



Moistening by Shallow Cumulus prior to Peaks of MJO Convection

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This presentation provides a summary of a recent research on moistening by shallow cumulus clouds during large-scale convective events in the tropical western Pacific. The large-scale convective events are grouped into those that are associated with the Madden-Julian Oscillation (MJO) and those that are not. Ten years of observations from a vertically pointing cloud radar, soundings, a microwave radiometer, and optical rain gauges at the ARM Manus site were used to identify precipitating and non-precipitating shallow cumulus clouds and to estimate their moistening tendencies. Our analysis shows that the observed anomalies in low-level moisture leading to rainfall peaks of MJO and non-MJO events cannot be explained in terms of moistening by these clouds. Both precipitating and non-precipitating shallow cumulus clouds provide substantial background moistening to the lower troposphere during both type of convective events, but their fluctuations are not in concert with the observed low-level moisture anomalies. Low-level moisture anomalies result from a subtle imbalance between the three dimensional moisture convergence from synoptic and intraseasonal perturbations and subgrid processes. In this context, the low-level moistening prior to the rainfall peak of MJO events can be attributed to a systematic decrease in drying from synoptic-scale perturbations. Such role of synoptic perturbations and severe drying near and immediately after the rainfall peak are the main differences between MJO and non-MJO events.