

NC STATE UNIVERSITY

**College of Physical and
Mathematical Sciences**
North Carolina State University
2700 Stinson Drive
Campus Box 8201 / 116 Cox Hall
Raleigh, NC 27695-8201

919.515.7777 (phone)
919.515.7855 (fax)
len_pietrafesa@ncsu.edu

October 23, 2006

VADM Conrad C. Lautenbacher
National Oceanic and Atmospheric Administration
Room 6811
14th Street & Constitution Avenue, NW
Washington, DC 20230

Dear VADM Lautenbacher:

I am pleased to forward both the Majority Report, along with the Minority Report, from the Hurricane Intensity Research Working Group (HIRWG). Your leadership in recognizing the need for improving the forecasts of hurricane intensity and in requesting an external assessment of existing capabilities external to and within the agency could not have been timelier. The NOAA Science Advisory Board (SAB) was pleased to take on the task of forming a very high level working group and is pleased to provide you the conclusions reached by the HIRWG. Unfortunately the HIRWG schedule, which included visits to the Hurricane Center, was delayed due to the interruptions caused by the passages of Hurricanes Katrina, Rita and Wilma but nonetheless was thorough, comprehensive and thoughtful.

The SAB chooses not to comment on any of the individual findings and recommendations in the report and unanimously endorses forwarding the entire HIRWG report to you. Some additional points, which in the opinion of several SAB members were not sufficiently emphasized, are presented below for your consideration. It is of note that the report actually consists of two components, the Majority Report and the Minority Report.

The Majority Report, in the considered judgment of seven of the ten HIRWG members, describes a way forward for NOAA that has a very high probability of significantly increasing the skill of hurricane intensity forecasts within a period of five years. To this end, it sets a very high, but attainable bar in one overarching goal and then states twenty-nine recommendations. Ten of these recommendations in the Majority Report are identified as especially critical to the future success of intensity forecasting and of the highest priority for implementation. In the text to follow, comments will be directed toward the Majority Report.

The Board view of the recommendations made in the Minority Report is that while there is great value in taking fundamental fluid mechanical approaches in providing insights into intensity modeling, implementation of these kinds of models into operations, given agency needs and procedures, is not deemed feasible. Thus these types of models should

be viewed strictly in a research mode and can provide useful insights. In the text to follow, the "Report" referred to is the Majority Report.

The SAB believes that this Report is most timely in that it provides NOAA a means to address some of the points raised in the recently released report of the National Science Board. That said, there are several additional comments that several Board members would like to emphasize as a supplement to the Report. The importance of air-sea interaction and event exchanges of heat, momentum and salt well down into and below the upper layers of Atlantic, Caribbean, Gulf and Pacific waters cannot be underestimated in intensity forecasting. To that end, the Report lacks a more comprehensive survey of important recently published studies and acknowledgement of research programs in addition to Cblast and Rainex, that must be taken into consideration before the recommendations in the Report can be implemented. This oversight was likely due to considerable time constraints that the HIRWG faced in putting the Report together. For example, there is a NOAA NWS NCEP air-sea interaction workshop summary derived from a NOAA convened national workshop of experts that is an excellent reference source (Shay, Surgi and Cione, 2005) for model and observational findings, advances and recommendations for future studies.

Also, the Report does not sufficiently emphasize the qualified success of the use of satellite altimetry in improving forecasts since 2004. Additionally, airborne dropped expendable sensor surveys have provided upper ocean profiles over the past several years which have been shown to provide considerable insight into intensity change, suggestive that deeper water column temperature and salinity signals may be very valuable for the assimilation of oceanic data into interactively coupled air-sea models to get the background state of the ocean correct.

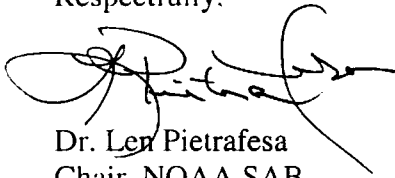
It has been shown in the peer reviewed literature that passages of hurricanes of varying sizes and translational speeds moving over the Loop Current and associated warm core rings in the Gulf of Mexico and across the Gulf Stream, with its associated warm frontal filaments and the cold dome Gulf Stream Trough, serve either to further intensify the wind fields (over the boundary currents, rings and filaments) or to de-intensify the events (over the Trough and over cooler shelf waters). Also, the value of assimilating radar data into the modern atmospheric models at very high resolutions of ~ 0 (1) kilometer, with higher resolution models nested within and interactively coupled with ocean models, including waves, cannot be underestimated. Finally compute power is an issue and that could be provided, on demand, by contracts with High Performance Computer providers, such as IBM or other corporations during actual events, and the models could be run continuously, both deterministically and statistically.

There are two final points that the Board would like to bring to your attention. The SAB believes that NOAA's overall hurricane research program is currently not well focused and lacks both intellectual and physical resources appropriate to the magnitude of the problem at hand. To that end, the agency may be relying far too much on development work being carried out by operational rather than research and development elements.

The HIRWG Report, coming in conjunction with the much broader National Science Board report, provides NOAA a unique opportunity for NOAA to develop a comprehensive plan and thus position itself to take the leading role in this area of research so important to our Nation's environmental security. If it is NOAA's intention to be proactive rather than reactive, NOAA must seek the additional support necessary to support this effort by the agency and its research partners.

The Board hopes that the HIRWG Report is of great value and guidance to you and the agency.

Respectfully,

A handwritten signature in black ink, appearing to read "Len Pietrafesa", written over a horizontal line.

Dr. Len Pietrafesa
Chair, NOAA SAB

Cc: J. Kelly
J. Snow
D.L. Johnson
C. Decker