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# Numerical Simulation of Glaze Ice Formation with Accompanied by Water Film Flow Using E-MPS Method

**Koji Fukudome[1,*], Takuya Wada[1], Toma Takahashi[1] and Makoto Yamamoto[1]**

[1]Tokyo University of Science, Niijuku 6-3-1, Katsushika-ku, Tokyo 125-8585, Japan.
[*]Corresponding Author: Koji Fukudome. Email: kfukudome@rs.tus.ac.jp

**Abstract:** Icing is a phenomenon that super-cooled droplets impinge and accrete on a solid surface. When the icing occurs on aircraft wings, it deteriorates aerodynamic performances of the wings and the blade cascades of the engine, which may lead to severe accidents. Although number of investigations have been performed both experimentally and numerically [1], the icing shape prediction is now not practically complete due to the complex aspect of icing phenomena. In the previous research, Toba et al. [2] employed an explicit-moving particles simulation method (referred as E-MPS method), which was based on the Lagrangian approach, to reproduce the icing process of super-cooled water droplets impinging on the NACA0012 airfoil. This E-MPS method enables us to reproduce complex ice shapes such as so-called feather and large-scale surface roughness which are difficult to be reproduced by the conventional grid-based method [3]. However, in the glaze ice condition, droplets form a thin water film and then solidify after running along the blade surface, so that it is needed to treat the water film behavior to obtain the icing shape. In the present study, the icing simulation method with the E-MPS method was improved to be able to reproduce a water film behavior. The present method was validated for the glaze icing on a flat plate, and then it was successfully applied to the glaze icing on the NACA0012 airfoil.

**Keywords:** Ice Accretion; Graze Ice; E-MPS; NACA0012

## References

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