# Summary Report of the Review of the NOAA Atlantic Oceanographic and Meteorological Laboratory

## March 4-6, 2014

## Review Panel

Chair: Dr. William K. M. Lau, NASA Goddard Space Flight Center

Members: Prof. Richard Dodge, Nova Southeastern University

Prof. Rana Fine, University of Miami

Prof. T. Krishnamurti, Florida State University

Prof. Douglas Luther, University of Hawaii at Manoa

Prof. Michael Montgomery, Naval Postgraduate School

Dr. Paul Sandifer, NOAA, National Ocean Service

**Overview**

The on-site review was conducted over a three-day period, March 4-6, 2014 at the Atlantic Oceanographic and Meteorological Laboratory (AOML), Miami, Florida. Prior to the site review, the reviewers were briefed on the review processes, and provided with instructions during two teleconferences with the Office of Oceanic and Atmospheric Research (OAR) staff. Review materials were posted on the AOML websites ahead of the review. At the review, AOML management and scientists presented organization structure and goals, core competencies, research activities and science highlights in three major research areas:

- Ocean and Climate (OC)
- Hurricane and Tropical Meteorology (HTM)
- Coastal Oceans and Ecosystems (COE)

During the second day, in addition to oral presentations, the review also included a) a separate discussion session with junior scientists in the absence of AOML management, b) telephone interviews with stakeholders who had previously provided written input, and c) a walking tour of the labs with informal poster presentation in the lobby and hallways by rank-and-file AOML scientists and staff. On the morning of the third day, the AOML Director, Dr. R. Atlas provided an overall summary of the review, and OAR Deputy Assistant Administrator, Dr. S. Fine briefed the review panel on the project prioritization and decision making processes at NOAA/OAR. After the presentations, the Committee Chair, Dr. William Lau provided initial feedback to AOML and OAR staff in a Q & A session with AOML leadership and OAR staff. The review formally adjourned at noon on March 6.

Overall, the panel members are very impressed with the breadth and depth of the research activities at AOML. The motivation and productivity of the workforce is very high. The increase in number of refereed publications since the last review has been most impressive. All major research activities conducted in the focused areas are well aligned and highly relevant to OAR goals. The AOML Director, Dr. Robert Atlas, has demonstrated outstanding leadership in achieving a balance between basic research and core competence (OAR directed and funded) work, resulting in greatly improved quantities and quality of research publications, data products and services. The totality of the sustained observational platforms and assets maintained by AOML in all the three focus areas is extremely important, and represents a tremendous resource to the international scientific communities, and to national and regional stakeholders.

AOML scores high marks in its core competences of : a) advancing scientific understanding of physical and/or chemical processes in all three major research areas, b) developing a global ocean observing system, c) conducting field campaigns involving highly instrumented aircraft for atmospheric oceanic processes and hurricane lifecycle research, d) developing and improving models that improve prediction of hurricane tracks and intensity, and e) conducting field and laboratory studies for constituents and transport of coastal waters and their impacts on coastal

ecosystem. In the last five years, AOML scientists have produced some very exciting new results and publications at the cutting, edge of science, and measurement technologies. Most of the recommendations from the 2008 review were adequatelyaddressed. All three research areas have made substantial progress, particularly in the topics of Observing System Simulation Experiments (OSSEs) of ocean, advanced hurricane modeling and forecasting, and environmental microbiology and human health. These topics were largely absent or weak five years ago.

The overall funding of AOML has been stable, with a slight (<10%) growth in the past 5 years. The ratio of NOAA base funds to other NOAA and external funds is about 55 to 45. This ratio varies substantially among divisions, with some divisions having much larger share of base funds compared to others, *e.g.*, the ratio is approximately 80 to 20 for the Hurricane Research Division. This may be due to the different level of maturity of the programs and projects among divisions. The uneven distribution needs to be monitored, and adjusted as needed, to be consistent with OAR/AOML program and project priorities. The outreach, education, and research-to-operation aspects of all three research areas are for the most part satisfactory. However, the level of activities seems to vary among the divisions. Again, this may reflect the different maturity of the programs, and the nature of the interactions with partners and stakeholders. While AOML is on the right path to excellence in all three major research areas, the committee also found areas where potential weakness and/or threats exist. Improvements in these areas, as described in the next section, will help AOML reach the highest level of excellence. This is reflected in the following ratings (qualified*) for each research area, and by each reviewer.

| Reviewer | Lau | Luther | Fine | Krishnamurti | Montgomery | Dodge | Sandifer |
|---|---|---|---|---|---|---|---|
| OC | O- | O- | O- | | | | |
| HTM | | | | S++ | O- | | |
| COE | | | | | | S++ | S++ |

Basic rating as defined by OAR: O=Outstanding (beyond satisfactory, outstanding in all areas); S=Satisfactory (meets expectations for quality, relevance and performance); NI=Needs Improvement (does not meet expectation)

Qualified rating: The qualified rating includes two sub-levels between the basic ratings. The number of positive (negative) sub-levels represents the degree above (below) the basic rating.

**Findings and recommendations:**

The recommendations provided in this summary apply across the three focused research areas and are intended to help AOML to achieve a high level of excellence in all areas.

1. Base funds and other-NOAA funds have been increased slightly in the past 5 years. However, because of tight government budgets and increased workloads, base funds have

to be used to augment internal NOAA funds. Often this augmentation comes at the expense of delayed or simply loss of new government FTE hiring slots, and falling behind in facility maintenance. This situation has to be remedied by OAR and AOML through the current administrative channels, recognizing that even without major improvements or upgrades, sustaining existing observational network and maintaining an aging facility require more funds each year because of inflation.

2. In recent decades, satellite data have provided major advances in weather prediction and climate analysis through data assimilation; improvement in representation of physical, chemical and biological processes in climate models; diagnosis of model bias, and validation of model predictions. While the major research areas in AOML research have used satellite data to various degree, the overall usage of satellite data, and interactions and collaboration with satellite organizations within and outside NOAA have not been maximized. AOML is encouraged to consider the increase and better use of satellite data from NOAA and NASA and other satellite agencies, in conjunction with its own observational network and aircraft field campaign in data assimilation, for OSSE research and data analysis. This will also help to generate new ideas and research topics for collaborations with universities and outside partners.

3. Overall, AOML meets expectation in its outreach, education and transition from research to operations. Better results and enhanced effectiveness can be achieved through improved communication with local organizations and stakeholders. AOML is encouraged to implement a more formal process for including stakeholder input into planning, prioritization and selection of research projects, product and services to be provided to stakeholders within and outside NOAA. Increased regular solicitation of ideas, internal reviews, and communications among AOML divisions will help to find new directions and opportunities. Regular consultation with stakeholders can ensure that products and services provided by AOML are optimally used.

4. Currently, the AOML workforce is more than 50% Cooperative Institute for Marine and Atmospheric Studies (CIMAS) scientists, whose support mainly comes from proposals. This ratio is likely to increase in the near future because of constraints in government hires. In some areas, CIMAS scientists are already carrying a heavy burden in generating external funds through proposals. AOML needs to explore other ways, such as through non-NOAA reimbursable funding, to maintain a robust work force with the proper balance between FTE and CIMAS scientists, compatible with the proportion of funding available for operational versus basic research.

5. The director position of Ocean Chemistry and Ecosystem Division has been vacant for too long. It needs to be filled as soon as possible with a forward looking visionary and highly respected scientist.

6. It is important for AOML to nurture and develop a high performing young/mid-career science workforce well attuned to the unique science and operational needs of the organization. These people will be the future leaders of AOML. This can be done through orientation meetings, listening sessions, mentoring programs, proposal writing tutorials, and presentation and skill training. To the extent possible, junior and mid-career scientists should be given high priority to go to science meetings to present papers, so as to expose their research to the wider research community. Individual performance metrics should include credits for doing operational work, which does not lead to refereed publications.

7. To increase the viability of the workforce, consideration should also be given to increased collaboration with universities through joint projects, and advising graduate students, and promoting student interns. AOML should consider the expansion of its post-doctoral program, such as the National Research Council fellowships available at federal laboratories, and other internship programs. To promote outreach and applied research, more engagement with students, and local communities through open house, webinars, and school science projects could be helpful.

8. Achievements and service awards and working group memberships seem to be mostly coming from NOAA or NOAA related programs. More visibility through serving as chairs or members of non-NOAA committees and international programs needs to be demonstrated. AOML scientists are encouraged to participate and sign up for elective services in major science organization, such as conveners, chair and member of program committees in American Meteorological Society (AMS) and American Geophysical Union (AGU). Senior scientists and administrators are encouraged to nominate young and mid-career scientists for awards outside of the NOAA organization.

**The Review Process**

- The overall preparations, documents, and logistic support including travel arrangements for the review were excellent. AOML scientists and staff were very responsive in providing additional materials on request during the review. All in all, review presentations, and the science talks were very informative.
- The session with junior scientists in the absence of AOML management was highly informative. The Panel heard candid remarks, and learned a lot about the concerns of the workforce, the working environment and management practices of AOML.

- Committee members gained a lot of useful information from the walking tour and the hall way posters - from actually seeing the arrays of instruments (old and new), listening to presenters and asking questions.
- The written inputs from stakeholders and telephone discussions were very helpful in providing a new perspective on users of AOML products and services.

**Recommendations**

- Reduce the number of power point science presentations; perhaps limit to no more than two per division, to allow more time for the panel to talk to junior scientists and ask questions at the walking tour.
- Presentations need to better define and emphasize work in which AOML clearly plays a primary leadership role in, as opposed to partnership or enabling roles.
- Given the important roles of Hurricane Forecast Improvement Project (HFIP), Climate Program Office (CPO), Ocean Acidification Program (OAP) and Coral Reef Conservation Program (CRCP) in funding AOML work, a representative from each of these offices should be present at the review as observer(s) to answer questions.