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Examples of the value of strong climatological signals in tropical cyclone forecasting

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Since 1970, tropical cyclone (TC) track forecasts have improved steadily in the Atlantic basin. This improvement has been linked primarily to advances in numerical weather prediction (NWP) models. Concurrently, with few exceptions, the development and operational use of statistical track prediction schemes have experienced a relative decline. Statistical schemes provided the most accurate TC track forecasts until approximately the late 1980s. In this study, we show that increased reliance on the global NWP models does not always guarantee the best forecast. Here, we use Hurricane Ivan from the 2004 Atlantic TC season as a classical example, and reminder, of how strong climatological signals still can add substantial value to TC track forecasts, in the form of improved accuracy and increased timeliness at minimal computational cost. We also examine TCs Dennis and Emily from the 2005 Atlantic season, in the same context of assessing the role of climatology in providing very early track information.

In an eight-day period in early September 2004, Hurricane Ivan was repeatedly, and incorrectly, forecast by twelve operational NWP models to move with a significant northward (poleward) component. At the same time, a climatology-based prediction technique, drawn entirely from the historical record of motion characteristics of TCs in geographical locations similar to Ivan, correctly and consistently indicated a more westward motion component, had a small directional spread, and was supported by a large number of archived cases. This climatological signal was in conflict with the deterministic NWP model output, and we suggest that the large errors in the official track forecast for TC Ivan could have been reduced considerably by taking into greater account such a strong climatological signal. We also suggest that this simple strategy of examining the strength of the climatological signal be considered for all TCs to identify cases where the NWP and official forecasts differ significantly from strong, persistent climatological signals.