Observations in support of coupled SST, deep convection and rainfall research

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The relationship between tropical sea surface temperature and rainfall climatology has long been regarded as pivotal to the understanding of current climate and the predictions/projections of future climate. Traditional investigations on this topic point to a very high correlation between rainfall and SST, which has been substantiated to a limited extent. However our recent study on the western Pacific warm pool reveals a complex relationship where local variability of SST is relatively large (~3ºC) and the seasonal mean SST is nearly uniform. For the region of our study with a 4 year time series, the correlation between SST and total rainfall, while positive, is only 0.42. Rainfall events are typically triggered within SST gradients, on average only 0.25ºC above the regional mean.

Multiple factors may be responsible for this relatively low correlation, which conventional wisdom suggests is near unity. One factor is simply the resolved scale of SST analyses. This poster presents strong evidence of localized lower boundary forcings associated with 75% of all rainfall events over 4 years. Our study was made possible exclusively by satellite datasets and products derived therefrom. The results are limited by temporal and spatial sampling limitations inherent to orbital mechanics, microwave radiometer footprint size, and extensive cloudiness and rainfall.

To gain increased understanding of rainfall occurrence and improved representation in global models will require additional investigations of coupled ocean atmosphere responses. This can be achieved through *regional scale observations that resolve the statistics of ocean-atmosphere mesoscale structure for periods of seasonal to interannual duration*. Observations and analyses should include SST structure and diurnal variation at scales from 1-200 km; corresponding lower atmospheric convergence fields; phase relationships with respect to transient tropical free wave forcings; and the inferred interfacial fluxes. We believe that routine monitoring by small UAVs and a regionally enhanced density of drifting buoys can provide the continuous timeseries necessary for use in conjunction with satellite data and NWP analyses to resolve forcing and coupling issues. Short-period intensive measurements from research vessels and manned aircraft could enable case studies that further clarify interpretation of the longer-term statistics.