Tropical Cyclone Simulations in The Very High Resolution Global Climate Models

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Hurricane and Typhoon are the major contributors to the annual damage and economic lost due to natural disaster around the world. How the characteristics of these high-impact weather extremes will change in a warming climate has attracted considerable interests from research community. For proper assessments, the reliability of simulated tropical cyclone (TC) genesis, tracks and intensity and how they respond to the large-scale climate conditions are very crucial. Limited by computational resources, until now, only a few very high resolution (1/4° or less) global climate models can produce more realistic intense TCs and at the same time have long enough integration to sample the climate-TC interactions without further dynamical downscaling.

Here we examined and compared the statistics and characteristics of TC tracks simulated explicitly in the very high resolution global climate models with the observational track data archive from IBTrACS. The hurricane genesis locations shifted toward southeast direction over tropical north Atlantic in CAM5 model as compared to the observation. On the other hand, the typhoon genesis occurrences in both CAM5 and MRI models are more poleward over the northwest Pacific than the observation. The impact of model systematic biases of necessary conditions for TC genesis (e.g. favorable wind shear, moist mid-troposphere, conditionally unstable atmosphere, etc.) on the errors of basin-scale seasonal TC activities will be discussed. The detailed statistics on lifetime evolution of tracks and their intensities suggest that the simulated TCs tend to decay much faster after their peak intensity as compared to the observation. The typical model biases on the spatial distribution and intensity of precipitation associated with tropical cyclones will be also examined.