2.2 Enabling vertical grid refinement for concurrently run nested grids

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As computational power increases, WRF is being used at increasingly fine horizontal resolutions. In WRF v3.2 an option for vertical grid refinement was added in "ndown" which processes WRF model output to provide initial and lateral boundary conditions for a nested domain with a higher resolution. A drawback of this method, especially for high-resolution large-eddy simulations, is that lateral boundary conditions are passed infrequently (i.e. at the frequency of output from the coarse grid), which is insufficient for passing turbulent fluctuations. For large-eddy simulations, it is desirable to run multiple domains concurrently, where lateral boundary conditions are passed at each time step of the parent domain.

A new option, allowing vertical grid refinement for multiple concurrently run domains, has been implemented in WRFv3.5. This option uses the vertical interpolation scheme from "ndown" for downscaled variables, but applies it at each time step.

Here, we validate our vertical nesting routine with idealized canonical cases and demonstrate the added benefit of using vertical grid nesting to more accurately capture vertical gradients within the nested domain. Additionally, we use vertical nesting for the real case of a 36 hour forecast in the San Francisco Bay Area, which is compared to observations.