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

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Principal Investigator: **Joseph Cione**
Hurricane Research Division
NOAA/AOML
Miami, FL 33149

Co- Investigator: **John Kaplan**
Hurricane Research Division
NOAA/AOML
Miami, FL 33149

Co-Investigator: **Chelle Gentemann**
Remote Sensing Systems
Santa Rosa, CA 95401

Co-Investigator: **Mark DeMaria**
NOAA/NESDIS/ORA
Fort Collins, CO 80523

1. Year 1 and Year 2 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).

During 2004, Version 1.0 of the North Atlantic Inner-Core SST cooling algorithm was tested using 'independent sample' data using cases from the 2003 Atlantic Hurricane Season. The results from this analysis were very encouraging. Overall, SHIPS exhibited improvement at every forecast interval >48h when the SST cooling algorithm was used. When all 72-120h tropical depression through major hurricane strength forecast events were combined (n=450) the average SHIPS forecast skill improvement was found to an impressive 8.8%. Similar to all previous dependent sample analyses, no mean degradation of SHIPS forecast skill was found over any forecast interval. It should also

be noted that even larger forecast skill improvements were found for the two major hurricane/rapid intensity cases (Fabian and Isabel) when the SST inner core cooling algorithm version of SHIPS was used. These very encouraging 2003 Atlantic season independent results will be presented in further detail at the IHC in March of 2005.

Attempts to improve SHIPS forecasts by incorporating high resolution (in time and space) SST data directly into the model were recently completed using storm events from the 2003 Atlantic Hurricane season. Unfortunately, the results from this particular analysis did not depict significant forecast skill improvement when high resolution SST data was used (in lieu of the weekly Reynolds SST data currently used by the SHIPS model). Nevertheless, it should be noted that no degradation with respect to SHIPS forecast skill was observed when high resolution SST data was used. Further, the PIs contend that in cases where two storms quickly follow one another (e.g. Isidore/Lili of 2002) the **only** way to accurately capture SST conditions ahead of the " trailing" TC is to utilize high resolution (in time and space) SST data. Findings from this analysis will also be presented at the 2005 IHC.

2. Final Year 2 Ongoing/Planned Work

. During the 2004 Atlantic Hurricane Season the algorithm was incorporated into a parallel version of SHIPS. Initial prognosis of how the inner core SST cooling version of SHIPS performed using 2004 Atlantic storms is currently underway. Preliminary results from this independent sample will also be presented at the 2005 IHC.

Efforts to test the utility of incorporating additional/new predictor(s) into the current version of the cooling algorithm have been ongoing. Unfortunately to date, no new viable predictor has emerged that has demonstrated an ability to materially improve the performance of the existing (Version 1.0) algorithm. Nevertheless, further efforts will be made in 2005 to enhance the existing cooling algorithm by testing additional potentially useful predictors.

The in May of 2005 the latest version of the North Atlantic Inner-Core SST cooling algorithm will be incorporated into a parallel version of SHIPS to test the impact the algorithm has on real-time SHIPS forecasts during the 2005 North Atlantic hurricane season.

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.