Title: The Governing Dynamics and Predictability of Recurving EPAC Tropical Cyclones

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Infrequent recurving eastern North Pacific (EPAC) tropical cyclones (TCs) can threaten life and property along the West Coast of North America primarily through flooding associated with heavy rainfall. These recurving EPAC TCs are most likely to occur during boreal autumn when a weakened subtropical ridge extends westward from North America into the EPAC or when an anomalous equatorward-protruding midlatitude trough is present in the EPAC. Although the local conditions needed to steer EPAC TCs inland have been climatologically examined, the upstream synoptic dynamical processes across the western North Pacific (WPAC) and central Pacific (CPAC) that can contribute to recurving and landfalling EPAC TCs have yet to be fully investigated. This seminar will illustrate how the structure and evolution of the large-scale flow across the WPAC and CPAC synoptic-dynamic processes governs whether EPAC TCs will recurve and impact the west coast of North America from a synoptic-dynamic perspective.

Tropical Cyclone (TC) Sergio (2018) was a classic example of an infrequent recurving eastern North Pacific (EPAC) TC. Following its landfall on 12 Oct 2018 in Baja California, TC Sergio's direct and indirect impacts resulted in costly damages for much of Baja California and parts of the southwestern US ($2.67 million, 2018 USD) due to severe flooding. The recurvature of TC Sergio proved to be challenging for operational global prediction models after the storm formed and tracked westward offshore of Central America. Although most deterministic global forecast models indicated that TC Sergio would track westward before recurving on 0000 UTC 8 Oct, some operational ensemble forecast models (e.g., the NCEP GEFS initialized at 0000 UTC 30 Sep) suggested the possibility of a forecast track bifurcation on 0000 UTC 5 Oct with some members tracking TC Sergio toward California and other members tracking it westward. The GEFS bifurcation provides a serendipitous opportunity to not only explore the handling of the upstream and local conditions that lead to the aforementioned source of uncertainty, but also to compare and contrast the different ensemble member solutions to other observed flow patterns that are conducive for EPAC TC recurvature. Accordingly, the GEFS track bifurcation depicted 120 h after initialization motivates this investigation of the meteorological processes that both contributed to the forecast track bifurcation and the associated model forecast uncertainty.

The observed amplified NPAC large-scale flow prior to TC Sergio's recurvature was associated with upstream Rossby wave breaking (RWB) and ridge building during the five days prior to Sergio's forecasted bifurcation point over the EPAC on 0000 UTC 5 Oct. Additionally, recurving TCs Trami and Walaka that underwent extratropical transition in the WPAC and the CPAC, respectively, were associated with the aforementioned RWB that lead to the development of an amplified downstream ridge over the EPAC and western U.S. on 7 Oct. Continued downstream RWB resulted in new trough formation during 7–9 Oct over the EPAC and western U.S. that enabled TC Sergio to be steered poleward. It is hypothesized that absent any trough over the western U.S. and EPAC in response to continued EPAC ridge amplification that TC Sergio would not have moved poleward and then northeastward prior to making landfall over Baja California. A cluster analysis will be constructed of the worst and best performing GEFS members from in order to determine the primary sources of error that produced a bifurcation of all ensemble member forecasts valid approximately at 0000 UTC 5 Oct 2018.