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Invited Talk
(Invited Talk)

In the free troposphere and stratosphere, tropical circulation is dominated by tropical waves and wave-driven winds. Tropical waves are forced by temporal and spatial variations in latent heat release, while tropical waves in turn act to organize patterns in rain and cloudiness through convective coupling. This talk focuses on the various roles of tropical waves in near-term climate prediction from seasonal to decadal timescales.

Tropical waves can have direct impacts on tropical weather forecasts, but they also play indirect roles in global and regional near-term climate prediction. Indirect effects on climate include the role of tropical waves in modulating upper tropical troposphere cirrus cloud formation and their related role in modulating global stratospheric water vapor. Both high cirrus and stratospheric water have surface temperature effects, and stratospheric water in particular has shown decadal-scale trends and abrupt interannual shifts that remain poorly understood. Tropical waves have indirect effects on seasonal prediction through the stratospheric quasi-biennial oscillation (QBO), an interannual variation in the direction and strength of lower-stratospheric zonal wind. QBO winds modulate tropical-extratropical teleconnections through their effect on Rossby wave propagation pathways. Tropical wave drag drives the QBO, and tropical waves also serve as links in the teleconnection chain between tropical sea surface temperatures and Northern Hemisphere winter weather patterns.

This talk will focus on the various ways that COSMIC temperature measurements are used to improve understanding of tropical waves and their roles in near-term climate prediction. COSMIC data have been used to study tropical waves with spatial scales ranging from global down to 200 km, and waves with temporal scales ranging from hourly to seasonal. The high vertical resolution, global sampling, and long duration of the COSMIC measurements permit direct resolution of a broad range of tropical waves and studies of their variability. The stability of COSMIC temperature measurements also makes them valuable in determining background reference temperatures that permit inferences on small-scale or high-frequency fluctuations in other datasets and thereby using these other data in combination with COSMIC. Recent studies related to variability in tropical cirrus, water vapor, and stratospheric winds will be presented that illustrate effects of tropical Kelvin waves, equatorial Rossby waves, and gravity waves.

OSTS session

Regional and Global CAL/VAL for Assembling a Climate Data Record

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