

Self-Aggregation of Convection in the RCEMIP Ensemble

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The Radiative-Convective Equilibrium Model Intercomparison Project (RCEMIP) is an intercomparison of multiple types of numerical models, including atmospheric general circulation models (GCMs), cloud-resolving models (CRMs), global cloud-resolving models (GCRMs), large eddy simulation models (LES), and single column models (SCMs), configured in radiative-convective equilibrium (RCE). In addition to questions about the response of clouds and convective activity to warming, RCEMIP offers an unprecedented opportunity to examine the self-aggregation of convection and its role in climate in a consistently configured ensemble of nearly 30 models. Self-aggregation occurs robustly across large domain simulations in CRMs, GCRMs, and GCMs, but with varying strengths, spatial structures, and temporal variability. Across all models, self-aggregation acts to warm and dry the atmosphere and reduce high cloudiness. However, there is no consistent response of the degree of aggregation to warming, with half of the simulations exhibiting an increase in aggregation with warming and half experiencing a decrease. The response of aggregation to warming varies not only from model to model but from metric to metric as well. The impact of self-aggregation on the energy budget through clear-sky processes and changes in cloudiness is also explored.

Primary authors: WING, Allison (Florida State University); STAUFFER, Catherine (Florida State University); REED, Kevin (Stony Brook University); BECKER, Tobias (Max Planck Institute for Meteorology)

Presenter: WING, Allison (Florida State University)

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