Tropical convection and its importance for South America

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Abstract:

Regions of tropical convection have long been associated with patterns of large-scale weather variability. One of the principal modes of tropical variability is called the Madden-Julian Oscillation (MJO). The MJO operates on the intraseasonal time scale, with a period between 30 and 60 days, and it is characterized by a region that favors convection and a region where the convection is less active. Those two regions are connected by large-scale horizontal and vertical circulation cells. As a consequence of the tremendous latent heat release in the region of active convection, Rossby waves are excited and propagate toward the east and poleward. These Rossby waves generated by the MJO interact with the wave train already present in the middle and high latitudes, through teleconnections. For South America, it was discovered that when the winter (June-August) convection is located in the western hemisphere and Indian Ocean, there is above-normal precipitation in northern, central, and southern Chile, accompanied by below-normal levels of contamination (PM10) in Santiago Chile. A similar, inverse relationship was found between surface ozone in Santiago and MJO convection in the Maritime Continent and western Pacific Ocean. These relationships are due to the teleconnections between MJO convection and local circulation over South America. In this seminar, the relationships between precipitation, contamination and convection will be discussed. Results from recent studies will also be presented, along with suggestions for future lines of work in this area of climate dynamics.