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The mesoscale organization of shallow convection:

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Using ten years of MODIS observations, patterns of mesoscale organization in trade-wind clouds are assessed and evaluated. By initially examining a subset of observations, four forms of organization are identified: Sugar, wherein clouds appear like fine-grained and unorganized sprinklings of powdered sugar over a background of the dark-ocean; Gravel, wherein clouds appear to predominate on the edges of intersecting cold-pools giving a more coarse granulation to satellite images; Flowers, regions of large (100-200 km) mesoscale cloud networks characterized by extensive stratiform cloud decks with well defined gaps; and Fish, also large-scale structured networks of clouds, but with less evidence of the more irregular structure of Gravel or the stratiform clouds found in Flowers. These classifications were learned by a group of twelve experts and used to classify ten years of December, January and February satellite imagery over the ten by ten degree test region in the North Atlantic trades. Each one of the approximately 900 images was classified by six experts. Some surprising results were that some form of organization was evident on the majority of images, but that experts unanimously agreed on the form of organization only 8% of the time. Of the different forms of organization the most common was Gravel, and the least common was Sugar. The human classification offers lessons in the classification of cloud scenes, may aid the training of automated schemes, and can be used to advance understanding as to the role, if any, the mesoscale organization of shallow convection plays in the climate system.