MMM SEMINAR SERIES

Atmospheric predictability: impact of the mesoscale k ^ (- 5/3) range

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Global numerical weather prediction (NWP) models have begun to resolve the mesoscale k^(-5/3) range of the kinetic energy (KE) spectrum, which is known to impose an inherently finite range of predictability per se as errors develop more rapidly on these scales than on the larger scales. However, the dynamics of these errors under the influence of the synoptic-scale k^(-3) range is little studied. As the error dynamics is largely constrained by the KE spectrum rather than by the model's dynamics itself, idealised models with the appropriate spectra can provide a valuable insight into the error dynamics when the k^(-5/3) range is better resolved in the future. In this presentation, the error-growth behaviour in a series of identical-twin perturbation experiments is examined using an idealised two-dimensional barotropic turbulence model at a range of resolutions. The synoptic-scale k^(-3) range of the KE spectrum gradually transitions into a k^(-5/3) range in the mesoscale, which is increasingly resolved as the model resolution increases. The error is fitted to a scale-dependent parametric error-growth model and the relationships of the parameters across the scales are analysed. By examining the dependence of such relationships on the model resolution and perturbation scale, the predictability limit is explored, and implications for the effectiveness of resolution-increases in NWP models are discussed.

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****Please note special time***

For Zoom information, please contact
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Seminar will also be live webcast:
https://operations.ucar.edu/live-mmm