Shallow convective organization in the Trades as seen by self-learning artificial intelligence

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The organization of shallow convection in the trades influences precipitation development, cold pool formation, clouds' radiative effects, and, thus, climate sensitivity. Deep learning techniques, especially in computer vision and self-supervision, are suitable tools to understand cloud organization purely from a machine's perspective. Yet, the physical interpretation of the network's classes remains challenging.

We use a self-supervised deep learning neural network to assess the organization and the associated physical properties of shallow convection during the EUREC4A field study. Based on geostationary GOES-East images of cloud optical depth, we analyze images from both Barbados Cloud Observatory, and from a random selection of a larger domain across the tropical Atlantic. The network classifies each image into one of four classes of organization. Based on the neural network outputs, that is higher-order image features and corresponding labels of the image, we analyze how these relate to the four categories previously identified from human labeling by the EUREC4A community (*Sugar, Gravel, Flower, Fish*).