4.21
4-5	5.01	5.49	5.68	5.89	5.12	4.57	4.43	4.81	4.88	4.58	4.98	5.18
4-6	5.59	6.08	6.34	6.74	5.91	5.43	5.12	5.44	5.41	5.08	5.45	5.81
4-7	5.96	6.51	6.84	7.48	6.59	6.10	5.64	5.98	5.88	5.57	5.79	6.29
3-1	4.23	4.33	4.07	3.89	3.54	3.00	2.86	3.11	3.16	3.24	3.90	4.01
3-2	4.78	5.15	5.16	5.23	4.54	4.01	3.93	4.33	4.38	4.15	4.67	4.91
3-3	5.35	5.81	5.97	6.24	5.30	4.75	4.56	4.90	4.96	4.72	5.19	5.62
3-4	5.85	6.37	6.68	7.23	6.20	5.64	5.30	5.68	5.63	5.35	5.65	6.17
2-1	4.76	5.18	5.34	5.39	4.48	3.76	3.63	4.01	4.20	4.10	4.56	4.98
2-2	5.67	6.15	6.47	6.95	5.91	5.23	4.96	5.34	5.38	5.14	5.46	5.91
1-1	3.90	4.13	3.97	3.73	3.50	2.78	2.59	2.82	3.07	3.03	3.52	4.05
1-2	4.26	4.67	4.77	4.67	3.95	3.23	3.09	3.44	3.67	3.57	4.02	4.41
1-3	5.41	5.83	6.18	6.62	5.59	4.78	4.54	4.95	5.08	4.91	5.18	5.54

Table A4: Seasonal mean wind speed (MWS) in m/s and its respective coefficient of variation (CoV) expressed as a % in Baja California (Mexico).

ID	Winter		Spring		Summer		Autumn	
	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV
23-1	4.17	8.9	4.82	13.6	4.19	16.6	4.04	15.8
23-2	4.36	8.9	5.51	13.7	4.40	17.6	4.35	13.6
23-3	4.91	8.7	5.85	12.1	4.40	18.1	4.64	12.2
22-1	3.99	8.9	4.50	11.7	4.38	13.3	3.85	16.1
22-2	4.18	8.5	5.43	13.1	4.60	15.4	4.27	13.6
22-3	5.00	8.1	6.04	11.7	4.56	17.6	4.74	11.8
21-1	5.01	11.2	3.95	13.8	3.56	13.2	3.81	20.2
21-2	4.79	10.5	3.83	10.8	3.86	12.8	3.67	20.0
21-3	4.21	9.6	3.83	7.4	3.76	10.6	3.53	16.4
21-4	5.00	7.2	5.79	10.9	4.43	15.6	4.70	10.9
21-5	5.36	7.3	6.22	10.4	4.64	16.7	4.99	11.4
21-6	5.38	7.6	6.39	9.7	4.80	17.1	5.11	11.6
20-1	5.19	10.8	4.07	16.2	3.57	13.6	3.89	20.6
20-2	5.09	10.3	3.78	15.9	3.71	13.3	3.71	21.4
20-3	4.63	9.3	3.64	13.6	3.33	11.7	3.56	17.4
20-4	4.78	6.6	5.08	9.3	4.19	10.5	4.43	9.6
20-5	5.32	6.6	6.37	9.9	4.88	15.5	5.10	10.6
20-6	5.42	7.3	6.52	9.2	5.00	16.4	5.21	11.3
19-1	5.23	10.4	4.27	16.7	3.66	13.4	4.00	19.7
19-2	5.23	9.7	3.95	18.5	3.67	12.8	3.85	20.6
19-3	4.90	8.7	3.84	16.0	3.41	10.7	3.72	17.2
19-4	4.39	7.2	4.48	8.7	4.02	8.8	4.00	10.5
19-5	5.02	6.0	6.05	9.4	5.00	11.5	5.00	8.7
19-6	5.35	7.2	6.60	9.3	5.18	16.0	5.28	10.4
19-7	5.46	8.0	6.77	8.6	5.23	16.7	5.35	10.6
19-8	5.53	8.7	6.83	8.4	5.27	16.8	5.43	9.9
18-1	5.33	9.2	4.23	18.3	3.73	12.5	4.00	19.4
18-2	5.09	9.2	3.97	17.3	3.58	10.7	3.81	18.1
18-3	4.66	8.2	4.00	10.3	3.69	8.3	3.76	13.4
18-4	4.48	7.7	4.24	7.7	3.85	10.5	3.88	10.6
18-5	5.27	6.6	6.46	9.6	5.25	14.1	5.25	8.7
18-6	5.48	8.3	6.88	8.4	5.42	15.6	5.43	9.9
18-7	5.59	8.9	6.97	8.2	5.44	16.2	5.53	9.7
17-1	5.25	9.3	4.12	18.3	3.77	11.9	3.92	18.4
17-2	5.03	9.4	3.99	15.0	3.78	10.1	3.76	16.7
17-3	4.73	8.4	4.22	8.1	3.84	8.3	3.91	11.0
17-4	4.94	5.9	5.66	8.8	4.80	9.8	4.76	8.2
17-5	5.42	8.7	7.02	8.4	5.76	13.9	5.55	9.1
17-6	5.65	9.3	7.13	8.1	5.69	15.5	5.68	9.4

(Continued)

Table A4 (continued)

ID	Winter		Spring		Summer		Autumn	
	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV
16-1	5.28	8.6	4.34	16.4	3.85	12.4	4.05	16.7
16-2	5.29	9.6	4.07	17.7	3.77	11.9	3.90	17.7
16-3	5.13	8.8	4.35	10.2	3.95	7.9	4.01	13.4
16-4	5.26	9.0	6.83	9.1	5.68	13.4	5.42	9.0
16-5	5.67	9.7	7.30	8.3	5.98	15.2	5.80	9.5
16-6	6.06	9.1	7.42	7.9	6.07	14.3	6.05	8.5
15-1	5.02	8.0	4.47	12.7	3.91	12.9	4.06	13.7
15-2	5.45	9.3	4.32	17.3	3.89	12.8	4.10	16.7
15-3	5.43	9.4	4.30	14.1	3.96	9.4	4.05	16.2
15-4	4.96	8.2	6.00	9.6	4.89	13.7	4.80	9.1
15-5	5.59	9.5	7.17	8.8	6.00	15.1	5.69	9.2
15-6	6.14	8.9	7.50	7.8	6.37	13.0	6.18	8.0
14-1	5.70	9.2	4.44	17.2	4.00	11.5	4.24	17.1
14-2	5.67	9.2	4.67	10.9	4.17	7.4	4.34	14.0
14-3	4.81	8.5	4.15	8.5	3.57	9.0	3.83	11.2
14-4	5.54	8.5	6.43	8.3	5.29	14.8	5.24	8.6
14-5	6.08	8.4	7.22	7.5	6.26	12.1	6.05	7.2
14-6	6.37	8.8	7.51	7.1	6.42	11.5	6.36	6.8
14-7	6.49	9.1	7.43	7.4	6.15	12.1	6.42	6.6
14-8	6.55	9.2	7.29	7.5	5.92	12.7	6.34	6.6
14-9	6.45	9.7	7.11	7.7	5.79	12.7	6.15	6.9
13-1	5.74	8.1	4.82	15.8	4.21	12.3	4.48	14.9
13-2	5.82	8.7	4.63	14.3	4.10	9.0	4.47	15.6
13-3	5.68	9.0	4.83	10.6	4.01	7.5	4.44	12.5
13-4	6.34	8.4	7.30	6.8	6.23	10.9	6.24	6.4
13-5	6.52	8.9	7.44	6.9	6.19	11.3	6.46	6.4
13-6	6.56	9.2	7.28	7.2	5.90	12.1	6.38	6.4
13-7	6.50	9.8	7.18	7.5	5.81	12.6	6.22	6.8
12-1	5.26	7.3	4.86	11.6	4.39	12.1	4.46	11.2
12-2	5.94	8.2	4.93	15.3	4.11	11.4	4.65	15.0
12-3	6.11	9.0	5.17	12.2	4.12	8.9	4.72	15.1
12-4	6.17	8.2	7.03	6.9	5.86	11.2	6.01	6.8
12-5	6.38	8.8	7.09	6.9	5.72	11.6	6.17	7.0
12-6	6.63	9.1	7.39	7.1	5.94	11.7	6.46	6.3
12-7	6.57	9.8	7.27	7.5	5.85	12.3	6.31	6.7
11-1	5.74	8.5	4.80	12.0	4.07	8.3	4.62	15.1
11-2	5.94	9.1	5.32	8.6	4.21	11.0	4.71	15.3
11-3	5.65	8.7	5.88	7.0	4.49	18.0	4.81	12.5
11-4	5.95	8.4	6.73	6.9	5.42	11.4	5.76	7.3
11-5	6.02	9.1	6.67	7.4	5.17	12.7	5.78	7.8

(Continued)

Table A4 (continued)

ID	Winter		Spring		Summer		Autumn	
	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV
11-6	6.43	9.3	7.24	7.3	5.71	12.2	6.27	6.4
10-1	5.66	7.5	5.10	10.4	4.39	9.6	4.71	13.4
10-2	6.11	9.9	5.08	11.7	4.11	7.7	4.74	17.9
10-3	5.69	9.5	5.54	7.4	4.14	17.6	4.64	15.8
10-4	5.88	9.0	6.24	7.1	4.84	12.8	5.40	9.5
10-5	6.10	8.8	7.02	7.5	5.43	13.0	6.02	7.2
10-6	6.57	9.5	7.47	8.0	5.83	13.0	6.47	6.5
10-7	6.51	10.3	7.54	7.8	6.04	12.7	6.42	6.5
10-8	6.35	11.3	7.47	7.7	6.13	12.1	6.25	6.7
9-1	5.46	6.9	5.17	8.0	4.45	11.3	4.78	11.7
9-2	5.70	9.5	4.78	12.6	3.99	8.8	4.66	17.5
9-3	5.59	10.6	5.01	8.3	4.07	11.0	4.56	17.2
9-4	6.00	8.4	6.69	7.6	5.12	14.6	5.77	7.9
9-5	6.25	10.2	7.58	8.3	6.02	13.5	6.49	7.1
9-6	6.34	10.9	7.55	8.1	6.08	13.2	6.42	7.1
9-7	6.25	11.7	7.51	7.9	6.20	12.2	6.23	7.2
8-1	6.02	7.3	5.49	8.0	4.59	11.7	5.15	12.3
8-2	5.43	9.0	4.61	10.4	4.21	7.9	4.63	15.1
8-3	5.55	11.3	4.72	8.6	4.23	6.6	4.62	17.5
8-4	5.89	10.3	5.86	9.3	5.43	12.1	5.19	13.8
8-5	6.11	9.6	7.43	8.8	5.97	14.6	6.26	7.8
8-6	6.10	11.5	7.45	8.5	6.04	13.4	6.29	8.4
8-7	6.13	12.0	7.38	8.0	6.14	12.2	6.13	8.1
7-1	5.31	11.3	4.80	7.9	4.81	6.8	4.70	15.2
7-2	5.96	12.0	5.46	9.6	5.55	8.2	5.17	16.0
7-3	6.28	10.5	6.40	10.2	6.47	10.5	5.76	12.8
7-4	6.53	8.9	7.04	8.5	6.65	11.5	6.06	10.6
7-5	5.60	11.9	6.91	8.8	5.66	12.5	5.80	9.5
7-6	6.01	11.9	7.09	8.4	5.95	11.8	5.95	9.0
7-7	6.11	12.6	7.25	8.1	6.20	11.6	5.95	8.7
7-8	6.19	13.1	7.40	8.3	6.44	11.8	6.01	8.6
6-1	5.07	10.6	5.07	8.9	5.36	7.4	4.75	12.6
6-2	5.79	13.0	5.02	9.8	5.48	8.4	5.02	17.1
6-3	6.08	13.0	5.31	7.9	5.31	7.6	5.19	16.8
6-4	5.73	11.8	5.88	8.6	5.38	11.8	5.15	13.5
6-5	4.78	11.9	5.51	8.8	4.35	12.7	4.63	10.2
6-6	5.92	12.5	6.76	8.6	5.75	11.7	5.64	9.5
6-7	6.07	13.1	7.06	8.7	6.09	12.2	5.77	9.3
5-1	5.02	9.8	5.08	8.3	5.33	7.5	4.76	11.3
5-2	5.40	12.2	4.82	8.0	5.28	10.0	4.82	15.9

(Continued)

Table A4 (continued)

ID	Winter		Spring		Summer		Autumn	
	MWS	CoV	MWS	CoV	MWS	CoV	MWS	CoV
5-3	5.75	14.6	4.64	7.0	4.69	7.6	4.91	17.3
5-4	5.29	11.5	5.03	8.4	4.13	9.3	4.58	15.2
5-5	4.27	10.9	4.10	8.2	3.10	9.7	3.65	13.2
5-6	5.14	12.9	5.79	9.6	4.74	12.8	4.93	10.7
5-7	6.04	13.3	6.81	9.4	5.83	12.6	5.63	10.0
4-1	5.14	10.9	4.93	7.3	5.21	8.9	4.69	13.3
4-2	5.32	12.8	4.78	5.7	5.06	7.1	4.84	13.3
4-3	5.74	10.2	5.63	7.2	4.96	7.9	5.33	11.4
4-4	4.32	14.3	4.57	9.6	3.58	13.2	3.85	11.9
4-5	5.23	13.4	5.56	10.1	4.60	12.6	4.82	11.0
4-6	5.83	13.5	6.33	10.3	5.33	13.0	5.31	10.9
4-7	6.26	14.0	6.97	11.0	5.90	13.2	5.74	10.6
3-1	4.19	12.8	3.83	9.3	2.99	9.8	3.43	14.2
3-2	4.95	13.6	4.98	10.2	4.09	11.6	4.40	10.9
3-3	5.60	13.7	5.84	11.5	4.74	13.2	4.96	11.8
3-4	6.13	14.3	6.70	11.9	5.54	13.9	5.54	11.6
2-1	4.97	15.2	5.07	12.6	3.80	13.7	4.29	12.9
2-2	5.91	14.6	6.44	12.1	5.18	13.8	5.32	12.3
1-1	4.02	17.2	3.74	10.6	2.73	10.6	3.21	12.5
1-2	4.45	17.4	4.47	12.7	3.25	12.6	3.75	12.6
1-3	5.59	15.1	6.13	12.0	4.75	13.2	5.06	12.3

Table A5: Interannual mean wind power density (WPD) in W/m^2 in Baja California (Mexico).

ID	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
23-1	98	93	90	96	75	87	92	80	92	115
23-2	106	108	103	113	91	110	103	96	118	139
23-3	118	126	119	119	111	125	115	114	140	160
22-1	96	85	85	95	73	80	89	76	85	103
22-2	103	101	100	114	88	106	103	95	110	133
22-3	121	128	125	127	113	132	120	123	140	170
21-1	82	91	77	81	79	79	91	76	81	101
21-2	91	87	80	85	76	78	90	73	83	102
21-3	89	74	76	83	65	67	77	64	73	88
21-4	114	118	115	121	103	119	109	110	127	155
21-5	127	135	137	139	127	143	128	141	149	186
21-6	130	143	143	148	139	155	139	154	159	203
20-1	84	95	84	89	85	87	98	84	87	111
20-2	90	91	86	92	82	85	96	80	91	111

(Continued)

Table A5 (continued)

ID	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
20-3	88	74	77	82	67	68	78	64	76	91
20-4	100	97	95	105	83	93	89	89	102	120
20-5	139	137	145	150	133	151	134	148	150	189
20-6	142	147	152	154	147	163	145	164	160	208
19-1	88	99	89	92	90	93	102	90	91	118
19-2	91	93	90	99	87	91	102	87	96	120
19-3	89	78	82	90	72	77	84	70	84	101
19-4	89	77	81	91	70	76	74	71	79	94
19-5	134	125	133	143	125	139	124	139	137	162
19-6	156	149	158	157	154	169	149	169	162	208
19-7	152	157	163	167	167	179	156	177	166	225
19-8	158	162	167	175	179	183	161	182	166	237
18-1	92	94	94	103	92	97	106	93	100	123
18-2	90	83	88	99	80	86	91	80	93	111
18-3	90	74	81	93	71	76	76	69	84	95
18-4	98	77	87	100	74	81	77	72	84	99
18-5	151	141	152	156	150	163	143	159	155	189
18-6	164	160	171	174	176	186	162	185	169	229
18-7	167	167	177	185	189	194	170	192	176	247
17-1	92	88	92	103	88	96	101	91	101	120
17-2	95	83	90	102	82	89	89	81	97	110
17-3	101	79	92	102	78	84	79	75	89	103
17-4	120	108	114	123	111	118	106	114	119	135
17-5	180	164	179	187	188	196	168	195	179	236
17-6	184	176	190	198	201	209	181	206	193	261
16-1	90	89	91	99	92	99	102	95	101	119
16-2	99	91	97	108	93	101	102	94	107	124
16-3	107	90	103	112	91	97	92	86	105	116
16-4	178	156	174	180	179	185	157	184	174	219
16-5	202	187	204	212	217	226	193	222	212	275
16-6	213	203	218	233	232	242	212	229	228	286
15-1	85	83	83	90	89	93	94	91	91	105
15-2	103	99	102	113	103	111	111	105	114	134
15-3	113	100	112	119	103	111	107	100	122	130
15-4	137	118	129	135	134	138	116	134	137	160
15-5	201	180	200	205	214	223	189	214	210	263
15-6	229	212	230	246	246	259	224	242	244	294
14-1	121	112	121	131	120	126	125	118	134	149
14-2	127	111	121	130	119	117	115	107	138	135
14-3	99	78	83	93	81	86	77	73	92	88
14-4	165	145	157	161	167	174	148	163	171	202

(Continued)

Table A5 (continued)

ID	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
14-5	219	199	216	230	231	243	208	223	229	271
14-6	238	221	241	258	251	262	226	245	250	290
14-7	234	218	238	251	247	253	222	239	244	281
14-8	223	213	230	240	235	241	216	228	236	270
14-9	207	206	217	228	220	228	206	214	220	248
13-1	126	119	126	136	132	137	135	129	135	160
13-2	134	123	131	141	132	131	129	119	144	150
13-3	128	110	119	126	119	120	111	102	130	126
13-4	226	206	227	241	235	247	212	228	238	269
13-5	235	219	241	253	245	256	224	238	246	280
13-6	221	213	231	240	230	243	217	226	236	267
13-7	208	210	223	234	219	234	209	219	227	257
12-1	117	109	115	121	120	123	121	115	117	140
12-2	142	132	146	153	144	149	143	131	148	169
12-3	156	138	149	160	149	151	143	128	161	163
12-4	203	185	203	211	209	223	188	201	215	240
12-5	208	195	213	222	215	230	197	207	218	248
12-6	224	218	239	248	233	251	222	236	240	278
12-7	212	215	233	242	224	243	215	229	234	268
11-1	139	129	133	147	134	140	128	113	140	147
11-2	160	138	152	159	145	155	136	126	156	158
11-3	151	129	135	146	134	149	127	129	147	153
11-4	178	168	181	182	180	198	164	174	185	209
11-5	173	166	180	186	178	199	165	173	181	213
11-6	205	199	223	232	215	238	206	222	220	264
10-1	137	129	132	143	135	139	133	117	136	147
10-2	160	147	155	167	154	158	145	129	162	159
10-3	145	128	134	141	131	145	124	121	144	145
10-4	161	154	160	163	156	177	146	150	163	181
10-5	195	185	205	209	195	225	185	203	205	247
10-6	223	214	247	254	234	263	227	251	244	295
10-7	220	216	253	255	236	263	231	257	248	292
10-8	214	215	249	248	229	256	226	253	239	273
9-1	132	126	126	129	126	129	128	116	127	136
9-2	139	134	136	145	136	143	129	116	141	142
9-3	135	126	131	134	126	137	119	112	139	134
9-4	184	174	186	191	178	209	172	190	192	230
9-5	227	210	255	258	238	271	235	270	254	314
9-6	219	211	257	256	236	263	236	266	251	299
9-7	212	213	254	249	230	257	231	262	245	280
8-1	157	155	154	154	146	153	159	141	155	152

(Continued)

Table A5 (continued)

ID	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
8-2	125	124	119	125	117	129	118	109	127	123
8-3	136	135	136	138	130	143	123	118	144	135
8-4	186	189	191	188	182	196	177	180	198	198
8-5	220	202	245	245	228	263	230	268	249	308
8-6	208	200	251	245	226	253	233	265	243	297
8-7	201	202	246	239	220	246	226	259	238	277
7-1	132	141	137	137	132	150	128	131	148	136
7-2	187	204	202	195	190	204	184	188	209	197
7-3	264	279	278	272	265	281	264	269	277	284
7-4	273	263	262	262	259	284	263	270	272	304
7-5	169	163	210	204	186	208	194	227	202	250
7-6	181	182	228	221	201	224	210	243	219	259
7-7	192	201	241	233	212	242	220	258	237	262
7-8	210	223	262	250	227	265	236	274	259	270
6-1	129	143	140	134	135	150	135	141	150	136
6-2	165	190	191	183	172	190	169	175	191	172
6-3	184	206	212	201	183	194	189	185	203	193
6-4	205	209	208	204	190	213	194	197	199	232
6-5	96	100	123	118	107	121	110	130	115	145
6-6	162	170	209	203	182	208	191	227	205	229
6-7	186	198	237	228	205	240	217	256	238	250
5-1	129	140	137	124	128	138	131	137	141	128
5-2	142	166	168	157	147	164	143	155	159	146
5-3	140	159	170	158	137	146	144	142	160	143
5-4	128	130	140	136	118	134	125	128	132	149
5-5	61	63	70	66	58	69	62	67	64	80
5-6	113	115	151	147	128	141	134	159	141	171
5-7	171	185	222	217	194	226	206	245	226	244
4-1	126	144	145	130	126	137	123	138	134	126
4-2	133	150	159	145	134	138	134	142	146	136
4-3	164	158	173	171	161	169	169	169	173	184
4-4	67	71	92	87	74	87	75	91	81	103
4-5	105	114	142	140	122	140	124	150	134	161
4-6	144	159	191	188	168	197	176	211	194	219
4-7	193	206	247	242	219	254	235	274	266	273
3-1	57	57	70	65	54	68	54	64	59	77
3-2	88	97	119	114	100	119	97	118	105	135
3-3	123	139	166	161	147	171	148	178	164	192
3-4	179	194	231	225	207	240	219	257	248	263
2-1	92	107	128	121	110	135	107	132	117	151
2-2	166	184	216	208	191	221	201	236	225	247

(Continued)

Table A5 (continued)

ID	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
1-1	47	59	70	60	53	74	51	62	53	79
1-2	72	86	104	96	85	108	81	101	86	120
1-3	153	168	198	188	170	196	179	210	196	220

Table A6: Monthly mean wind power density (WPD) in W/m^2 in Baja California (Mexico).

ID	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
23-1	72.70	71.43	77.53	90.74	127.38	119.57	53.70	100.61	169.18	82.70	65.51	69.87
23-2	72.71	87.92	110.24	128.60	179.25	140.36	62.46	105.56	173.96	96.88	71.40	74.44
23-3	99.80	116.10	142.83	146.69	194.72	137.31	65.44	108.02	188.83	107.55	90.15	101.35
22-1	73.22	66.56	70.61	79.71	109.79	118.39	63.38	99.96	163.61	69.13	57.30	68.51
22-2	67.47	81.39	104.61	124.97	176.84	145.42	68.40	106.36	167.78	90.32	63.18	68.83
22-3	104.16	121.48	152.90	159.90	213.38	144.69	68.00	106.17	179.15	112.26	92.61	106.14
21-1	137.75	123.34	100.41	54.98	51.37	59.54	37.94	58.88	95.08	66.03	94.52	129.17
21-2	132.00	107.74	86.99	52.75	52.81	74.33	52.77	72.84	119.82	58.32	83.65	121.09
21-3	96.05	79.12	71.76	56.40	62.50	73.44	50.01	79.78	140.09	52.21	60.80	86.03
21-4	104.50	114.66	139.48	139.88	180.64	124.17	60.45	101.67	166.84	103.27	89.92	104.50
21-5	126.15	140.29	178.67	172.57	214.25	136.79	69.63	115.63	184.38	120.76	110.44	127.66
21-6	128.09	150.19	199.03	186.66	225.40	151.30	76.72	136.02	186.72	129.34	115.70	132.04
20-1	148.52	140.44	119.40	63.31	55.59	61.63	39.51	55.76	87.89	70.60	105.41	140.87
20-2	151.42	131.23	108.11	56.03	48.46	69.15	53.36	65.24	107.02	60.88	95.76	140.48
20-3	119.06	102.05	88.10	50.12	44.46	52.48	38.50	66.45	129.68	49.15	72.77	107.12
20-4	98.59	94.98	104.83	97.69	116.67	92.16	55.61	92.44	161.38	81.77	78.86	94.49
20-5	121.82	138.47	184.24	188.07	234.22	155.15	79.44	117.70	188.53	127.29	111.84	123.07
20-6	129.78	153.09	208.50	199.90	240.16	164.98	84.71	134.30	190.98	134.05	121.07	134.72
19-1	146.51	148.58	132.24	73.79	64.68	66.16	42.80	54.99	85.56	77.43	110.99	142.71
19-2	155.10	143.20	124.11	63.81	54.00	70.40	54.57	62.33	104.33	67.11	102.05	147.25
19-3	127.53	114.95	101.00	56.98	51.19	53.70	41.93	64.33	125.75	53.92	82.23	120.41
19-4	83.46	77.74	75.64	72.57	89.93	81.24	51.90	76.18	138.61	65.67	67.48	82.53
19-5	106.02	118.02	155.36	166.11	207.55	150.94	90.83	120.26	187.66	118.48	102.98	108.47
19-6	125.23	150.56	209.59	210.15	257.03	183.57	95.00	133.34	197.11	139.91	124.50	132.08
19-7	132.48	166.25	238.34	225.42	261.55	187.42	96.16	143.30	182.37	147.30	129.73	141.23
19-8	139.06	176.11	252.63	236.29	259.80	189.63	99.98	155.02	175.46	156.74	134.58	148.22
18-1	156.83	151.41	136.94	72.37	60.14	72.01	54.59	59.53	100.00	71.42	108.57	153.71
18-2	142.49	128.84	113.19	61.41	54.89	61.71	51.27	63.03	120.04	58.33	92.32	136.56
18-3	108.97	98.06	87.80	61.80	65.99	65.04	50.16	65.69	131.17	53.41	76.62	106.56
18-4	95.63	89.77	81.76	74.99	90.86	84.50	56.21	70.23	142.06	64.73	74.57	94.13
18-5	117.31	138.44	188.39	199.53	248.48	182.31	102.67	131.01	185.67	133.98	119.68	125.09
18-6	131.64	169.66	246.08	238.52	273.39	199.29	107.89	145.75	188.30	153.24	134.30	143.91
18-7	141.64	182.98	267.52	252.79	273.46	204.06	111.62	156.64	183.49	167.09	142.49	155.06
17-1	157.52	143.44	127.62	66.06	54.60	69.39	60.38	59.31	111.03	63.43	103.83	151.60

(Continued)

Table A6 (continued)

ID	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
17-2	146.57	126.87	108.40	62.89	56.54	65.04	59.53	62.68	129.77	54.35	94.65	137.89
17-3	115.15	104.47	91.72	74.31	80.35	74.55	55.14	65.25	145.35	61.45	82.99	110.19
17-4	100.59	109.27	133.14	135.15	164.48	123.84	86.21	106.00	147.18	99.02	95.14	103.59
17-5	125.82	166.42	250.86	256.01	292.48	226.29	132.85	157.04	205.41	160.63	135.34	139.46
17-6	145.03	189.99	284.29	273.29	292.77	228.78	129.92	163.24	202.70	178.05	151.15	162.04
16-1	153.40	142.86	132.62	74.56	60.54	74.87	63.37	55.18	94.71	67.17	108.04	148.90
16-2	170.74	148.23	126.64	68.87	53.85	68.60	64.89	59.34	122.81	61.96	111.59	162.19
16-3	150.40	132.35	110.49	79.67	76.09	73.41	61.10	65.59	145.68	63.99	101.40	141.58
16-4	118.91	155.85	229.39	241.97	281.96	220.86	131.18	146.75	201.86	153.67	128.53	132.72
16-5	148.32	196.03	296.68	296.24	319.40	267.36	153.93	170.57	222.73	188.50	156.15	164.96
16-6	177.34	222.42	314.10	310.40	317.37	263.64	161.46	182.37	227.76	209.79	177.81	192.79
15-1	127.28	125.07	121.32	82.16	70.67	80.15	60.13	51.01	80.00	65.22	100.10	125.31
15-2	180.39	162.99	143.07	80.94	59.85	75.61	69.40	60.38	117.20	71.09	123.88	173.42
15-3	186.39	161.21	131.78	85.08	68.30	72.58	67.61	66.42	140.52	68.68	120.99	174.32
15-4	110.19	127.63	162.52	170.17	206.11	157.35	92.30	102.25	149.56	111.98	103.30	113.38
15-5	145.65	187.31	274.78	285.53	316.52	279.56	162.98	164.94	213.39	179.51	150.39	158.04
15-6	185.15	228.43	315.87	323.93	332.37	293.61	192.82	196.40	239.66	219.26	186.73	198.94
14-1	209.48	188.44	158.43	99.91	71.22	79.67	74.88	70.35	139.01	83.18	140.70	199.03
14-2	200.78	181.24	140.58	102.61	80.76	78.91	66.21	73.26	143.83	81.57	131.43	186.36
14-3	121.64	120.99	94.98	82.95	71.97	65.57	43.92	51.37	103.94	63.34	85.32	117.26
14-4	149.14	165.39	207.75	208.55	228.73	199.29	120.24	123.15	160.37	137.83	135.05	150.69
14-5	181.26	214.82	280.88	291.94	300.44	275.35	190.93	189.87	221.81	204.40	181.13	191.31
14-6	206.29	249.83	316.04	329.44	319.58	275.14	195.47	196.31	233.24	231.82	209.17	217.93
14-7	218.04	264.29	321.30	324.75	295.00	242.46	164.02	174.99	223.68	234.92	222.53	230.12
14-8	221.76	268.68	311.66	312.57	272.66	219.41	142.61	161.69	210.00	224.54	223.17	235.82
14-9	211.61	259.03	290.46	298.29	253.01	207.55	135.16	152.04	196.57	200.93	207.75	225.47
13-1	201.50	196.47	175.46	119.22	85.05	96.59	83.49	74.49	133.66	95.56	147.01	195.29
13-2	216.15	194.43	156.99	111.34	80.02	81.24	76.65	80.40	153.09	94.70	152.33	209.71
13-3	185.11	178.57	145.45	118.08	90.57	78.34	55.17	65.78	121.48	88.55	129.41	177.15
13-4	205.26	245.07	291.51	304.31	292.50	249.26	180.67	181.55	213.13	217.34	204.86	212.79
13-5	220.91	270.27	318.28	324.34	296.19	237.32	166.92	174.24	221.14	234.83	229.14	234.08
13-6	220.33	271.41	308.92	311.50	272.58	209.89	142.79	157.87	208.62	222.73	228.62	237.71
13-7	213.74	266.19	295.71	308.06	262.32	207.53	138.60	153.06	199.66	203.02	214.38	230.72
12-1	155.93	163.17	154.55	119.16	87.65	108.27	84.96	73.66	120.90	92.89	127.51	151.78
12-2	222.87	214.92	186.55	135.37	100.65	93.47	77.00	82.24	146.48	109.70	166.25	218.55
12-3	237.49	216.62	183.42	150.03	117.20	96.60	66.66	80.68	143.32	110.73	169.08	230.20
12-4	191.84	230.03	263.69	271.88	263.80	209.63	148.39	151.23	187.28	193.85	189.12	196.34
12-5	211.80	254.35	283.52	284.01	258.36	191.61	132.50	139.05	185.12	204.51	216.98	224.54
12-6	225.62	278.95	318.82	327.26	285.88	211.83	146.68	157.71	207.35	225.59	238.44	246.95
12-7	217.90	273.61	306.37	323.61	274.38	209.33	142.46	155.31	202.67	209.28	224.21	241.77
11-1	206.40	189.72	158.11	126.35	97.35	83.89	70.59	86.05	131.24	106.82	162.85	205.92

(Continued)

Table A6 (continued)

ID	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
11-2	212.99	202.16	168.96	166.18	152.36	123.62	70.50	75.18	122.65	117.36	165.64	208.13
11-3	174.50	175.89	162.88	171.77	179.90	140.06	73.01	71.84	114.52	111.40	140.92	166.89
11-4	177.75	211.41	237.71	237.87	237.83	165.43	114.18	118.77	157.17	169.85	173.83	181.63
11-5	182.19	220.57	247.10	246.27	222.38	149.84	99.60	105.61	150.49	168.78	189.33	199.30
11-6	206.96	259.23	301.98	314.58	273.08	194.76	133.05	142.02	188.49	206.62	222.51	231.71
10-1	195.80	192.43	167.07	135.74	102.28	95.76	76.60	80.94	110.55	110.11	163.07	190.34
10-2	251.05	229.31	179.45	150.69	116.19	92.62	67.45	77.46	117.98	128.15	194.58	242.33
10-3	183.45	178.23	152.44	159.64	161.12	125.22	62.49	63.93	102.41	110.34	153.55	181.29
10-4	194.67	205.29	204.41	196.07	202.74	126.68	85.00	90.79	126.21	145.48	170.02	187.92
10-5	190.82	236.45	282.59	293.91	265.75	177.09	118.31	125.26	173.70	193.80	201.72	208.83
10-6	222.17	282.62	337.36	357.25	304.36	213.83	145.54	156.75	207.51	225.91	243.75	251.36
10-7	211.14	281.68	335.45	367.65	310.46	229.96	163.45	175.43	211.47	218.36	228.90	239.95
10-8	199.02	274.89	320.89	362.95	304.66	233.39	169.32	183.03	205.21	203.02	206.97	224.26
9-1	170.01	171.05	157.77	134.91	108.44	108.11	76.16	72.61	99.12	113.63	155.96	164.56
9-2	210.35	196.33	161.05	124.98	95.12	78.59	70.23	76.74	108.99	120.88	181.87	212.57
9-3	188.14	171.49	134.83	132.24	129.91	101.59	63.47	65.07	96.39	110.78	166.65	192.12
9-4	200.94	225.52	250.47	256.04	248.08	160.03	108.34	112.30	157.43	176.59	191.53	203.02
9-5	199.66	270.81	347.97	384.64	328.52	236.61	169.66	182.17	228.87	240.09	230.63	222.66
9-6	200.86	277.49	339.39	377.06	316.29	234.72	173.02	187.04	219.67	220.85	223.50	227.84
9-7	195.77	274.82	324.68	370.79	311.60	238.24	178.56	192.91	209.91	202.82	204.13	220.12
8-1	222.64	218.16	184.76	160.10	120.81	120.17	82.28	77.76	111.61	138.17	193.18	207.85
8-2	171.28	166.11	137.47	107.21	81.91	75.00	85.53	87.26	107.02	107.76	159.56	175.93
8-3	194.63	173.70	134.29	120.93	118.18	87.98	80.15	81.78	103.39	120.04	185.60	206.26
8-4	211.15	206.47	171.33	203.72	249.67	228.66	148.81	131.70	134.71	152.15	208.40	218.99
8-5	194.30	255.66	333.63	372.68	332.20	238.55	177.02	184.95	218.51	220.14	214.07	210.85
8-6	186.01	264.10	330.34	368.93	306.39	228.70	174.77	191.99	219.08	212.96	211.44	212.62
8-7	191.77	266.51	312.73	355.81	296.58	227.75	178.03	192.31	204.94	193.34	197.94	213.71
7-1	172.58	163.47	128.96	124.87	130.40	107.27	118.37	113.82	111.39	117.96	176.63	183.18
7-2	238.68	217.88	165.19	188.84	230.45	207.51	165.61	148.16	139.11	159.36	241.33	251.74
7-3	264.15	277.72	233.49	290.69	377.85	369.93	278.64	234.67	211.77	210.65	267.55	265.59
7-4	306.65	305.47	286.86	304.29	365.00	320.94	228.02	192.55	212.20	200.80	264.21	271.07
7-5	156.70	220.03	272.68	306.50	252.35	184.82	149.10	168.55	185.97	173.41	174.70	175.79
7-6	187.68	250.88	284.16	319.06	259.17	201.84	164.60	182.71	190.38	173.72	187.29	204.59
7-7	199.86	265.79	293.52	341.33	282.88	226.65	180.14	196.96	194.01	176.41	187.06	217.17
7-8	214.24	283.05	306.60	371.23	314.07	256.99	195.76	213.09	204.68	187.16	193.26	236.32
6-1	147.28	155.05	126.16	135.13	149.08	141.89	152.32	135.21	113.06	110.76	157.43	149.29
6-2	227.83	208.48	150.30	148.72	174.48	158.91	176.45	155.76	130.45	147.07	236.39	244.31
6-3	262.38	247.41	173.64	176.88	195.18	173.01	171.55	142.58	129.50	164.69	251.83	254.28
6-4	242.67	261.92	237.21	226.17	265.04	219.37	161.26	131.36	152.68	153.69	206.25	208.88
6-5	111.78	141.78	161.99	169.12	137.44	90.42	75.37	86.72	101.34	92.69	110.95	119.24
6-6	189.72	241.35	254.48	287.32	226.59	181.52	149.86	171.39	169.47	147.90	169.80	199.32

(Continued)

Table A6 (continued)

ID	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
6-7	210.08	268.02	281.67	334.08	271.91	219.67	173.00	193.28	185.04	165.90	182.14	225.49
5-1	139.60	151.19	124.71	128.58	143.33	138.11	148.95	130.67	109.56	105.14	148.00	132.40
5-2	184.87	180.33	139.34	121.91	136.66	126.09	173.84	153.24	120.91	127.28	198.37	194.89
5-3	233.63	196.32	132.69	112.53	107.10	90.99	125.03	110.20	100.11	140.06	222.81	228.51
5-4	169.55	185.49	170.13	160.95	151.06	105.06	83.92	70.03	84.01	114.35	146.39	145.80
5-5	107.27	104.48	86.16	71.52	57.18	31.51	29.12	34.60	47.02	47.29	85.07	93.77
5-6	139.24	180.63	182.14	199.64	145.33	109.20	97.95	124.74	123.75	106.99	130.47	145.16
5-7	211.29	265.44	268.52	311.20	240.75	194.53	158.12	182.84	172.35	154.72	180.66	225.06
4-1	151.60	155.99	128.42	114.57	124.36	120.04	155.07	133.45	102.50	106.12	156.85	144.55
4-2	171.08	159.53	127.69	122.16	126.34	118.17	160.66	136.47	111.67	126.01	173.57	168.20
4-3	190.35	198.45	190.96	207.23	199.26	165.44	127.34	113.87	125.37	162.05	178.91	171.74
4-4	101.06	125.63	110.05	109.83	77.69	52.74	48.88	65.05	66.28	56.82	84.28	97.74
4-5	152.27	188.71	171.37	177.92	124.20	96.83	87.44	115.25	114.11	94.75	127.69	154.10
4-6	197.84	248.23	236.91	263.68	190.76	150.51	127.19	154.32	146.86	130.38	165.58	211.51
4-7	240.84	304.60	304.25	364.96	268.78	209.98	168.79	196.30	187.90	176.80	204.70	269.91
3-1	110.08	112.85	76.53	63.80	47.17	29.25	27.01	35.91	38.55	41.48	80.04	89.73
3-2	141.00	173.27	139.93	136.30	91.59	67.61	62.74	85.22	85.69	75.13	113.00	142.29
3-3	183.24	233.55	210.19	224.66	149.93	111.80	94.01	120.04	120.33	111.72	150.86	201.52
3-4	233.91	299.73	293.27	345.31	239.84	182.42	148.75	179.01	175.07	164.26	195.83	263.12
2-1	153.83	198.37	170.69	167.79	104.46	68.40	55.68	76.63	82.93	82.67	118.69	164.70
2-2	223.59	288.55	281.06	323.44	218.02	158.62	127.57	158.56	159.11	151.57	185.17	245.20
1-1	98.81	119.04	84.32	67.70	48.27	25.20	20.88	27.69	32.84	37.72	69.88	102.46
1-2	128.88	168.93	139.55	129.83	78.04	46.38	37.48	51.84	58.46	62.03	96.06	135.63
1-3	204.83	264.91	261.75	297.75	195.65	132.41	105.34	135.79	140.39	138.03	167.89	216.11

Table A7: Seasonal mean wind power density (WPD) in W/m^2 in Baja California (Mexico).

ID	Winter	Spring	Summer	Autumn
23-1	71.31	98.55	91.30	105.80
23-2	78.36	139.36	102.79	114.08
23-3	105.73	161.41	103.59	128.84
22-1	69.40	86.70	93.91	96.68
22-2	72.57	135.48	106.73	107.09
22-3	110.58	175.39	106.29	128.01
21-1	130.06	68.92	52.12	85.21
21-2	120.21	64.18	66.65	87.26
21-3	87.00	63.55	67.74	84.37
21-4	107.88	153.33	95.43	120.01
21-5	131.33	188.50	107.35	138.53
21-6	136.71	203.70	121.34	143.92
20-1	143.26	79.43	52.30	87.97

(Continued)

Table A7 (continued)

ID	Winter	Spring	Summer	Autumn
20-2	140.99	70.87	62.59	87.88
20-3	109.33	60.89	52.48	83.87
20-4	96.00	106.40	80.07	107.34
20-5	127.76	202.17	117.43	142.55
20-6	139.14	216.19	127.99	148.70
19-1	145.93	90.24	54.65	91.33
19-2	148.47	80.64	62.43	91.16
19-3	120.90	69.73	53.32	87.30
19-4	81.22	79.38	69.77	90.59
19-5	110.83	176.34	120.68	136.37
19-6	135.91	225.59	137.30	153.84
19-7	146.60	241.77	142.29	153.13
19-8	154.41	249.57	148.21	155.59
18-1	153.94	89.82	62.04	93.33
18-2	135.90	76.50	58.67	90.23
18-3	104.48	71.87	60.30	87.07
18-4	93.14	82.54	70.31	93.79
18-5	126.93	212.13	138.67	146.44
18-6	148.36	252.66	150.98	158.62
18-7	159.84	264.59	157.44	164.36
17-1	150.78	82.76	63.03	92.76
17-2	137.03	75.94	62.42	92.92
17-3	109.87	82.13	64.98	96.60
17-4	104.46	144.25	105.35	113.78
17-5	143.87	266.45	172.06	167.13
17-6	165.64	283.45	173.98	177.30
16-1	148.31	89.24	64.47	89.97
16-2	160.28	83.12	64.28	98.79
16-3	141.34	88.75	66.70	103.69
16-4	135.80	251.11	166.26	161.35
16-5	169.73	304.10	197.29	189.13
16-6	197.45	313.96	202.49	205.12
15-1	125.81	91.38	63.76	81.78
15-2	172.15	94.62	68.47	104.06
15-3	173.84	95.05	68.87	110.06
15-4	117.03	179.60	117.30	121.61
15-5	163.62	292.27	202.49	181.10
15-6	204.11	324.06	227.61	215.21
14-1	198.84	109.85	74.97	120.96
14-2	189.29	107.98	72.79	118.94
14-3	119.88	83.30	53.62	84.20

(Continued)

Table A7 (continued)

ID	Winter	Spring	Summer	Autumn
14-4	155.00	215.01	147.56	144.41
14-5	195.72	291.09	218.72	202.44
14-6	224.61	321.69	222.30	224.74
14-7	237.40	313.68	193.82	227.04
14-8	242.02	298.97	174.57	219.24
14-9	231.99	280.59	164.91	201.75
13-1	197.61	126.58	84.86	125.41
13-2	206.60	116.12	79.43	133.37
13-3	180.10	118.03	66.43	113.15
13-4	220.95	296.11	203.83	211.78
13-5	241.66	312.93	192.82	228.37
13-6	243.09	297.67	170.19	219.99
13-7	236.86	288.70	166.40	205.69
12-1	156.85	120.45	88.96	113.77
12-2	218.62	140.86	84.23	140.81
12-3	227.90	150.21	81.31	141.04
12-4	205.98	266.46	169.75	190.08
12-5	230.12	275.30	154.39	202.20
12-6	250.48	310.65	172.07	223.79
12-7	244.43	301.46	169.03	212.05
11-1	200.52	127.27	80.18	133.64
11-2	207.56	162.50	89.77	135.22
11-3	172.28	171.52	94.97	122.28
11-4	190.19	237.81	132.79	166.95
11-5	200.61	238.58	118.35	169.53
11-6	232.64	296.55	156.61	205.87
10-1	192.70	135.03	84.44	127.91
10-2	240.64	148.78	79.17	146.91
10-3	180.81	157.73	83.88	122.10
10-4	195.83	201.07	100.83	147.24
10-5	212.01	280.75	140.22	189.74
10-6	252.08	332.99	172.04	225.72
10-7	244.31	337.85	189.61	219.58
10-8	232.79	329.50	195.25	205.07
9-1	168.42	133.71	85.63	122.90
9-2	206.23	127.05	75.18	137.25
9-3	183.73	132.33	76.71	124.61
9-4	209.79	251.53	126.89	175.18
9-5	231.10	353.71	196.14	233.19
9-6	235.47	344.25	198.26	221.34
9-7	230.32	335.69	203.24	205.62

(Continued)

Table A7 (continued)

ID	Winter	Spring	Summer	Autumn
8-1	216.05	155.22	93.40	147.65
8-2	170.98	108.86	82.60	124.78
8-3	191.37	124.47	83.30	136.34
8-4	212.04	208.24	169.72	165.09
8-5	220.33	346.17	200.18	217.58
8-6	220.98	335.22	198.49	214.49
8-7	224.08	321.70	199.36	198.74
7-1	172.97	128.08	113.15	135.33
7-2	235.92	194.83	173.76	179.93
7-3	269.00	300.67	294.42	229.99
7-4	294.33	318.72	247.17	225.74
7-5	184.22	277.18	167.49	178.03
7-6	214.45	287.46	183.05	183.80
7-7	227.67	305.91	201.25	185.83
7-8	244.59	330.63	221.95	195.03
6-1	150.46	136.79	143.14	127.08
6-2	226.67	157.83	163.71	171.30
6-3	254.41	181.90	162.38	182.00
6-4	237.78	242.81	170.66	170.87
6-5	124.29	156.18	84.17	101.66
6-6	210.18	256.13	167.59	162.39
6-7	234.58	295.89	195.32	177.69
5-1	140.97	132.21	139.24	120.90
5-2	186.52	132.64	151.06	148.85
5-3	219.21	117.44	108.74	154.33
5-4	166.88	160.71	86.34	114.92
5-5	101.81	71.62	31.74	59.79
5-6	155.05	175.70	110.63	120.40
5-7	233.98	273.49	178.49	169.24
4-1	150.57	122.45	136.19	121.82
4-2	166.10	125.40	138.43	137.08
4-3	186.78	199.15	135.55	155.44
4-4	108.17	99.19	55.56	69.13
4-5	165.07	157.83	99.84	112.18
4-6	219.25	230.45	144.01	147.61
4-7	271.84	312.66	191.69	189.80
3-1	104.21	62.50	30.72	53.36
3-2	152.23	122.61	71.86	91.28
3-3	206.16	194.93	108.62	127.64
3-4	265.66	292.80	170.06	178.39
2-1	172.38	147.64	66.90	94.76

(Continued)

Table A7 (continued)

ID	Winter	Spring	Summer	Autumn
2-2	252.53	274.17	148.25	165.28
1-1	106.82	66.76	24.59	46.81
1-2	144.57	115.81	45.24	72.18
1-3	228.71	251.72	124.52	148.77

Table A8: Monthly coefficient of variation (CoV) expressed as a % of its respective monthly mean wind speed (MWS) in Baja California (Mexico).

ID	Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
23-1	9.3	8.5	8.6	4.2	12.3	11.0	11.4	13.4	18.4	13.3	14.5	9.7
23-2	8.6	9.0	8.5	4.2	13.0	12.8	12.5	12.6	17.5	10.7	8.3	8.8
23-3	7.3	10.0	9.4	4.3	13.3	12.9	14.6	13.2	17.1	9.6	8.6	8.9
22-1	8.8	7.8	6.8	4.9	9.3	7.7	8.5	12.3	17.8	12.5	14.7	10.4
22-2	7.6	8.1	7.3	4.1	11.1	11.3	10.0	11.0	17.2	9.2	5.9	8.5
22-3	6.5	9.4	8.9	4.3	12.5	13.5	14.0	11.9	17.2	8.5	7.1	8.1
21-1	8.3	15.6	16.4	7.9	9.6	5.1	9.9	15.9	21.5	13.2	17.0	8.2
21-2	8.2	13.1	14.0	6.3	8.5	7.2	10.4	15.8	18.5	13.9	19.8	8.2
21-3	8.0	9.9	8.6	5.9	7.8	7.7	8.2	14.1	16.9	12.2	17.6	9.9
21-4	5.7	8.9	8.0	4.3	12.7	12.6	13.1	10.9	16.8	7.0	6.5	7.0
21-5	5.9	8.9	9.3	4.1	12.3	12.6	14.5	11.4	16.6	7.9	8.9	7.2
21-6	6.1	8.9	10.1	3.8	11.0	13.0	14.8	10.9	16.7	7.9	9.1	7.8
20-1	8.0	15.3	18.1	8.5	10.7	6.2	10.2	15.7	20.0	14.0	15.7	8.3
20-2	8.0	13.3	17.8	6.7	10.2	9.1	10.2	16.5	18.0	12.7	18.6	8.1
20-3	7.3	11.0	13.7	6.4	9.6	11.9	7.6	15.5	16.4	9.6	17.4	8.6
20-4	5.4	8.0	7.2	4.7	12.3	8.9	8.5	10.1	14.5	6.0	7.0	6.6
20-5	5.4	7.8	8.4	3.7	11.3	12.2	11.7	10.2	15.7	6.8	7.8	6.5
20-6	5.7	8.6	9.8	3.4	10.1	13.2	12.9	10.2	16.7	7.0	8.6	7.6
19-1	7.8	14.6	18.3	8.8	12.0	5.6	9.2	15.1	18.1	15.0	14.2	8.3
19-2	8.0	12.7	19.5	9.0	11.9	7.5	9.6	16.6	18.0	12.7	17.2	7.8
19-3	7.5	10.8	16.0	7.7	10.6	9.9	7.9	14.5	16.5	9.6	15.8	7.5
19-4	6.5	8.2	6.7	5.1	9.4	6.3	6.5	7.7	15.1	6.9	8.7	7.2
19-5	5.1	6.8	7.2	3.1	9.9	9.5	7.1	8.9	12.8	5.1	5.7	6.0
19-6	5.4	8.2	9.5	3.1	9.3	13.4	10.9	9.4	14.9	7.1	7.7	7.5
19-7	6.7	9.0	9.9	3.7	8.9	13.8	13.0	9.1	15.7	7.0	6.8	8.0
19-8	7.9	9.9	10.3	4.7	8.6	14.0	14.7	9.1	14.3	6.8	6.3	8.0
18-1	7.8	12.0	19.6	9.3	12.0	5.8	9.4	15.7	16.8	13.2	15.6	7.7
18-2	8.7	11.4	18.5	9.0	10.3	8.1	9.2	13.8	16.2	11.7	16.1	7.1
18-3	7.6	10.0	12.2	6.3	6.4	6.4	7.7	10.2	13.4	7.6	14.0	6.9
18-4	7.1	9.3	7.6	7.3	7.1	5.5	9.7	9.9	13.1	7.2	10.9	6.9
18-5	5.2	7.5	8.4	3.1	9.7	12.1	8.6	8.3	12.6	6.3	5.8	6.7
18-6	7.0	8.9	9.6	3.8	8.6	13.7	11.1	8.4	14.3	7.0	6.4	8.2

(Continued)

Table A8 (continued)

ID	Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
18-7	8.2	10.1	10.3	4.8	8.3	14.1	13.2	8.7	13.9	6.5	6.3	8.0
17-1	9.0	11.5	19.7	9.2	9.8	7.8	9.6	14.2	14.5	12.3	16.3	6.9
17-2	8.6	11.8	16.7	8.0	6.8	8.5	9.5	11.0	13.3	10.1	16.5	7.0
17-3	6.9	11.0	8.9	6.9	6.4	5.3	8.1	9.6	11.1	7.0	12.2	7.2
17-4	5.5	6.9	6.9	3.6	9.5	8.5	5.5	6.1	11.6	6.3	6.2	5.6
17-5	7.3	8.8	9.3	4.0	8.1	12.8	8.5	7.5	12.1	6.7	5.9	8.5
17-6	8.8	10.2	10.5	5.0	7.9	14.2	11.7	8.1	13.2	6.1	6.3	8.2
16-1	8.5	10.6	18.0	7.6	9.4	6.8	8.7	14.7	11.3	10.5	14.9	6.6
16-2	9.0	12.4	19.0	8.2	8.0	8.0	9.8	14.0	12.7	10.6	16.7	6.0
16-3	6.5	12.1	12.0	6.4	5.9	4.5	7.8	9.8	11.5	8.3	14.0	6.8
16-4	8.2	8.9	9.6	3.9	8.6	12.8	7.3	6.7	11.3	6.9	6.3	8.9
16-5	9.4	10.2	10.6	5.1	7.6	14.2	10.5	7.5	12.7	5.9	6.8	8.7
16-6	9.6	9.9	10.4	5.9	7.0	13.4	11.1	8.2	11.3	5.0	6.7	7.2
15-1	8.1	9.7	14.8	6.4	8.6	5.4	8.0	14.2	8.1	8.0	12.2	6.4
15-2	9.1	12.2	18.7	8.0	8.7	7.2	9.7	16.0	10.6	10.4	15.2	5.7
15-3	7.1	13.0	15.8	8.1	5.6	5.6	9.1	11.5	11.9	10.8	15.3	6.3
15-4	8.1	8.3	8.4	4.5	9.6	12.2	6.6	7.4	12.4	6.8	7.7	8.1
15-5	9.6	9.7	10.5	5.4	7.8	14.0	9.4	7.2	11.8	5.8	7.4	8.7
15-6	9.7	9.7	10.1	6.0	6.6	12.6	9.2	7.7	10.0	4.5	6.9	6.9
14-1	7.6	12.7	18.1	8.8	6.9	8.6	8.8	14.7	11.1	11.8	15.1	5.9
14-2	5.8	13.1	12.2	7.2	4.5	8.0	5.1	8.5	11.0	10.5	12.8	7.4
14-3	7.2	10.0	7.4	9.4	6.8	6.3	6.0	10.1	10.5	7.3	12.0	8.8
14-4	8.8	9.2	9.8	5.3	8.2	13.6	9.8	7.7	11.5	5.9	8.1	8.1
14-5	9.3	9.0	9.4	5.9	6.4	12.3	8.0	7.1	8.9	4.4	6.9	6.8
14-6	9.3	9.5	8.8	6.7	5.8	11.6	8.5	8.1	8.4	3.9	6.4	7.3
14-7	9.6	9.4	8.5	7.9	5.9	12.0	10.9	8.8	8.4	3.6	6.5	8.1
14-8	10.0	8.8	8.1	8.3	6.2	11.7	12.2	9.7	8.6	3.9	6.6	8.7
14-9	10.0	8.3	7.7	8.7	6.6	10.9	13.2	9.7	9.3	4.1	6.9	10.4
13-1	7.5	11.1	16.8	7.8	7.7	9.8	8.6	15.0	9.8	11.4	13.4	5.4
13-2	5.3	12.9	15.0	6.9	7.7	10.4	6.0	10.4	12.4	12.1	13.4	6.3
13-3	5.7	12.7	9.8	6.5	7.4	8.7	3.5	7.2	10.1	9.0	11.1	7.8
13-4	8.6	8.9	8.5	6.6	5.4	11.4	8.1	7.2	7.9	4.0	6.5	7.3
13-5	9.3	9.1	8.1	7.5	5.1	11.2	10.5	8.1	8.1	3.4	6.6	8.1
13-6	9.7	8.5	7.7	8.1	5.5	11.4	12.1	9.5	8.4	3.7	6.1	8.9
13-7	9.9	8.3	7.6	8.6	5.8	10.9	13.0	10.3	9.4	3.9	6.4	10.5
12-1	7.2	9.8	12.5	7.0	6.4	9.3	7.9	13.6	8.7	9.0	11.7	4.6
12-2	5.9	12.3	15.7	6.6	10.3	13.2	7.7	12.7	12.3	11.2	12.6	5.4
12-3	5.5	13.2	12.4	7.7	8.5	10.4	4.2	7.9	12.1	10.4	12.4	7.0
12-4	8.2	8.3	8.4	6.6	5.8	11.7	8.9	6.7	8.4	3.7	7.1	7.8
12-5	9.0	8.8	8.3	7.6	5.0	11.8	10.7	7.7	8.8	3.4	7.4	8.8
12-6	9.5	8.1	7.8	8.1	4.9	10.8	11.9	9.2	8.4	3.6	5.7	9.2

(Continued)

Table A8 (continued)

ID	Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
12-7	9.8	8.3	7.6	8.7	5.3	10.5	13.1	10.1	9.4	4.1	6.0	10.6
11-1	5.4	12.6	12.2	7.2	8.5	9.1	7.5	8.7	12.5	11.1	12.9	6.3
11-2	5.4	13.1	9.5	7.8	7.6	7.8	4.7	7.2	11.3	9.9	12.4	8.1
11-3	7.0	10.5	6.9	6.4	6.7	9.6	9.9	8.5	11.6	6.9	12.1	8.9
11-4	8.1	8.2	8.4	6.1	6.3	11.8	9.9	6.0	8.8	3.7	8.2	8.7
11-5	9.4	8.5	8.8	7.9	5.5	13.1	11.9	8.1	9.7	3.6	8.0	9.4
11-6	9.9	8.1	8.2	8.4	4.7	11.3	12.3	9.4	8.8	3.8	5.3	9.4
10-1	5.6	11.0	11.2	6.5	8.0	7.4	7.3	11.2	10.9	9.7	12.8	5.2
10-2	6.0	14.7	12.3	7.8	7.9	7.7	4.2	8.6	12.6	13.5	13.6	7.6
10-3	6.4	13.0	8.8	6.8	7.0	10.0	7.7	9.6	11.6	10.3	13.6	8.8
10-4	7.0	10.1	8.3	5.6	7.4	13.3	11.4	6.0	9.4	5.4	10.5	10.4
10-5	9.1	8.0	9.0	8.2	5.3	13.5	12.4	8.3	9.6	4.5	6.2	8.9
10-6	10.1	8.4	8.7	9.2	5.2	12.6	13.5	9.5	8.8	4.8	4.9	9.2
10-7	10.5	8.5	8.1	9.1	5.2	11.1	14.2	10.1	9.0	5.0	5.5	10.3
10-8	10.8	8.9	7.7	8.5	5.5	8.8	14.3	10.3	8.6	5.0	6.3	11.6
9-1	5.9	9.4	8.0	5.8	6.9	5.9	7.7	12.5	10.3	7.6	10.1	5.3
9-2	6.3	14.0	11.9	8.0	10.5	8.5	6.9	10.7	13.6	12.6	14.4	6.7
9-3	5.6	15.7	10.3	7.3	7.6	8.1	5.3	7.8	10.2	12.0	14.4	8.7
9-4	7.4	9.0	9.1	7.6	6.3	16.1	13.9	7.7	9.9	5.1	6.9	9.0
9-5	10.8	8.8	8.7	9.8	5.7	14.0	14.5	9.6	9.4	6.3	5.1	8.4
9-6	11.0	9.0	8.2	9.5	5.4	12.2	15.5	10.1	9.2	6.1	6.1	10.0
9-7	11.4	9.3	7.8	8.7	5.4	9.2	15.1	10.2	8.7	5.9	6.9	11.6
8-1	6.2	9.1	7.9	4.9	4.9	5.3	7.3	12.4	11.1	7.7	8.0	6.8
8-2	7.5	12.3	9.2	7.5	7.8	3.8	7.8	10.6	12.4	11.0	13.3	7.0
8-3	6.2	16.3	10.0	7.5	8.2	5.3	5.9	7.5	9.5	12.8	15.3	8.6
8-4	6.5	14.5	9.0	6.6	6.2	7.0	6.4	7.2	7.4	10.4	15.0	9.2
8-5	9.4	8.8	9.1	10.6	6.4	15.5	16.9	8.7	11.0	7.1	4.4	8.7
8-6	11.7	9.4	8.2	9.9	5.7	13.0	16.3	9.8	9.9	8.1	7.2	10.0
8-7	11.9	9.4	8.0	8.9	5.5	9.5	15.7	9.8	9.1	7.4	7.6	11.6
7-1	8.7	15.8	8.5	8.2	7.1	3.1	7.4	8.5	8.4	12.2	15.9	8.1
7-2	6.7	17.6	9.5	8.0	6.2	6.1	6.7	7.4	6.4	12.8	15.8	9.6
7-3	8.0	14.4	9.1	7.0	5.8	8.0	6.5	8.3	6.1	11.3	15.4	9.0
7-4	8.3	10.2	8.5	4.9	6.5	8.7	7.6	8.1	8.0	9.0	13.5	8.1
7-5	12.2	9.9	8.7	10.3	6.4	13.0	15.1	8.7	10.8	9.6	7.5	10.1
7-6	12.3	9.1	8.3	9.1	5.8	9.6	15.4	9.5	9.6	9.3	8.3	11.8
7-7	13.1	9.4	8.4	8.2	5.9	6.9	15.6	10.1	8.8	8.7	8.3	13.1
7-8	14.2	9.5	9.0	7.1	6.5	5.3	15.3	11.1	7.8	8.4	8.4	13.9
6-1	10.1	14.1	8.4	7.6	7.1	4.6	7.8	8.1	6.7	10.8	15.0	8.0
6-2	6.8	19.4	10.2	9.7	7.0	7.5	8.2	7.9	8.2	14.4	16.2	9.7
6-3	5.5	19.8	10.3	7.9	5.0	6.7	5.9	7.6	7.0	13.6	14.7	11.3
6-4	11.9	13.7	9.7	7.6	7.8	10.7	6.5	9.5	7.9	11.5	16.9	9.2

(Continued)

Table A8 (continued)

ID	Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
6-5	12.8	11.0	9.3	9.5	7.4	15.6	12.9	9.0	13.3	10.2	6.8	11.0
6-6	13.7	9.6	8.6	8.5	6.5	8.1	15.8	10.3	9.5	10.5	8.6	12.9
6-7	14.7	10.0	9.2	7.6	7.2	6.5	16.4	11.3	8.8	10.1	8.5	13.7
5-1	8.8	12.8	8.9	6.9	7.0	6.2	7.4	7.5	4.6	9.5	13.9	7.7
5-2	6.7	18.2	9.4	8.3	5.8	9.3	9.4	8.0	8.9	13.3	16.0	9.8
5-3	6.1	21.4	8.6	7.0	5.1	4.9	6.5	5.6	7.7	13.7	12.8	12.8
5-4	7.6	15.0	9.8	6.7	7.6	9.5	5.9	8.8	7.0	13.1	13.3	10.9
5-5	10.5	11.9	6.9	6.0	7.9	12.3	7.3	9.1	11.8	8.7	10.4	10.6
5-6	15.3	10.1	9.0	9.5	7.5	12.9	14.0	11.6	11.6	12.1	8.8	11.8
5-7	15.4	10.7	9.4	8.2	8.0	7.8	17.0	11.9	9.4	12.1	8.4	13.4
4-1	6.2	15.9	7.9	7.8	5.9	8.9	8.5	7.6	6.9	11.6	14.1	9.4
4-2	5.2	18.8	6.6	5.4	4.7	5.4	7.3	3.5	6.2	11.6	12.8	11.7
4-3	4.6	13.7	9.2	6.0	6.6	6.2	6.5	8.0	5.6	11.8	9.5	11.1
4-4	16.9	12.9	8.6	8.7	8.7	15.7	9.3	12.8	13.1	12.5	8.5	12.5
4-5	16.4	10.8	8.5	8.7	8.1	11.7	13.5	12.3	11.0	13.4	7.6	12.3
4-6	15.9	11.8	9.8	8.8	8.6	10.0	16.5	12.6	10.5	13.6	8.0	12.9
4-7	16.5	11.7	11.1	8.7	9.8	9.4	16.8	12.9	10.4	12.9	8.6	13.6
3-1	14.8	12.0	7.1	6.4	8.9	11.0	5.4	10.6	8.6	10.2	11.6	11.2
3-2	17.1	11.5	8.9	7.8	8.0	11.5	10.2	11.6	10.2	12.9	7.2	12.2
3-3	15.8	12.5	10.4	9.0	9.1	11.8	15.2	12.8	11.4	14.7	8.0	12.8
3-4	16.7	12.8	11.7	9.3	10.2	11.5	17.2	13.3	11.7	14.2	9.1	13.4
2-1	18.2	14.6	10.6	9.0	9.3	14.2	12.3	13.7	12.3	15.8	9.1	12.7
2-2	17.1	13.7	12.0	9.5	9.7	12.8	16.0	13.1	12.0	15.5	9.3	13.4
1-1	20.7	17.7	12.3	5.8	9.0	10.8	8.8	10.7	7.9	11.2	12.1	14.0
1-2	20.6	17.2	11.1	9.3	8.7	13.7	9.8	12.4	10.8	15.3	9.6	14.6
1-3	17.3	14.8	11.8	9.3	9.1	13.4	13.7	12.5	11.8	15.9	9.5	13.4

References

1. Yu H, Wen B, Zahidi I, Chow MF, Liang D, Madsen DØ. The critical role of energy transition in addressing climate change at COP28. Results Eng. 2024;22(9):102324. doi:10.1016/j.rineng.2024.102324.
2. He JY, Chan PW, Li QS. Statistical characterization of marine wind structure over wind-turbine-relevant heights in tropical cyclones. J Wind Eng Ind Aerodyn. 2024;253:105874. doi:10.1016/j.jweia.2024.105874.
3. Cárdenas-Rondón JA, Gómez-Ortega O, Rodríguez-Casado C, Ogueta-Gutiérrez M, Franchini S. Similarity solution for sectional A_2^* aerodynamic derivative for single axis solar trackers at various angles of attack and ground distances. J Wind Eng Ind Aerodyn. 2024;255(9):105932. doi:10.1016/j.jweia.2024.105932.
4. Yaqub A, Iftikhar MU, Ali Abbas Kazmi S, Waseem M. Techno-economic analysis of sustainable rural electrification through hybrid renewable energy microgrids. Results Eng. 2026;30(29):109939. doi:10.1016/j.rineng.2026.109939.
5. Mahmoud M, Adhari OHK, Sayed ET, Ali Abdelkareem M, Olabi AG. Advances in hybrid renewable energy systems coupled with mechanical energy storage: progress and challenges. Results Eng. 2026;29(24):108994. doi:10.1016/j.rineng.2026.108994.
6. Rivera NM, Ruiz-Tagle JC, Spiller E. The health benefits of solar power generation: evidence from Chile. J Environ Econ Manag. 2024;126(2):102999. doi:10.1016/j.jeem.2024.102999.

7. Salem D, Suleiman A, Altork Y. Integrating artificial intelligence and multi-criteria analysis for sustainable hybrid renewable energy in healthcare facilities. Results Eng. 2026;29(13):109425. doi:10.1016/j.rineng.2026.109425.
8. AlAsfar J, Irshidat M, Mustafa M. Review of advancing hybrid renewable energy systems: the strategic role of solar cooling and multi-source integration in arid climates. Results Eng. 2026;29(10):109281. doi:10.1016/j.rineng.2026.109281.
9. International Energy Agency (IEA). COP28 tripling renewable capacity pledge [Internet]. 2024 [cited 2026 Aug 28]. Available from: https://iea.blob.core.windows.net/assets/ecb74736-41aa-4a55-aacc-d76bdfd7c70e/COP28TriplingRenewableCapacityPledge.pdf.
10. Tian X, An C, Chen Z. The role of clean energy in achieving decarbonization of electricity generation, transportation, and heating sectors by 2050: a meta-analysis review. Renew Sustain Energy Rev. 2023;182(1):113404. doi:10.1016/j.rser.2023.113404.
11. Singh K, Meena RS, Kumar S, Dhyani S, Sheoran S, Singh HM, et al. India's renewable energy research and policies to phase down coal: success after Paris agreement and possibilities post-Glasgow Climate Pact. Biomass Bioenergy. 2023;177(8):106944. doi:10.1016/j.biombioe.2023.106944.
12. Beljan D, Herc L, Pfeifer A, Duić N. Comparison of different drivers on energy systems investment dynamics to achieve the energy transition goals. e-Prime. 2024;9(2):100711. doi:10.1016/j.prime.2024.100711.
13. Relich M. Renewable energy in the European union: the state of the art and directions of development. Wseas Trans Bus Econ. 2024;21:630–7. doi:10.37394/23207.2024.21.52.
14. Goyal V, Aishwarya M, Cenate CFT, Varghese J, Marathe A, Bhagat GP, et al. Role of wind energy in achieving global carbon neutrality: challenges and opportunities. E3S Web Conf. 2024;591(7):02002. doi:10.1051/e3sconf/202459102002.
15. Summerfield-Ryan O, Park S. The power of wind: the global wind energy industry's successes and failures. Ecol Econ. 2023;210(8):107841. doi:10.1016/j.ecolecon.2023.107841.
16. Choi Y, Park S, Choi J, Lee G, Lee M. Evaluating offshore wind power potential in the context of climate change and technological advancement: insights from Republic of Korea. Renew Sustain Energy Rev. 2023;183:113497. doi:10.1016/j.rser.2023.113497.
17. Lüth A, Keles D. Risks, strategies, and benefits of offshore energy hubs: a literature-based survey. Renew Sustain Energy Rev. 2024;203(2):114761. doi:10.1016/j.rser.2024.114761.
18. Ali S, Meo MS. How wind-based renewable energy contribute to CO_2 emissions abatement? Evidence from quantile-on-quantile estimation. Int J Environ Sci Technol. 2024;21(9):6583–96. doi:10.1007/s13762-023-05409-3.
19. Bousla M, Belfkir M, Haddi A, El Mourabit Y, Bossoufi B. Comparison of artificial intelligence approaches for estimating wind energy production: a real-world case study. Results Eng. 2024;24(49):103626. doi:10.1016/j.rineng.2024.103626.
20. International Energy Agency (IEA). Wind power capacity in the net zero scenario, 2010–2030 [Internet]. 2022 [cited 2026 Aug 28]. Available from: https://www.iea.org/data-and-statistics/charts/wind-power-capacity-in-the-net-zero-scenario-2010-2030.
21. International Energy Agency (IEA). Installed capacity of offshore wind by region and scenario, 2018–2040 [Internet]. 2019 [cited 2026 Aug 28]. Available from: https://www.iea.org/data-and-statistics/charts/installed-capacity-of-offshore-wind-by-region-and-scenario-2018-2040.
22. Rowell D, McMillan D, Carroll J. Offshore wind H&S: a review and analysis. Renew Sustain Energy Rev. 2024;189(3):113928. doi:10.1016/j.rser.2023.113928.
23. Bilgili M, Yasar A, Simsek E. Offshore wind power development in Europe and its comparison with onshore counterpart. Renew Sustain Energy Rev. 2011;15(2):905–15. doi:10.1016/j.rser.2010.11.006.
24. Süld JK, Rasheed A, Kristiansen J, Sætra Ø, Carrasco A, Kvamsdal T. Mesoscale numerical modelling of met-ocean interactions. Energy Proc. 2015;80:433–41. doi:10.1016/j.egypro.2015.11.447.
25. Wilson JC, Elliott M. The habitat-creation potential of offshore wind farms. Wind Energy. 2009;12(2):203–12. doi:10.1002/we.324.

26. Kim A, Kim H, Choe C, Lim H. Feasibility of offshore wind turbines for linkage with onshore green hydrogen demands: a comparative economic analysis. Energy Convers Manag. 2023;277:116662. doi:10.1016/j.enconman.2023.116662.
27. Ladenburg J, Dubgaard A. Preferences of coastal zone user groups regarding the siting of offshore wind farms. Ocean Coast Manag. 2009;52(5):233–42. doi:10.1016/j.ocecoaman.2009.02.002.
28. von der Dunk A, Grêt-Regamey A, Dalang T, Hersperger AM. Defining a typology of peri-urban land-use conflicts—a case study from Switzerland. Landsc Urban Plan. 2011;101(2):149–56. doi:10.1016/j.landurbplan.2011.02.007.
29. Danovaro R, Bianchelli S, Brambilla P, Brussa G, Corinaldesi C, Del Borghi A, et al. Making eco-sustainable floating offshore wind farms: siting, mitigations, and compensations. Renew Sustain Energy Rev. 2024;197(8):114386. doi:10.1016/j.rser.2024.114386.
30. Brussa G, Grosso M, Rigamonti L. Life cycle assessment of a floating offshore wind farm in Italy. Sustain Prod Consum. 2023;39(6):134–44. doi:10.1016/j.spc.2023.05.006.
31. Sykes V, Collu M, Coraddu A. A review and analysis of the uncertainty within cost models for floating offshore wind farms. Renew Sustain Energy Rev. 2023;186(12):113634. doi:10.1016/j.rser.2023.113634.
32. Juárez-Casildo V, Cervantes I, González-Huerta RDG. Strategic pathways for offshore wind in Mexico: geospatial insights and economic viability toward energy sustainability. Energy Sustain Dev. 2024;83(17):101565. doi:10.1016/j.esd.2024.101565.
33. Canul-Reyes DA, Rodríguez-Hernández O, Jarquin-Laguna A. Potential zones for offshore wind power development in the Gulf of Mexico using reanalyses data and capacity factor seasonal analysis. Energy Sustain Dev. 2022;68:211–9. doi:10.1016/j.esd.2022.03.008.
34. Meza-Carreto J, Romero-Centeno R, Figueroa-Espinoza B, Moreles E, López-Villalobos C. Outlook for offshore wind energy development in Mexico from WRF simulations and CMIP6 projections. Energies. 2024;17(8):1866. doi:10.3390/en17081866.
35. Mattu KL, Bloomfield HC, Thomas S, Martínez-Alvarado O, Rodríguez-Hernández O. The impact of tropical cyclones on potential offshore wind farms. Energy Sustain Dev. 2022;68(3):29–39. doi:10.1016/j.esd.2022.02.005.
36. Quintero-Núñez M, Sweedler A, Tanaka S. Renewable resources of energy in northern Baja California. Mexico WIT Trans Ecol Environ. 2006;99:769–78. doi:10.2495/rav060751.
37. Rehman S, Natarajan N, Mohandes MA, Meyer JP, Alam MM, Alhems LM. Wind and wind power characteristics of the eastern and southern coastal and northern inland regions, South Africa. Environ Sci Pollut Res. 2022;29(57):85842–54. doi:10.1007/s11356-021-14276-9.
38. Negra NB, Holmstrøm O, Bak-Jensen B, Sørensen P. Model of a synthetic wind speed time series generator. Wind Energy. 2008;11(2):193–209. doi:10.1002/we.244.
39. El-gindy AAH, El-nashar ES. Probability modelling of wind velocity for assessment of wind energy at Alexandria coast. Res J Appl Sci Eng Technol. 2014;8(18):2001–15. doi:10.19026/rjaset.8.1192.
40. Rotich IK, Musyimi PK. Wind power density characterization in arid and semi-arid Taita-Taveta and Garissa counties of Kenya. Clean Eng Technol. 2023;17(14):100704. doi:10.1016/j.clet.2023.100704.
41. Quan P, Leephakpreeda T. Assessment of wind energy potential for selecting wind turbines: an application to Thailand. Sustain Energy Technol Assess. 2015;11(2):17–26. doi:10.1016/j.seta.2015.05.002.
42. Jung C, Schindler D. The annual cycle and intra-annual variability of the global wind power distribution estimated by the system of wind speed distributions. Sustain Energy Technol Assess. 2020;42:100852. doi:10.1016/j.seta.2020.100852.
43. Bodini N, Lundquist JK, Zardi D, Handschy M. Year-to-year correlation, record length, and overconfidence in wind resource assessment. Wind Energ Sci. 2016;1(2):115–28. doi:10.5194/wes-1-115-2016.
44. Torralba V, Doblas-Reyes FJ, Gonzalez-Reviriego N. Uncertainty in recent near-surface wind speed trends: a global reanalysis intercomparison. Environ Res Lett. 2017;12(11):114019. doi:10.1088/1748-9326/aa8a58.
45. Zheng C. A positive trend in the stability of global offshore wind energy. Acta Ocean Sin. 2024;43(1):123–34. doi:10.1007/s13131-024-2345-4.

46. Zhang W, Zhang L, Liu J. Satellite-based re-examination of changes in terrestrial near-surface wind speed in the last 30 years. Front Earth Sci. 2024;12:1398638. doi:10.3389/feart.2024.1398638.
47. Lee JC, Fields MJ, Lundquist JK, Lunacek M. Determining variabilities of non-gaussian wind-speed distributions using different metrics and timescales. J Phys Conf Ser. 2018;1037:072038. doi:10.1088/1742-6596/1037/7/072038.
48. Global Modeling and Assimilation Office (GMAO). MERRA-2 tavg1_2d_slv_Nx: 2d, 1-hourly, time-averaged, single-level, assimilation, single-level diagnostics, version 5.12.4. Greenbelt, MD, USA: Goddard Earth Sciences Data and Information Services Center (GES DISC); 2015. doi:10.5067/VJAFPLI1CSIV.
49. Gelaro R, McCarty W, Suárez MJ, Todling R, Molod A, Takacs L, et al. The modern-era retrospective analysis for research and applications, version 2 (MERRA-2). J Clim. 2017;30(14):5419–54. doi:10.1175/jcli-d-16-0758.1.
50. Buchard V, Randles CA, da Silva AM, Darmenov A, Colarco PR, Govindaraju R, et al. The MERRA-2 aerosol reanalysis, 1980 onward. Part II: evaluation and case studies. J Clim. 2017;30(17):6851–72. doi:10.1175/jcli-d-16-0613.1.
51. Alcalá G, Perea-Moreno AJ, Hernandez-Escobedo Q. Wind resource assessment using Weibull function for different periods of the day in the yucatan peninsula. Chem Eng Trans. 2019;76:1003–8. doi:10.3303/CET1976168.
52. Kim HG, Kim JY, Kang YH. Comparative evaluation of the third-generation reanalysis data for wind resource assessment of the southwestern offshore in South Korea. Atmosphere. 2018;9(2):73. doi:10.3390/atmos9020073.
53. de Assis Tavares LF, Shadman M, de Freitas Assad LP, Estefen SF. Influence of the WRF model and atmospheric reanalysis on the offshore wind resource potential and cost estimation: a case study for Rio de Janeiro State. Energy. 2022;240(4):122767. doi:10.1016/j.energy.2021.122767.
54. Morales-Ruvalcaba CF, Rodríguez-Hernández O, Martínez-Alvarado O, Drew DR, Ramos E. Estimating wind speed and capacity factors in Mexico using reanalysis data. Energy Sustain Dev. 2020;58(3):158–66. doi:10.1016/j.esd.2020.08.006.
55. Bett PE, Thornton HE, Clark RT. Using the twentieth century reanalysis to assess climate variability for the European wind industry. Theor Appl Clim. 2017;127(1):61–80. doi:10.1007/s00704-015-1591-y.
56. Lee JCY, Fields MJ, Lundquist JK. Assessing variability of wind speed: comparison and validation of 27 methodologies. Wind Energ Sci. 2018;3(2):845–68. doi:10.5194/wes-3-845-2018.
57. Feng J, Shen WZ. Wind farm power production in the changing wind: robustness quantification and layout optimization. Energy Convers Manag. 2017;148:905–14. doi:10.1016/j.enconman.2017.06.005.
58. Prasad KM, Nagababu G, Jani HK. Enhancing offshore wind resource assessment with LIDAR-validated reanalysis datasets: a case study in Gujarat. India Int J Thermofluids. 2023;18(11):100320. doi:10.1016/j.ijft.2023.100320.
59. Ren G, Wan J, Liu J, Yu D. Characterization of wind resource in China from a new perspective. Energy. 2019;167(8):994–1010. doi:10.1016/j.energy.2018.11.032.
60. Liang M, Luo B, Zhi L. Application of graphene and graphene-based materials in clean energy-related devices. Int J Energy Res. 2009;33(13):1161–70. doi:10.1002/er.1598.
61. Hasan WSA, Hassan ASM, Shukri MA. Assessment of wind power potential and economic viability at Al-Hodeidah in Yemen: supplying local communities with electricity using wind energy. Energy Rep. 2024;12(3):2981–96. doi:10.1016/j.egyr.2024.08.073.
62. Akdağ SA, Güler Ö. A novel energy pattern factor method for wind speed distribution parameter estimation. Energy Convers Manag. 2015;106:1124–33. doi:10.1016/j.enconman.2015.10.042.
63. Zahariea D, Husaru DE. Atmospheric air density analysis with Meteo-40S wind monitoring system. MATEC Web Conf. 2017;112:07020. doi:10.1051/matecconf/201711207020.
64. Ulazia A, Sáenz J, Ibarra-Berastegi G, González-Rojí SJ, Carreno-Madinabeitia S. Global estimations of wind energy potential considering seasonal air density changes. Energy. 2019;187(2):115938. doi:10.1016/j.energy.2019.115938.
65. Wang L, Liu J, Qian F. Wind speed frequency distribution modeling and wind energy resource assessment based on polynomial regression model. Int J Electr Power Energy Syst. 2021;130(1):106964. doi:10.1016/j.ijepes.2021.106964.
66. Habte A, Sengupta M, Gueymard C, Golnas A, Xie Y. Long-term spatial and temporal solar resource variability over America using the NSRDB version 3 (1998–2017). Renew Sustain Energy Rev. 2020;134:110285. doi:10.1016/j.rser.2020.110285.

67. Marcos R, González-Reviriego N, Torralba V, Soret A, Doblas-Reyes FJ. Characterization of the near surface wind speed distribution at global scale: ERA-Interim reanalysis and ECMWF seasonal forecasting system 4. Clim Dyn. 2019;52(5):3307–19. doi:10.1007/s00382-018-4338-5.
68. Cowin E, Wang C, Walsh S. Assessing predictions of Australian offshore wind energy resources from reanalysis datasets. Energies. 2023;16(8):3404. doi:10.3390/en16083404.
69. Gil-García IC, Ramos-Escudero A, Molina-García Á, Fernández-Guillamón A. GIS-based MCDM dual optimization approach for territorial-scale offshore wind power plants. J Clean Prod. 2023;428(10):139484. doi:10.1016/j.jclepro.2023.139484.
70. Kheder-Haddouche S, Nedjari HD, Louassa S. Improvement of the wind map using interpolation method for a region in southwestern Algeria. In: Proceedings of the 2023 14th International Renewable Energy Congress (IREC); 2023 Dec 16–18; Sousse, Tunisia. p. 1–5. doi:10.1109/IREC59750.2023.10389465.
71. Zhao W, Zhong Y, Li Q, Li M, Liu J, Tang L. Comparison and correction of IDW based wind speed interpolation methods in urbanized Shenzhen. Front Earth Sci. 2022;16(3):798–808. doi:10.1007/s11707-021-0948-z.
72. Wang B, Sun Y, Lu Y, Shen X, Xu Y, Jin P, et al. Research on dynamic capacity-increase technique based on spatial interpolation methods of transmission line meteorological data. In: Proceedings of the 2023 3rd International Conference on New Energy and Power Engineering (ICNEPE); 2023 Nov 24–26; Huzhou, China. p. 950–4. doi:10.1109/ICNEPE60694.2023.10429618.
73. Chen C, Zhao N, Yue T, Guo J. A generalization of inverse distance weighting method via kernel regression and its application to surface modeling. Arab J Geosci. 2015;8(9):6623–33. doi:10.1007/s12517-014-1717-z.
74. Maleika W. Inverse distance weighting method optimization in the process of digital terrain model creation based on data collected from a multibeam echosounder. Appl Geomat. 2020;12(4):397–407. doi:10.1007/s12518-020-00307-6.
75. Li Z, Zhang X, Zhu R, Zhang Z, Weng Z. Integrating data-to-data correlation into inverse distance weighting. Comput Geosci. 2020;24(1):203–16. doi:10.1007/s10596-019-09913-9.
76. Hodam S, Sarkar S, Marak AGR, Bandyopadhyay A, Bhadra A. Spatial interpolation of reference evapotranspiration in India: comparison of IDW and kriging methods. J Inst Eng Ind Ser A. 2017;98(4):511–24. doi:10.1007/s40030-017-0241-z.
77. Ozelkan E, Chen G, Ustundag BB. Spatial estimation of wind speed: a new integrative model using inverse distance weighting and power law. Int J Digit Earth. 2016;9(8):733–47. doi:10.1080/17538947.2015.1127437.
78. Lee K, Kang DH, Jung HC, Park G, Gye C, Kumar S, et al. Toward a ground-based and long-term meteorological forcing dataset for South Korea. Theor Appl Clim. 2023;153(1):155–72. doi:10.1007/s00704-023-04457-6.
79. Carvalho D. An assessment of NASA's GMAO MERRA-2 reanalysis surface winds. J Clim. 2019;32(23):8261–81. doi:10.1175/jcli-d-19-0199.1.
80. Fernandes I, Pimenta FM, Saavedra OR, Assireu AT. Exploring the complementarity of offshore wind sites to reduce the seasonal variability of generation. Energies. 2022;15(19):7182. doi:10.3390/en15197182.
81. Hulio ZH, Yousufzai G, Jiang W. Statistical analysis of wind resource and energy potential assessment of Quaidabad site, Sindh Pakistan. J Eng Des Technol. 2021;19(6):1291–316. doi:10.1108/jedt-04-2020-0129.
82. Troccoli A, Muller K, Coppin P, Davy R, Russell C, Hirsch AL. Long-term wind speed trends over Australia. J Clim. 2012;25(1):170–83. doi:10.1175/2011jcli4198.1.
83. Lange B, Larsen S, Højstrup J, Barthelmie R. Importance of thermal effects and sea surface roughness for offshore wind resource assessment. J Wind Eng Ind Aerodyn. 2004;92(11):959–88. doi:10.1016/j.jweia.2004.05.005.
84. Guo Q, Huang R, Zhuang L, Zhang K, Huang J. Assessment of China's offshore wind resources based on the integration of multiple satellite data and meteorological data. Remote Sens. 2019;11(22):2680. doi:10.3390/rs11222680.
85. Yildirir V, Rusu E, Onea F. Wind variation near the black sea coastal areas reflected by the ERA5 dataset. Inventions. 2022;7(3):57. doi:10.3390/inventions7030057.
86. Rehman S, Irshad K, Ibrahim NI, AlShaikhi A, Mohandes MA. Offshore wind power resource assessment in the gulf of north Suez. Sustainability. 2023;15(21):15257. doi:10.3390/su152115257.

87. Karamanis D, Tsabaris C, Stamoulis K, Georgopoulos D. Wind energy resources in the Ionian Sea. Renew Energy. 2011;36(2):815–22. doi:10.1016/j.renene.2010.08.007.
88. Zheng CW, Li XY, Luo X, Chen X, Qian YH, Zhang ZH, et al. Projection of future global offshore wind energy resources using CMIP data. Atmos Ocean. 2019;57(2):134–48. doi:10.1080/07055900.2019.1624497.
89. Arenas-López JP, Badaoui M. Analysis of the offshore wind resource and its economic assessment in two zones of Mexico. Sustain Energy Technol Assess. 2022;52(1):101997. doi:10.1016/j.seta.2022.101997.
90. Al-Wesabi FN, Almekhlafi MA, Abdullah Al-Hagery M, Alamgeer M, Mahmood K, Eltahir MM, et al. Analysis and assessment of wind energy potential of Al-Hodeidah in Yemen. Comput Mater Contin. 2021;69(2):1995–2011. doi:10.32604/cmc.2021.018644.
91. Ren L, Zhang W, Wang Y, Wang H, Yang H, Yao P, et al. Distribution characteristics and assessment of wind energy resources in the coastal areas of Guangdong. Sustain Horiz. 2024;9(10):100081. doi:10.1016/j.horiz.2023.100081.