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Objective classification of cloud organisation with unsupervised neural networks

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Existing methods for characterising cloud organisation rely on metrics which measure specific features of the cloud structures present, however existing features lead to ambiguity in identifying the convective regimes and formulating new metrics which are physically relevant is a challenging task. By automatically extracting spacial features necessary to solve a specific task (here distinguishing different regimes of cloud organisation) deep neural networks provide a novel approach to measuring cloud organisation.

This work presents a unsupervised neural network model able to autonomously discover different patterns of convective organisation and classify spatial regions into distinct forms of convective organisation.

The model is here applied to study of shallow trade-wind cumulus clouds, being trained on GOES-16 imagery of the tropical Atlantic, to try and unpick the poorly understood mechanisms driving different forms of convective organisation. Shallow trade-wind clouds are focussed on because their differing behaviour between climate models accounts for majority of inter-model spread in climate projections, and the spatial organisation of these clouds appears to cause a strong impact of their radiative properties.

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