Project Title: **Assessment of hurricane vortex and boundary layer models for the development of wind and pressure profiles and fields**

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Abstract:

The main objective of this project is to evaluate existing models and methods for representing the wind and pressure vortex structure of tropical cyclones (TCs). The initial assessment was performed by comparing TC vortex profiles with observed wind and pressure from reanalysis data provided by the National Hurricane Center's (NHC) hurricane database (HURDAT; Landsea & Franklin, 2013) and Colorado State University's (CSU) extended best track (EBTRK; Demuth et al., 2006). Several models for representing the vortex structure of a TC have been developed in the past. Recreation of wind and pressure profiles for each of the studied models for the selected TCs in the North Atlantic basin was achieved using MATLAB® scripts. The studied vortex models were able to reasonably represent the wind profile data included in HURDAT and EBTRK for tropical storms and hurricanes. It was found that the Holland (1980), the Holland et al. (2010) and the Xie et al. (2012) wind models performed better for decreasing hurricane intensity, capturing the behavior of both the 1-min average maximum sustained wind speeds (V_{max}) and the standard 34-, 50-, and 64-knots gale winds. Also, the Willoughby et al. (2006) wind model replicated the V_{max} and gale winds despite using smaller values of radius to maximum wind speed (R_{max}). However, the best representations of hurricane categories 1 through 5 wind data were obtained with the models presented by Hu et al. (2012) and Gao et al. (2015) with almost negligible root-mean-square error. Tropical storms and weaker TC were best represented by the model presented by Holland et al. (2010). The results of this project are intended to aid in the development of regulation and guidance that incorporates the latest developments in coastal hazard analysis and quantification of related uncertainties.