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Organized Convection Parameterization for GCMs

Wednesday 5 May 2021 16:00 (1h 45m)

The enormous exchange of energy during transitions between the three phases of water and the dominance of convection as a transport process are fundamental to Earth's weather and climate. Moist convection organizes into mesoscale systems (MCSs) but, being neither parameterized nor adequately resolved, MCSs are missing from contemporary global climate models (GCMs). This long-standing deficiency adversely affects the type, intensity, distribution, and frequency of precipitation. A new parameterization of organized moist convection based on fluid-dynamical principles of multiscale coherent structures and slantwise layer overturning provide upscale heat transport and counter-gradient momentum transport which are distinct from diffusive mixing associated with unorganized cumulus. Implementation of the parameterization in the NCAR Community Atmosphere Model (CAM) improves the Madden-Julian Oscillation and convectively coupled tropical waves; generates large-scale patterns of precipitation consistent with TRMM measurements; and displays remarkable structural invariance across a wide range of scales. Results reported in Moncrieff et al. (2017) and Moncrieff (2019) will be summarized, along with some new results of implementation in the Department of Energy (DOE) Energy Exascale Earth System Model (E3SM).

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Session Classification: Modelling and Parameterising Deep Convective Organisation

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