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A High-Order Numerical Model for Species Transport and Emergency Response

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Summary

A high-order numerical model is developed to simulate species transport for use in emergency response situations. The model includes employing an hp-adaptive finite element technique to construct velocity fields within complex geometries as well as over irregular terrain features. Lagrangian particles are used to display contaminant dispersion patterns. The use of hp-adaptive finite element methods permit both automatic local refinement and unrefinement of the computational grid - a fine mesh is developed in those regions where flow features and/or species gradients change rapidly while a coarse mesh is employed where flow and transport are unvarying (or smooth). The use of Lagrangian particles permits rapid visualization and assessment of contaminated areas, highlighting those areas where exposure to hazardous contamination may occur. The model is computational efficient, runs on PCs, and is particularly suitable for emergency response assessment. Simulation results of contaminant dispersion within buildings as well as from external atmospheric releases will be presented.