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Multi-Scale Models for the Tropics: A Systematic Route for Improving Theory, Computational, and Predictive Strategies.

One of the unexplained striking features of tropical convection is the observed statistical self-similarity, in clusters, superclusters, and intraseasonal oscillations through complex multi-scale processes ranging from the mesoscales to the equatorial synoptic scales to the intraseasonal/planetary scales. On the other hand, the accurate parameterization of moist convection presents a major challenge for accurate prediction of weather and climate through numerical models. After a brief survey of the observational record, this lecture summarizes recent work giving insight into these complex issues through the paradigm of modern applied mathematics done by the lecturer with various collaborators. This part begins with new multi-spatial scale, multi-time scale, simplified asymptotic models derived systematically from the equatorial primitive equations on the range of scales from mesoscale to equatorial synoptic to planetary/intraseasonal (Majda 2006. (Received January 16, 2008)