

ABSTRACT

Petascale Computing and the Terra Incognita

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The spatial resolution improvements anticipated with petascale computing could move some meteorological and oceanographic models into the *terra incognita*, where the numerical grid-mesh scale is Δ of the order of the scale ℓ of the energy-containing turbulence. The ensemble-mean closures in standard use in weather and climate models require $\Delta \gg \ell$, and so are not appropriate there. Contemporary LES closures, which do not account for the “tilting” terms in the subgrid flux conservation equations and therefore strictly require $\Delta \ll \ell$, might also not be suitable in the *terra incognita*. We’ll review the early history of these subgrid flux equations, present some measurements that illustrate the importance of their tilting terms, and discuss simple rate-equation subgrid models that could be useful in the *terra incognita*.