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A 3-d modeling approach for studying the formation, maintenance, and decay of Tropical Tropopause Layer (TTL) cirrus associated with deep convection

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This study is being conducted to examine the distribution, variability, and formation-decay processes of TTL cirrus associated with tropical deep convection using the University of Wisconsin Non-Hydrostatic modeling system (NMS). The experimental design is based on Tripoli, Hack and Kiehl (1992) which explicitly simulates the radiative-convective equilibrium of the tropical atmosphere over extended periods of weeks or months using a 2D periodic cloud resolving model. The experiment design includes a radiation parameterization to explicitly simulate radiative transfer through simulated crystals. Advanced Microphysics Prediction System (AMP) will be used to simulate microphysics by employing SHIPS (Spectral Habit Ice Prediction System) for ice, SLiPS (Spectral Liquid Prediction System) for droplets, and SAPS (Spectral Aerosol Prediction System) for aerosols. The period of integration is 1 month enough to achieve a radiative equilibrium. The purpose of this study is to determine the relative contributions of Deep convection outflow versus local radiation-aerosol interactions to the formation of the cirrus observed in the TTL. On going studies also consider the role of gravity waves shed by convective towers and their role in TTL cirrus formation and maintenance.