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Modulation of TC activity by the tropical intraseasonal oscillation over the Eastern Pacific in a high resolution GCM

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Tropical intraseasonal variability (ISV, e.g. Madden Julian Oscillation) exerts significant influences on global climate and weather systems including tropical cyclones (TCs). This serves as a critical basis of the "Seamless Prediction" concept by bridging the forecasting gap between medium- to long-range weather forecast and short-term climate prediction. For extended range forecasts of TC activity on the intraseasonal time scale (10~60 days), most of current approaches are based on statistical models or downscaling techniques. Recently, with the development of high-resolution general circulation models (GCMs) with improved model physics, it becomes possible for these GCMs to represent both ISV and TCs, leading to a new avenue for subseasonal TC prediction by using dynamical models. In this study, we present some recent results on the analysis of ISV and TC activity over the eastern Pacific (EPAC) simulated by a new high resolution atmospheric model (HiRAM) developed at NOAA's GFDL. Our results illustrate that the observed dominant boreal summer ISV modes over the EPAC are captured well in HiRAM. Further analysis indicates that the observed relationship between the ISV and TC activity over the EPAC can also be faithfully captured in this model. We performed further analysis on the key factors associated with the ISV in modulating TC activity based on a composite anomalous genesis potential index (GPI) distribution during the ISV evolution over the EPAC. It is found that both lower troposphere vorticity and mid-level relative humidity associated with the ISV are comparably important to the ISV composite GPI anomalous pattern.