

# MMM SEMINAR SERIES



## *The Role of Radiation and Cloud in Accelerating Tropical Cyclone Genesis*

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This study uses CERES satellite measurements and WRF model simulations to examine the importance of radiative heating in promoting tropical cyclone (TC) genesis and modulating the prediction skills of TC intensification in an operational hurricane forecasting model. There is a growing recognition that radiative heating plays a critical role in accelerating the development of tropical mesoscale convective systems through cloud-radiation interactions. Therefore, investigating the role of radiative heating that contributes to TC development can advance our understanding of how the large-scale forcing influences TC genesis. A series of experiments have been conducted using numerical model simulations to address how cloud-radiation interactions modulate the development of TCs. Both satellite measurements and model simulations demonstrate consistent signals of TC genesis that tropical waves (TWs) that develop into the TC category tend to have stronger cloud radiative heating than those that don't, especially within 500 km of the circulation center. While latent heating is known to provide a higher magnitude of energy for TCs, our study finds that radiative heating also contributes substantially to TC genesis. Our numerical simulations reveal that when cloud-radiation interactions are included, the likelihood of TC genesis increases, particularly for storms at the weaker end of the intensity spectrum. The structural differences in cloud radiative heating within and around the TC area created by cloud-radiation interactions are found to be the key driver of this increase in genesis chances. In addition to the importance of radiative heating to TC genesis, the model's ability to capture radiative heating also directly influences the prediction skills of TC intensification in numerical weather forecasting. Our findings suggest that cloud-radiation interactions play a crucial role in triggering the development of TWs and TCs at the early stage of their lifetime.

**Thursday, 23 February 2023, 2:00pm**

**Refreshments 1:45pm**

**Please also join colleagues for refreshments and informal discussion after the seminar until 3:30pm**

NCAR-Foothills Laboratory, 3450 Mitchell Lane  
FL2-1022, Large Auditorium

**Seminar will also be live webcast**

<https://operations.ucar.edu/live-mmm>

Participants may ask questions during the seminar via Slido.