

ATS/CIRA Colloquium

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Hosted by Michael Bell

2:30 p.m. Thursday, April 20
ATS 101 and Zoom

Climate Controls of Tropical Cyclone Size: Rotation, Rossby Waves, and Climate Change

Tropical cyclones cause widespread damage and loss of life globally each year. In a future warmer climate, tropical cyclones are expected to have stronger maximum wind speeds, but could they also get larger? This talk will discuss how I integrate theory, observations, idealized models, and global climate models to understand what sets the size of tropical cyclones on Earth. I will focus in particular on how size depends on both the Coriolis parameter and its meridional gradient. The latter acts as the strong dynamical constraint on size in the Earth's tropics, via a length scale traditionally known as the "Rhines scale". This length scale has long been used to explain properties of jet streams and the size of extratropical cyclones, and I will demonstrate how this concept can be applied in a very simple manner to explain why it limits the size of an isolated tropical cyclone. This work further provides novel insight into the basic meaning of the Rhines scale itself in any context. These results suggest that storm size should not change strongly with warming, which is corroborated by results from idealized and real-world GCM simulations. The above insights will be combined with recent work linking storm properties to economic damage to discuss whether landfalling storms are expected to become more damaging in the future.

Colloquia page: atmos.colostate.edu/colloquia