

Atlantic Oceanographic and Meteorological Laboratory Science Review
November 19-21, 2019
Charge to Reviewers

Purpose of the Review

The National Oceanic and Atmospheric Administration (NOAA) Office of Oceanic and Atmospheric Research (OAR) conducts laboratory science reviews every five years to evaluate the quality, relevance, and performance of research conducted in its laboratories. This review is useful both for internal OAR/NOAA planning, programming, and budgeting, and for the laboratory's strategic planning of its future science. These reviews should also ensure that OAR research is linked to the NOAA Strategic Plan, relevant to NOAA's research mission and OAR corporate priorities, of high quality as judged by preeminence criteria, and carried out with a high level of performance. Each reviewer will independently prepare his or her written evaluations of at least one research area. The chair, a federal employee, will create a report summarizing the individual evaluations. The chair will not analyze individual comments or seek a consensus of the reviewers.

Scope of the Review

This review will cover the research of the Atlantic Oceanographic and Meteorological Laboratory (AOML) over the last five years. The research areas and related topics for the review are: TBD the list goes here

Description of AOML Research Areas

1. Physical Oceanography and its Impact on Weather, Climate and Ecosystems

Objective: Observe and understand the physical processes and mechanisms that control global ocean circulation, and characterize and predict how these mechanisms affect global and regional climate, extreme weather, sea level, and ecosystems.

AOML's physical oceanography researchers observe variations in the ocean circulation and property transport from fine-scale mixing to long-term climate change, and improve understanding of the physical processes and mechanisms that control these variations. Studies are designed to characterize, understand and predict the influence of the ocean on regional and global climate, extreme weather, sea level, and ecosystems to improve assessments, outlooks, forecasts, and resource management. In addition to designing and implementing components of the global ocean observing system, we evaluate how new and existing observations improve ocean modeling forecasts, outlooks, and assessments.

2. Ocean Chemistry and Ecosystems

Objective: Provide sound science to support informed water-quality decision-making at national, state, and local levels.

AOML's ocean chemistry and ecosystem portfolio is varied and examines how changes in numerous properties of ocean chemistry influence the associated biological systems. We leverage expertise in air-sea gas exchange to quantify the role of the oceans in sequestering carbon dioxide and the role and feedback of coastal oceans in the marine carbon cycle. We design and execute monitoring strategies to characterize, understand and predict the impact of remote and local forcing pressures, including climate change, ocean acidification, and land-based sources of pollution, and their synergistic interactions, on critical marine ecosystems. We develop and apply data, models, and ecological assessments to better inform resource management decision support for our federal, state, and local partners.

3. Hurricanes and Modeling

***Objective:** Improve the basic physical understanding, data assimilation, and model forecasts of tropical cyclone intensity/structure change, with a focus on rapid intensity change and associated impacts such as rainfall.*

AOML's hurricane research is comprised of three foci: observations and understanding, modeling, and data assimilation. We leverage and annual hurricane field program to characterize, understand, and predict physical process important to the prediction of tropical cyclone track, intensity, and structure change and their impacts (rainfall, storm surge, flooding, damaging waves, winds, and severe weather). We advance hurricane forecast guidance by creating and verifying next generation numerical models, and advancing data assimilation techniques in support of NOAA's unified forecast system. And we leverage NOAA's Quantitative Observing System Analysis Program and data assimilation techniques to optimize the use of current and proposed observations to improve global and hurricane forecast guidance.

Evaluation Guidelines

For each research area reviewed, each reviewer will provide one of the following overall ratings:

- *Highest Performance:* Laboratory greatly exceeds the Satisfactory level and is outstanding in almost all areas.
- *Exceeds Expectations:* Laboratory goes well beyond the Satisfactory level and is outstanding in many areas.
- *Satisfactory:* Laboratory meets expectations and the criteria for a Satisfactory rating.
- *Needs Improvement:* Laboratory does not reach expectations and does not meet the criteria for a Satisfactory rating. The reviewer will identify specific problem areas that need to be addressed.

Reviewers are to consider the Quality, Relevance, and Performance of the Laboratory, and to provide one of the overall ratings above for each research area reviewed. We also ask that, in addition to the overall ratings for each research area, if possible, also assign one of these ratings for the subcategories of Quality, Relevance, and Performance within the research area reviewed. Ratings are relative to the Satisfactory definitions shown below.

1. **Quality:** Evaluate the quality of the Laboratory's research and development. Quality is a measurement of merit within the scientific community based on the novelty, soundness, accuracy, and reproducibility of a specific body of research, as represented by outputs delivered by the Laboratory. Assess whether appropriate policies are in place to ensure that high quality work will be performed in the future. Assess progress toward meeting OAR's goal to conduct preeminent research as listed in the "Indicators of Preeminence." Preeminence is tied to the frequency and level of peer review publication undertaken or supported by the Laboratory along with corresponding bibliometric data, as this information serves as a benchmark with which to compare the Laboratory to other organizations of similar size and scope.
- **Quality Rating Criteria:**
 - *Satisfactory* rating – Laboratory scientists and leadership are often recognized for excellence through collaborations, research accomplishments, and national and international leadership positions. While good work is done, Laboratory scientists are not usually recognized for leadership in their fields.
 - **Evaluation Questions to consider:**
 - Does the Laboratory conduct or support/fund preeminent research? Are the scientific products and/or technological advancements meritorious and do they significantly contribute to the scientific community?
 - How does the quality of the Laboratory's research and development rank among Research and Development (R&D) programs in other U.S. federal agencies? Other science agencies/institutions?
 - Are appropriate approaches in place to ensure that high quality work will be done in the future?
 - Do Laboratory researchers demonstrate scientific leadership and excellence in their respective fields (e.g., through collaborations, research accomplishments, externally funded grants, awards, membership and fellowship in societies)?
 - Is the Laboratory supporting the right people doing the best science?
 - **Indicators of Quality:** Indicators can include, but not be limited to the following (note: not all may be relevant to each Laboratory)
 - The Laboratory's total number of refereed publications per unit time and/or per scientific Full Time Equivalent scientific staff (FTE).
 - A list of technologies (e.g. observing systems, information technology, numerical modeling algorithms) transferred to operations/application and an assessment of their significance/impact on operations.
 - The number of citations for the Laboratory's scientific staff by individual or some aggregate.
 - A measure (often in the form of an index) that represents the value of either an individual scientist or the Laboratory's integrated contribution of refereed publications to the advancement of knowledge (e.g., Hirsch Index). NOAA librarians recommend percentile analysis as the preferred bibliometric approach.
 - A list of awards won by groups and individuals for research, development, and/or application.
 - Elected positions on boards or executive level offices in prestigious organizations (e.g., the National Academy of Sciences, National Academy of Engineering, or fellowship in the American Meteorological Society, American Geophysical Union

or the American Association for the Advancement of Science etc.).

- Service of individuals in technical and scientific societies such as journal editorships, service on U.S. interagency groups, service of individuals on boards, steering groups, and committees of international research-coordination organizations. Evidence of collaboration with other national and international research groups, both inside and outside of NOAA as well as within the Laboratory itself, including Cooperative Institutes and universities, as well as reimbursable support from non-NOAA sponsors.
- Significance and impact of involvement with patents, invention disclosures, Cooperative Research and Development Agreements and other activities with industry.
- Other forms of recognition from NOAA information customers such as decision-makers in government, private industry, the media, education communities, and the public.
- Contributions of data to national and international research, databases, and programs, and involvement in international quality-control activities to ensure accuracy, precision, inter-comparability, and accessibility of global data sets.

2. Relevance: Evaluate the degree to which the Laboratory's research and development is relevant to NOAA's and OAR's missions and of value to the Nation. It is a direct expression of the OAR Vision and corporate priorities– to deliver NOAA's Future needs. Relevance refers to the value of the Laboratory's activities to users beyond the scientific community, both in terms of hypothetical value and actual impact. It is measured by how well the specific research or activity supports OAR's and NOAA's missions and broader societal needs. As OAR's Reviews are focused on the preceding five years of operation for each Laboratory or Program, multiple strategic documents and priorities are of consideration for Relevance. For the operating period between 2014 – 2019, the NOAA 5-year Research and Development Plan objectives (FY13 - FY18), the NOAA Strategic Plan objectives (FY 14 - FY16), and the NOAA priorities (FY17 – present) will be used for evaluation. This relevance can come in the form of applying scientific knowledge to policy decisions, improving operational capabilities at NOAA's service lines, or patenting and licensing new products for commercial use. Assess whether the Laboratory identifies the overarching problem(s) it seeks to address and whether its activities address its goals and objectives identified above, the goals of relevant inter-agency working groups, relevant legislative requirements, and impacts to society at large.

➤ **Relevance Rating Criteria:**

- *Satisfactory* rating -- The R&D enterprise of the Laboratory shows linkages to NOAA's and OAR's missions, NOAA Strategic Plan, NOAA Priorities, OAR corporate priorities and 5-Year Research and Development Plan, and is of value to the Nation. There are some efforts to work with customer needs but these are not consistent throughout the research area. Transition plans for delivery of research products to customers or operators are being developed constantly but do not yet cover all applicable activities.

➤ **Evaluation Questions to consider:**

- Does the research address existing (or future) societally relevant needs (national and international)?
- How well does the research address issues identified in the NOAA strategic plan,

NOAA priorities and research plans or other policy or guiding documents, including inter-agency working group goals and relevant legislative requirements?

- Are customers engaged to ensure relevance of the research? How does the Laboratory foster an environmentally literate society and the future environmental workforce? What is the quality of outreach and education programming and products? Does the Lab have an identified Transition pathway (R2X) so their products are moved to the relevant customers?
 - Does the science and outreach conducted or funded by the Laboratory fulfill stakeholder needs, including the needs of other Line Offices?
 - Are there R&D topics relevant to national needs that the Laboratory should be pursuing but is not? Are there R&D topics in NOAA and OAR plans that the Laboratory should be pursuing but is not?
- **Indicators of Relevance:** Indicators can include, but should not be limited to the following (note: not all may be relevant to each Laboratory)
- A list of research products, information and services, models and model simulations, and an assessment of their impact by end users, including participation or leadership in national and international state-of-science assessments.
 - Evidence of linkages to objectives in the NOAA strategic plan and NOAA priorities (e.g., milestones completed in the Annual Operating Plan).
 - Successfully implemented transition plans with documentation of effective transitions to customers.
 - Economic value of Laboratory products, as demonstrated by cost-effectiveness and impacts analyses conducted by NOAA's Office of the Chief Economist.
 - Access to Laboratory products, as demonstrated by counts of hits/usage of and downloads from Laboratory web sites.
 - Evidence of public outreach, such as visitors to Laboratory, product demonstrations or local education efforts conducted by Laboratory personnel.

3. Performance: Evaluate the overall effectiveness with which the Laboratory executes its mission and meets NOAA Strategic Plan and Priorities objectives and the needs of the nation, given its resources. Performance is a measurement of effectiveness (ability to achieve useful results) and efficiency (ability to achieve quality, relevance, and effectiveness in a timely fashion with minimal waste). It refers not only to how well tasks are executed, but also to the adequacy of the leadership, workforce, and infrastructure in place to meet the Laboratory's goals. One of the key criteria of performance is the quality of management: how well Laboratory leadership interacts with stakeholders, articulates its strategic direction, and manages its R&D portfolio. Performance therefore is also a measure of accountability: how well the Laboratory oversees and directs its own operations and how well those operations adhere to and further the goals of NOAA's and the Laboratory's strategic plans. Laboratories are judged on how well they plan and conduct their research and development. The evaluation will be conducted within the context of three sub-categories: **a) Research Leadership and Planning, b) Efficiency and Effectiveness, c) Transition of Research to Applications (when applicable and/or appropriate).**

➤ **Performance Rating Criteria:**

- *Satisfactory* rating --

- The Laboratory generally has documented scientific objectives and strategies through strategic and implementation plans (e.g., Annual Operating Plan) and a process for evaluating and prioritizing activities.
- Laboratory management generally functions as a team and works to improve operations.
- The Laboratory usually demonstrates effectiveness in completing its established objectives, milestones, and products.
- The Laboratory often works to increase efficiency (e.g., through leveraging partnerships).
- The Laboratory is generally effective and efficient in delivering most of its products/outputs to applications, operations or users.

A. Research Leadership and Planning: Assess whether the Laboratory has clearly defined objectives, scope, and methodologies for its key projects.

➤ **Evaluation Questions to consider:**

- Does the Laboratory have clearly defined and documented scientific objectives, rationale and methodologies for key projects?
- Does the Laboratory have an evaluation process for projects: selecting/continuing those projects with consistently high marks for merit, application, and priority fit; ending projects; or transitioning projects? If so, how well does it adhere to that process?
- How does the laboratory manage its transition process? What does the lab do throughout its research and development activities to enhance the likelihood of successful transitions?
- Does the Laboratory identify the overarching problem(s) it seeks to address through research and development or science and outreach? Are scientists required to develop a good plan, execute that plan, and report on it?
- Does the Laboratory have the leadership and flexibility (i.e., time and resources) to respond to unanticipated events or opportunities that require new research and development activities?
- Does the Laboratory provide effective scientific leadership to and interaction with NOAA and the external community on issues within its purview?
- Does Laboratory management function as a team and strive to improve operations? Are there institutional, managerial, resource, or other barriers to the team working effectively?
- Has the Laboratory effectively responded to and/or implemented recommendations from previous science reviews?

➤ **Indicators of Leadership and Planning:** Indicators can include, but not be limited to, the following (Note: Not all may be relevant to each Laboratory).

- NOAA Strategic Plan
- Program/Project Implementation Plans
- Transition Plans
- Annual Operation Plan performance measures and milestones
- Active involvement in NOAA planning and budgeting process
- Early engagement with end users for technology

- Final report of implementation of recommendations from previous reviews
- B. Efficiency and Effectiveness:** Assess the efficiency and effectiveness of the Laboratory's research and development, given its goals, resources, and constraints and how effective it is in obtaining needed resources through NOAA and other sources.

➤ **Evaluation Questions to consider:**

- Does the Laboratory execute its research in an efficient and effective manner given its goals, resources, and constraints?
- Is the Laboratory organized and managed to optimize the planning and execution of research, including the support of creativity? How well integrated is the work with NOAA's and OAR's planning and execution activities? Are there adequate inputs to NOAA's and OAR's planning and budgeting processes?
- Is the proportion of the Laboratory's external funding appropriate relative to its NOAA base funding?
- Is the Laboratory leveraging relationships with internal and external collaborators and stakeholders to maximize research outputs?
- Are human resources adequate to meet current and future needs? Is the Laboratory organized and managed to ensure diversity in its workforce? Does it provide professional development opportunities for staff?
- Are appropriate resources and support services available? Are investments being made in the right places?
- Is infrastructure sufficient to support high quality research and development?
- How effective is oversight of the Laboratory? Are projects on track and meeting appropriate milestones and targets? What processes does management employ to monitor the execution of projects?

➤ **Indicators of Efficiency and Effectiveness:** Indicators can include, but should not be limited to, the following (Note: Not all may be relevant to each Laboratory).

- List of active collaborations
- Number, types, and longevity of partnerships (indicates how well the Laboratory leverages relationships with collaborators to maximize research outputs)
- Funding breakout by source (indicates involvement and commitment of NOAA vs. external stakeholders)
- Laboratory demographics (e.g. diversity)
- Ability to meet required deadlines (e.g. reports to Congress)
- Performance metrics of products and services.
- Employee satisfaction (e.g. from internal surveys)

- C. Transition of Research to Applications:** How well has the Laboratory delivered products and communicated the results of their research? Evaluate its effectiveness in transitioning and/or disseminating its research and development into applications (operations, commercialization, and/or information services).

➤ **Evaluation Questions to consider:**

- How well is the transition of research to applications, commercialization, and/or dissemination of knowledge planned and executed?

- Are end users of the research and development involved in the planning and delivery of applications and/or information services? Are they satisfied?
 - Are the research results communicated to stakeholders and the public?
- **Indicators of Transition:** Indicators can include, but not be limited to, the following (Note: Not all may be relevant to each Laboratory).
- A list of technologies (e.g. observing systems, information technology, numerical modeling algorithms) transferred to operations/application and an assessment of their significance/impact on operations/applications.
 - Significance and impact of transition to industry, including patents, license agreements and other related activities.
 - Discussions or documentation from stakeholders.

Proposed Schedule and Time Commitment for Reviewers:

The review will be conducted November 19-21, 2019 in Miami, Florida. Two teleconferences before the review are planned with the OAR Deputy Assistant Administrator for Science, Gary Matlock, who will be the Executive liaison with the review team and for the completion of the report. All relevant information requested by the review team will be provided on the review website at least two weeks before the review.

Each reviewer is asked to independently prepare their written evaluations on each research theme, including an overall rating for the theme and provide these to the Chair with a copy to Philip Hoffman in OAR headquarters. The Chair, TBD, will create a report summarizing the individual evaluations. The Chair will not analyze individual comments or seek a consensus of the reviewers. We request that within 45 days of the review, the review team provide the draft summary report to Gary Matlock. Once the report is received, OAR staff will review the report to identify any factual errors and will send corrections to the review team. The final individual evaluations and the summary report are to be submitted to the OAR Assistant Administrator, Craig McLean.

Review Team Resources:

OAR will provide resources necessary for the review team to complete its work.

1. Review Team Support: Information to address each of the laboratory’s research themes to be reviewed will be prepared and posted on a public review website. A copy of all the information on the website will also be provided to reviewers at the review.
2. Travel arrangements for the onsite review will be made by AOML and paid for by OAR.
3. On-site review team support to acquire and deliver to the team any additional relevant documents requested during the review which will aid in assessing the Laboratory.