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Fractal Physics, Fractal Grids and Fractal Scaling

Antoon van Hooft (1), Stephane Popinet (2), Chiel van Heerwaarden (3), Steven van der Linden (1), Stephan de Roode (1), and Bas van de Wiel (1)

(1) TU Delft, Delft, the Netherlands (j.a.vanhooft@tudelft.nl), (2) UPMC & CNRS, Paris, France, (3) WUR, Wageningen, the Netherlands

Adaptive grids hold an important advantage over the usage of static and pre-tuned grids, as the most challenging atmospheric scenarios are typically localized in the spatial and temporal domain. Examples include the radiative cooling of cumulus cloud interfaces and the diurnal cycle. We present results obtained with applying an adaptive-grid approach to a variety of modeling fidelities, ranging from turbulence resolving direct numerical simulations and large-eddy simulations to Reynolds-averaged techniques. Corresponding to existing literature, the overall analysis shows that the adaptive-grid approach may play an important role in the future of atmospheric modeling as it enables the required computational effort for running a model at an increased resolution to scale correspondingly with the complexity of the resolved physics. Which is necessarily favorable compared to the scaling of fixed-grid approaches.