Developing an Inner-Core SST Cooling Predictor for Use in SHIPS

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1. Accomplishments to date

Since mid July 2003, significant progress has been made towards developing Version 1.0 of the North Atlantic Inner-Core Sea Surface Temperature (SST) cooling algorithm. Building on in-situ inner core hurricane observations documented in Cione and Uhlhorn (2003), a statistically stable cooling algorithm was developed and has recently been tested in 'dependant mode' using 1000s of individual forecasts taken from the Statistical Hurricane Intensity Prediction Scheme (SHIPS) 1989-2002 storm database. These encouraging results depict noticeable improvement in SHIPS intensity forecasts over all forecast time periods between 12-120h. Even more encouraging, when these results were stratified by initial storm intensity and observed intensity change, the positive impact on SHIPS forecasts was even more dramatic. These very promising results will be presented in detail at the upcoming IHC meeting in Charleston (1-5 march, 2004).

2. Upcoming JHT year 1 work

Version 1.0 of the North Atlantic Inner-Core SST cooling algorithm will undergo 'independent sample' testing in 2004. The algorithm will be incorporated into a parallel version of SHIPS to test the impact of the algorithm in real-time SHIPS forecasts during the 2004 North Atlantic hurricane season.

Preliminary efforts have also begun to test the feasibility of incorporating a useful 'sub-surface' predictor into the cooling algorithm. However, at this time, it is unknown if a viable new predictor will emerge or if it will materially improve the performance of the Version 1.0 algorithm. Nevertheless, attempts will be made to enhance the existing cooling algorithm by testing several potentially promising sub-surface predictors.

Another proposed enhancement includes incorporating high resolution (in time and space) SST data directly into the SHIPS model. Since the cooling algorithm utilizes an 'ambient' SST along the proposed storm track, it is believed that improvements to the ambient SST in SHIPS will improve inner-core SST estimates, and as a result, future SHIPS forecasts of intensity change. (Note: SHIPS currently utilizes a weekly Reynolds SST analysis). This work has recently begun and will continue under the leadership of JHT co-investigator Chelle Gentemann of Remote Sensing Systems.

3. Changes to existing JHT Year 1 timeline

So far, this JHT project is on or ahead of schedule with respect to the timeline of major deliverables originally presented. However like most projects, minor modifications become necessary as the project evolves.

One such minor adjustment is to not pursue algorithm enhancements for non-hurricane strength events. The basis for making this decision is two-fold. So far, preliminary testing of the recently developed Version 1.0 North Atlantic Inner-Core SST cooling algorithm has shown that the biggest positive impact on SHIPS forecasts has been for stronger systems (of hurricane intensity or greater). After analyzing these results, investigators believe that there is a well-founded scientific basis as to why this is the case. Stronger storms are typically much more organized and more readily exhibit 'inner-core' characteristics and features. Also, the increased winds associated with stronger tropical systems should result in greater variability with respect to surface forcing (i.e. fluxes) for any given inner-core SST change.

The second issue at hand is a simple manpower/resource consideration. Investigating 100s of historical tropical storm and weaker events will take many man-hours to complete with no guarantee that the resulting cooling algorithm will be materially improved. Given the limited resources on hand and perceived marginal scientific benefit, the investigators strongly believe that our efforts would be much better served investigating other avenues, particularly increased efforts to improve ambient SSTs and potentially incorporating a viable 'sub-surface' predictor in the existing algorithm.

References

Cione, J.J. and E. Uhlhorn 2003: Sea surface temperature variability in hurricanes: Implications with respect to intensity change. *Mon. Wea. Rev.*, **131**: 1783-1796.