Improvements to Operational Statistical Tropical Cyclone Intensity Forecast Models

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While tropical cyclone (TC) track forecast skill has improved significantly in the last 10 years, intensity forecast skill has been improving much more slowly. In the last five years, the Statistical Hurricane Intensity Prediction Scheme (SHIPS) and the Logistic Growth Equation Model (LGEM) have been providing some of the most skillful operational intensity guidance. SHIPS and LGEM are currently operational at both JTWC and NHC, and they have been continuously improved since they became operational, largely under Joint Hurricane Testbed (JHT) support.

Three upgrades/additions to SHIPS/LGEM that could provide an improved suite of statistical-dynamical forecast guidance to both NHC and JTWC will be presented. These include 1) replacing weekly sea surface temperatures (SSTs) with 1° resolution with daily SST with 0.25° resolution, aimed at improving the Maximum Potential Intensity (MPI) estimates, one of the primary predictors used in SHIPS, as well as model forecasts over sharp SST gradients; 2) adding a physical mechanism to account for storm-induced SST cooling, which could eventually replace the currently used empirical SST cooling algorithm and possibly allow for the removal of the ocean heat content (OHC) predictor from the models; and 3) adding forecasts of TC structure including wind radii and mean sea level pressure (MSLP) to SHIPS/LGEM, which provides TC wind radii and MSLP estimates that are consistent with the SHIPS/LGEM intensity forecasts. Tasks 1 and 3 have been mostly completed, and a paper has been published on wind structure forecasts. The evaluation of retrospective and real-time parallel runs of the modified SHIPS/LGEM and TC structure forecasts during 2016 Atlantic and eastern North Pacific hurricane season will be presented, together with the preliminary results for extending model modifications to global version, and use of depth-averaged temperature based on variable mixing depth to account for storm-induced SST cooling. Final model modification and adjustments, as well as further steps for transitioning these improvements to pre-operations and operations will be discussed.