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GFDL's global non-hydrostatic modeling system for multi-time-scale tropical cyclone predictions

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A high-resolution version of NOAA/GFDL Atmosphere Model (HiRam) has been developed with initial focus on the short-term predictions and long-term simulations of tropical cyclones. The model's dynamics is the non-hydrostatic extension of the vertically Lagrangian finite-volume dynamical core (Lin 2004) constructed on a quasi-uniform cubed-sphere grid (Putman and Lin 2007). Physical parameterizations are based on the GFDL AM2.1 for IPCC AR4/AR5, except the deep convective parameterization is replaced by a non-intrusive shallow convection scheme, and the strati-form cloud scheme is replaced by a more sophisticated cloud-microphysics commonly used in cloud-resolving models. These dynamical and physical changes made the model more suitable for multi-scale "seamless" weather-climate applications.

We will present preliminary results, covering a wide spectrum of temporal-spatial scales, ranging from multi-decade simulations of tropical cyclone trends (under present and climate-change conditions), tropical cyclone climatology, ensemble seasonal hurricane predictions, and 5 to 10 days deterministic forecasts. The goal is to evaluate the skill of GFDL's high resolution climate model on tropical cyclones simulations/predictions.