

Comments on "Tropical Cyclone Motion and Surrounding Parameter Relationships"

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Using compositing techniques, George and Gray (1976) describe the relationships between instantaneous tropical cyclone motion and surrounding environmental parameters. Studies of this type are needed and the authors are to be commended on their exhaustive research. Indeed, a similar study for the Atlantic area would be most welcome. I believe, however, that the results, to date, should be considered as diagnostic and the authors should be cautious about speculating on the prognostic potential. In particular, I feel that their statement, "It is concluded that a new operational forecast scheme might be developed using the findings of this study with some possible improvements in track forecasting," is overly optimistic.

Exactly how these improvements will be effected from the findings to date is not clear. Researchers working on statistically founded models for the prediction of tropical cyclone motion have been attempting to capitalize on the predictive potential of "steering" for a number of years. The Riehl-Haggard (Riehl *et al.*, 1956) and the Miller-Moore (1960) methods using, respectively, the 500 and 700 mb levels are two early examples. Even recently, Neumann and Lawrence (1975) attempt to use a complex steering grid. No matter how one massages the uncertain objective analyses around the storm, however, the variance reducing potential of the resulting predictors has been limited.

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George and Gray are certainly aware of these difficulties and their opening remarks allude to the problem. However, I believe that additional background material on this point should have been included in their paper.

In any case, the main point I would like to make is that in the *statistical* sense, the availability of continuous satellite viewing of tropical cyclones has downgraded the relative predictive potential of the steering concept. Properly interpreted, these satellite data, together with aircraft reconnaissance, provide the forecaster with a reasonably accurate estimate of the storm's initial motion and how this motion has been changing. Given the choice between these latter motion vectors and some sort of "steering" function derived from the surrounding flow, statistical programs will invariably select the forecaster's estimate of present and past motion as the principal predictors of short-range tropical cyclone displacement.

Nevertheless, I concur with the authors suggestion that increased wind and other environmental data

should be obtained from in and around the storm. Indeed, such data are needed for better initialization of numerical models. Also, as pointed out by the authors, if it can be shown that there is a lag in the storm's response to the surrounding flow, then the monitoring of this flow by aircraft would have statistical predictive potential. However, in the light of the author's *current* findings, I believe the impact on statistical models will be minimal.

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