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AN UNSTRUCTURED MESH NONHYDROSTATIC MODEL FOR OROGRAPHIC FLOWS

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A three-dimensional semi-implicit edge-based unstructured-mesh model [1,2] is developed that integrates non-hydrostatic anelastic equations, suitable for simulation of small-to-mesoscale atmospheric flows. The model builds on non-oscillatory forward-in-time Multidimensional Positive Definite Advection Transport Algorithm (MPDATA) approach [3], using finite-volume discretization and admitting unstructured meshes with arbitrarily shaped cells. Implicit large eddy simulation exploits properties of MPDATA.

Applications to weekly and strongly (stably) stratified orographic flows are reported. They epitomise diverse aspects of highly nonlinear non-hydrostatic dynamics. The solutions are obtained on fully unstructured meshes and compared to equivalent results generated with an established structured-grid model and observation. Furthermore, a study that examines simulations of stratified flow past a sphere and a semi-sphere for a range of stable stratifications and both laminar and turbulent boundary layer flow regimes will be discussed.

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