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Emergence of large-scale patterns in moist atmospheric convection

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We discuss the emergence and temporal evolution of large-scale spatial-temporal oscillating modes in deep moist convection, for an atmosphere in radiative-convective equilibrium. To this end, we use cloud-resolving numerical simulations of the convective atmosphere at very high resolution and on domain sizes spanning from 500 km to a few thousands of kilometers. The results of the simulations indicate the presence of a self-organization process of the tropospheric water vapour field, where convective cells cluster together and generate almost-periodic temporal oscillations of the domain-averaged rainfall field.
While the overall picture is robust to changes in cloud microphysics, the details of the clustering process and the amplitude of the oscillations depend on the microphysical parameterizations adopted and on the domain size.