Dynamical and statistical modeling of future hurricanes

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According to recent assessments, hurricane strength in the North Atlantic basin will likely increase in the future. If true, this will have far reaching impacts on a multitude of human activities. A combination of statistical and dynamical downscaling techniques is used to narrow remaining uncertainties in future projections of hurricane frequency, intensity and location. A current and future climate scenario generated by the global Community Climate System Model (CCSM) under A2 emissions scenario is downscaled both dynamically and statistically to extract tropical cyclone information using somewhat independent techniques. For the dynamical assessment, the NCAR Nested Regional Climate Model (NRCM) is embedded within the CCSM for three time-slices of 1995-2005, 2020-2030 and 2045-2055 for the North Atlantic basin on a 36 km and a 12 km grid. For the statistical assessment, known relationships between large-scale climate variables and tropical cyclones are applied to the climate data. Dynamical and statistical assessments both show an accelerating increase in the number of North Atlantic hurricanes and an equatorward shift in the region of maximum storm activity and formation. NRCM results show a modest increase of average intensity of approximately 2 ms-1, but a more marked increase in the number and intensity (approximately 3.5 ms-1) of the most intense hurricanes that can be resolved by the model. An extreme value analysis shows the largest percentage increase in storm numbers for the strongest storms.