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Effect of frictional rain dissipation on hurricane intensity

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Rain pours in a hurricane at a rate of some 2 cubic kms per day. As these torrential rains fall through the ambient environment they lose energy due to friction with the surrounding air. The influence of this energy lost per unit time, the "rainpower", on the intensity of a hurricane remains unknown. In this study we use satellite-based rain data from the Tropical Rainfall Measuring Mission (TRMM) to compute the rainpower in all hurricanes in the North Atlantic basin, 1997-2013. We find that the rainpower is on the same order of magnitude as the ocean-derived power that fuels the hurricane. To investigate the influence of rainpower on hurricane intensity, we parameterize the TRMM-derived rainpower data and incorporate it in Emanuel's Carnot-heat-engine model of hurricanes that predicts the maximum hurricane intensity for a given set of climatological and oceanic conditions. We find that rainpower lessens the predicted hurricane intensity by 20% on average. Further, we compare the predicted intensities with the observed hurricane intensities for the North Atlantic basin over a period of 30-years and show that rainpower brings the predictions in better accord with observations. Our findings have implications for weather and climate-change forecasting.