Composite Analyses of Tropical Convective Systems Prior to Tropical Cyclogenesis

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The dynamical and thermodynamical processes responsible for the evolution of a loosely-organized tropical convective system into a highly-organized, mature tropical cyclone are still poorly understood. Previous studies have examined these processes using a variety of techniques such as composited fields, case studies, and idealized models. Each of these approaches is associated with certain benefits and drawbacks. Compositing allows for a large number of cases to be processed at the expense of obscuring highly variable, yet potentially important features. While case studies have the advantage of retaining highly variable transient features which are useful for examining scale interactions, the approach carries the disadvantage that a careful, time consuming examination of a large number of cases is necessary to establish the representativeness of the relevant dynamical and physical processes. Studies employing idealized models allow for detailed studies of system evolution, but the outcomes can be dependent on the choice of model parameters.

The present study uses compositing techniques to study the genesis process. In order to best exploit the unique benefits of a composite study while minimizing the impact of its drawbacks, a pre-genesis phase space is employed. The variables on which the phase space is constructed are chosen such that they identify the current states of highly variable, yet prominent features (e.g. system tilt). Cases located in close proximity to one another on the phase space are composited while more distant cases in the phase space are excluded. Several sets of composites are generated using several model analysis data sources (e.g. CFSR, ECMWF, etc.) allowing for identification of discrepancies between model representations of the systems. In addition to an overview of this phase space, preliminary results of the composite analyses will be presented along with some possible operational applications of the phase space.