

Impact of stratospheric temperature on hurricane intensity: An idealized modeling study

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Recent climate record indicates that tropical lower stratospheric temperature has been decreasing around 0.5-1 degree every 10 years over past several decades. Several studies suggest that this stratospheric temperature trend may significantly modulate hurricane intensity and frequency on the inter-annual time scale. To further understand the physical basis of the relationship between stratospheric temperature and hurricane intensity, we carried out an idealized modeling study using a high resolution mesoscale model. Stratospheric temperature is varied in a set of numerical simulations of hurricanes over radiative-convective equilibrium (RCE) with an isothermal stratosphere. It is found that simulated hurricanes can maintain their peak intensity for about two days, but weaken afterwards, primarily due to their interaction with large scale environment. Hurricane intensity, measured using minimum surface pressure and the maximum azimuthal mean wind speed, is sensitive to the stratospheric temperature: lower stratospheric temperature leads to high intensity. Simulated hurricane intensity is too strong compared against the prediction from the canonical potential intensity theory. Implications of the results from this modeling study will also be discussed.