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Observational evidence for ocean feedback causing episodes of convective aggregation breakup in the tropical Pacific.

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Cloud resolving models run in idealized conditions of radiative convective equilibrium often show convective switching a state of random convection to a state in which the convection is clustered, leading to a much drier mean state. These simulations have shown that feedbacks with the ocean over thin mixed layers can delay or prevent clustering onset. Understanding convective aggregation is critical as it could alter our assessment of tropical climate sensitivity, and yet it has been difficult so far to even assess aggregation in observations, due to the lack of ability to observe convective core location from space until Doppler radar is available. Here, using a novel analysis method to examine a combination of state-of-the-art retrievals of clouds, water vapour, precipitation and sea surface temperature available since 2016, we present observations that demonstrate convective aggregation operates in the tropical western Pacific region on the sub-1000 km scale, in a region with very weak spatial gradients in sea surface temperature. Convection is generally seen to be in a highly aggregated state, but intermittently and rapidly flips to a random state when low wind conditions prevail, associated with thin mixed ocean layers which oppose aggregation. These events generally persist for a few days to a week or more before convection transitions back to a clustered state. We believe this to be the first direct evidence of this "switching" of clustering state occurring on the meso-scale in the tropics. Summary statistics of these random-convection episodes will be presented.