Tropical cyclone return periods: comparison of a stochastic track model with an extreme value analysis of historic data

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ABSTRACT: We estimate return-periods as a function of intensity for land-falling tropical cyclones (TCs). Two statistical techniques are compared and contrasted: (1) extreme value theory using the Generalized Pareto Distribution (GPD) based solely on data at landfall and (2) a stochastic model of the complete life-cycle of TCs based on basin-wide TC data. The stochastic TC model brings many more data to bear on landfall estimation than the GPD analysis, allowing for greater precision in estimates of intensity at long return periods. However, the added complexity of the TC model increases the possibility of bias. While the two analyses display broad-brush agreement, there are differences in detail. We present and discuss the outcome of the stochastic TC model and use two methods to validate the model's return periods, including comparison to the GPD results. We also estimate the uncertainty in the model's return periods using a generalized jackknife procedure.