

In search of ghost cold pools and moisture rings

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Moisture rings at cold pool fronts have been identified as playing a key role in convective propagation in numerical simulations. However, it is not clear if these are features of real cold pools due to the uncertainties of model microphysics and representation of turbulence at the cold pool front. We therefore analyse more than a decade of station observations from two islands in the tropical western Pacific to identify cold pool fronts using a new wavelet based algorithm to detect both young vigorous fronts as well as weak fronts from nearly recovered cold pools. We find that moisture rings are nearly ubiquitous, found in more than 80% of fronts. Using wind gust strength as a proxy of cold pool age, we show that moisture anomalies are mostly absent for young vigorous fronts, but grow with cold pool age, indicating that surface latent heat fluxes dominate rainfall evaporation as the moisture source for cold pool rings. This finding is broadly supported by recent literature, which commonly show moisture rings in oceanic environments, but no evidence of enhanced moisture with land-based cold pool observations.

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