TC genesis guidance using pre-development Dvorak climatology

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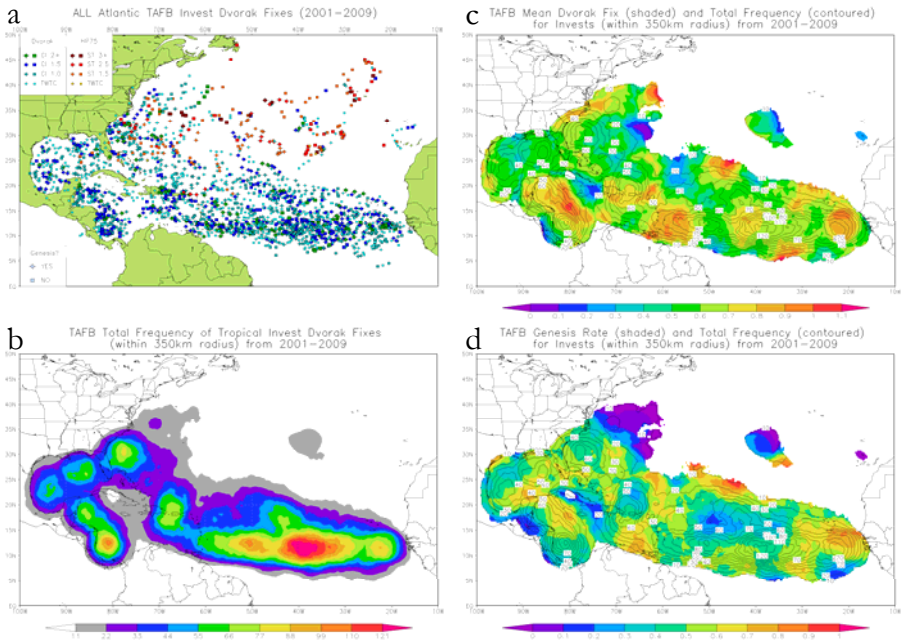
Climatology

The Dvorak Technique (1975, 1984) provides forecasters with a tool to identify a tropical disturbance's position and intensity. In addition to classifying named tropical cyclones (TCs), weaker invests and other pre-genesis systems of interest are analyzed by this method. As such, a climatology of Dvorak classifications for both developing and non-developing cases is compiled and examined as primitive objective guidance for TC genesis. This product is intended to augment the subjective probabilities of TC formation in the NHC's Graphical Tropical Weather Outlook (GTWO).

This climatology currently consists of fixes in the Atlantic, East Pacific, and Central Pacific development basins. The following study focuses on Atlantic cases from the NHC Tropical Analysis and Forecasting Branch (TAFB) for 2001-2010 and the NESDIS Satellite Analysis Branch (SAB) for 2005-2010. Further, all figures shown exclude data from systems classified as 'subtropical' by the Hebert and Poteat (1975) method, except for HP75 points noted in Figure *1a*.

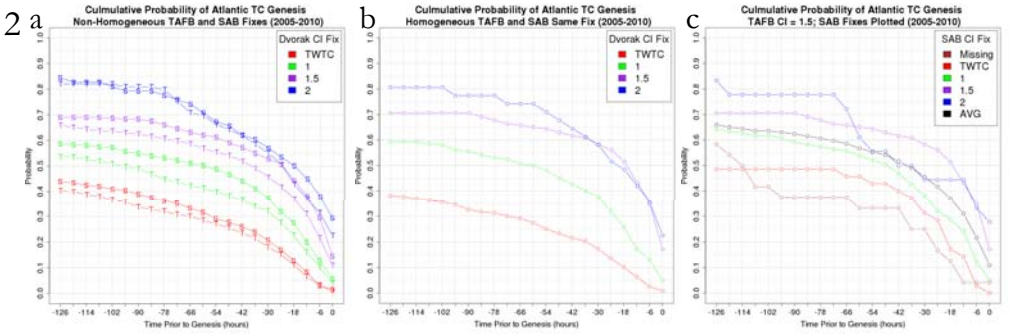
Figure *1* shows the distribution of pre-genesis and non-genesis disturbances from 2001-2009, as classified by TAFB. The locations, intensities, and future (non-)development of such invests are shown in panel *a*. The frequency of tropical invests within a 350km radius of each geographic location is shaded in panel *b*. There are multiple preferred regions of activity: a western and northwestern path along the main development region, around Puerto Rico, between Florida and North Carolina, and bi-modal maxima in the Gulf of Mexico and western Caribbean Sea. The last two panels have the frequency in panel *b* contoured, where *c)* also shades the average Dvorak current intensity (CI) number (where too weak to classify, TWTC, equals 0) and *d)* shades the total genesis rate (with an unspecified, unlimited time interval). Gridded analysis in panels *b*, *c*, and *d* were passed through a 9-point smoother once before contouring/shading.

1



Probabilities

2



Climatological rates of genesis using Dvorak CI classifications for Atlantic invests are shown above in Figure *2*. A common record length (2005-2010) is here plotted for both TAFB and SAB data sets. For each panel, the abscissa is the time prior to genesis and ordinate is the probability of TC genesis. The curves illustrate how the probability of development increases with lead-time. Different colored curves represent different Dvorak intensity estimates, as denoted in the legend. For reference, NHC GTWO probabilities are valid with 48 hours of lead time.

Panel *a* shows the probabilities of genesis from TAFB (T) and SAB (S) using all available data from the respective agencies (thus, the probabilities are calculated using different numbers of Dvorak classifications and are non-homogeneous). Either due to missing data or fewer Dvorak fixes (or both), SAB probabilities are generally higher and indicate SAB is more likely to provide a Dvorak classification for invests that eventually undergo genesis. Panel *b* shows the probability of genesis when both TAFB and SAB share the same intensity estimate (e.g. both are TWTC for the same system at the same time). Panel *c* demonstrates the added value of using fixes from both agencies. When a TAFB Dvorak classification is 1.5, the likelihood of development can be modified by the SAB Dvorak fix. For example, with a lead-time of 48 hours, the probability of genesis for a system with a TAFB fix of 1.5 and a SAB fix of TWTC is higher than if SAB did not provide a fix (or it is Missing). 'AVG' corresponds to having all SAB fixes included and represents the purple 'T' curve in panel *a*.

Verification

3

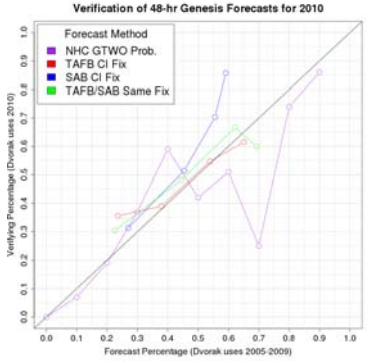
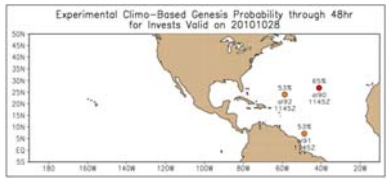


Figure *3* shows a comparison of genesis verifications for 2010 between the NHC GTWO probability (purple curve; where the forecasts are verified by the percentage of time a forecast percentage actually occurred), TAFB Dvorak CI fixes (red curve), SAB Dvorak CI fixes (blue curve), and TAFB and SAB fixes that agree (green curve; as in Figure *2b*). Forecasts from Dvorak classifications are created from 2005-2009 data and verified with 2010 data. The Dvorak percentages (especially TAFB) show comparable skill to NHC forecasts, and can be used to augment NHC performance.

Real-Time Guidance

http://moe.met.fsu.edu/genesis

4



As the online ATCF system is updated with Dvorak classifications from invests, real-time probabilities are created and posted at the above website. Currently, the probabilities shown are for 48-hour lead time (to match the NHC GWTO) using TAFB archive from 2001-2008. Figure *4* shows an example from the website on October 28, 2010. The online system and genesis products will continue to be expanded, in order to increase utility and skill.

References and Acknowledgements

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