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Unsupervised Classification of Convective Organisation in EUREC4A with Deep Learning

Leif Denby
University of Leeds, Institute for Climate and Atmospheric Science, School of Earth and Environment, Leeds, United Kingdom of Great Britain – England, Scotland, Wales (l.c.denby@leeds.ac.uk)

The representation of shallow tradewind cumulus clouds in climate models accounts for majority of inter-model spread in climate projections, highlighting an urgent need to understand these clouds better. In particular their spatial organisation appears to cause a strong impact of their radiative properties and dynamical evolution. The precise mechanisms driving different forms of convective organisation which arise both in nature and in simulations are however currently unknown.

The EUREC4A field campaign presents an unprecented oppertunity to study the ambient conditions (e.g. windshear, horizontal convergence, subsidence) while simultaneously measuring the cloud properties. Using an unsupervised neural network able to autonomously discover discover different patterns of convective organisation this work quantifies the ambient and cloud-properties present in differently organised regimes and in transitions between these regimes.

The model is trained on GOES-R imagery of the tropical Atlantic. Spatial maps of convective organisation and temporal evolution of these will be presented together with large-scale influences on their development, helping unpick the dynamics of convective clouds in this region.