October 15, 2002

MEMORANDUM FOR: Gregory W. Withee Assistant Administrator, NESDIS

FROM:

Marie Colton Director, ORA

SUBJECT:

Response for the Science Advisory Board regarding ORA External Science Review Report follow-up

The NESDIS Office of Research and Application would like to thank the External Science Team (EST) Panelists from the NOAA Science Advisory Board (SAB) for their thorough review held September 14-15, 2000. We appreciated the opportunity to discuss NESDIS science and applications with the group and to get suggestions and recommendations on how to improve our programs.

We will take this opportunity to demonstrate how we have responded to the EST suggestions over the past two years. For convenience, each recommendation in the EST reporth has been numbered sequentially (see numbered copy) and used in our response. Following the report outline, our response is organized in five sections: 1) Strategic, Operational and Tactical Planning; 2) Science Priorities; 3) Partnerships; 4) Technology Transfer; and 5) Capacity Building, Education and Diversity.

1. Strategic, Operational and Tactical Planning

A Strategic Planning

a) EST Recommendations

Recommendation #2: A strategic plan for the ORA is needed which incorporates customer input. This plan will not only serve as an important element in the ORA roadmap to the future, it will further serve to integrate the vision, mission and objectives of the ORA with other divisions within NESDIS and NOAA. This integration is needed to maximize the contributions of the ORA to the broader community of internal and external stakeholders.

Recommendation #7: It is important that management foster a view to distant research horizons and not allow pre-occupation with instant results for the web pages to dominate the agenda.

Recommendation #8: The ORA must distinguish between work that is relevant and work that is a priority. Given that part of the ORA mission is the validation of satellite products, it is unfortunate that ORA scientists

must seek external funding for needed instrumentation and to support field programs. Does NOAA/NESDIS/ORA consider the inherent, if not the immediately apparent costs of obtaining external funds? The constraints of inadequate base funds warrant vigilance by the ORA to avoid mission drift and to prioritize its objectives.

Recommendation #9: It is recommended that the ORA determine an optimal breadth of research as part of its strategic planning process.

b) ORA Interpretation

ORA should continue to focus activity using the Operating Plans and Tasks for ORA (OPTORA) process, taking into account the concerns expressed by the SAB. In instituting the OPTORA process, ORA should develop a "roadmap" that links emerging and required remote sensing science, future instruments, and user requirements into a consolidated view for the future. Input should be obtained from other NESDIS and NOAA offices and reviewed by our customers. The vision should be cognizant of relevance, mission priorities, and resources such that substantive progress can be made in relevant scientific areas that can be adequately supported, and irresolvable goals identified.

c) ORA Actions

Over the past two years and most recently with the Program Review instituted by the new NOAA administrator, NOAA as a whole and NESDIS have developed or are in the process of developing new strategic plans. From these plans, NESDIS has prepared a 5-year Implementation plan and each Office is linked to this plan by an Annual Management Contract, which identifies applications milestones to be completed each year. ORA has been contributing and participating in all these activities. Also because of the program review, NESDIS has been designated to work with other NOAA line Offices to establish NOAA-wide observational requirements. Results for NWS, NMFS and NOS are almost completed. This process will guide NOAA in its systems development and priorities which will lead to improved specifications for ORA in future program development.

B Performance Measures

a) EST Recommendations

Recommendation #1: It is recommended that the ORA define and implement approaches to document the value-added by ORA science to the internal/external user community.

Recommendation #5: The EST believes that it would be wise and prudent for the ORA to develop metrics that permit management to have a more

quantitative view of its relative effort in the areas of development and transition, a view that can be communicated to others.

Recommendation #6: It is recommended that ORA routinely survey organizations internal and external to NOAA to determine the value-added to the activities of their organizations by the ORA transition and operational product activities.

Recommendation #10: The EST applauds the institution of the OPTORA process and recommends that the ORA strategic plans and operational tasks are aligned with the ORA and NESDIS budgets and that all are used to prioritize the work of ORA.

- b) ORA Interpretation: ORA should better describe and promote understanding of the "business" of applications science by characterizing the investment costs and return rates for new products in terms of economic or other quantitative measures that can be used to explain, inform, justify, prioritize or focus new science investment.
- c) ORA Actions

In the NESDIS Annual Management Contracts mentioned above, offices are required to set milestones and report quarterly on their accomplishments in accordance with the Government Performance Review Act. ORA has accomplished all its goals for the past two years. Furthermore, because of the President's Management Agenda that requires performance measures to be instituted, NESDIS and ORA have received extensive training in specifying measures appropriate to desired outcomes of science programs. Recently, ORA management attended a three-day workshop on "Peformance Measures for R&D Organizations" which brought together all of the R&D branches of government agencies to address common approaches for measuring"user-inspired" science performance within federal science programs. ORA intends to adopt such a "values-oriented" framework to specify measures appropriate in each of the categories of long-term, sustaining, improved, and technologically innovative work.

ORA has participated in two GOES Users Conferences where users' requirement in terms of hardware, software, and products where discussed and where constituents where able to voice their needs. This is a very important source of feedback for the Office activities. Finally, a products review was conducted between NESDIS and the NWS, which reviewed nearly 400 satellites products for relevance and quality.

2. Science Priorities

a) EST Recommendations

Recommendation #3: The EST recommends that the ORA work more closely with the management of NOAA, other elements of NOAA (e.g. the National Weather Service), and NASA to provide a stronger emphasis on the development of improved systems and observations from geostationary orbit. Enhanced collaborations with NASA regarding such efforts are encouraged.

Recommendation #12: The EST recommends that the ORA plan and strengthen its efforts in the calibration and validation of satellite data for climate purposes. This effort not only should involve joint efforts with NASA and the Department of Defense (DOD), but also with academia, particularly the inclusion of graduate students and faculty. These types of efforts are very good for the training of students and the acquisition of an appropriate depth of understanding of how satellite instruments perform and how their measurements can be applied.

Recommendation #13: The EST supports the ORA in its efforts to engage in a more deliberate ocean and coastal remote sensing direction and recommends that the OPTORA process be applied to the ocean efforts and that NESDIS and NOAA subsequently encourage and support this as deemed appropriate and possible. The approach employed by the ORAD to identify the needs of the "customer base" as guidance to selecting tasks within the NOAA guidelines is key to the success of this effort.

Recommendation #14: The EST encourages the ORA and its divisions to include in its planning and programs explicit social science objectives and associated research.

b) ORA Interpretation:

The National Polar-orbiting Environmental Satellite System (NPOESS) has established a risk-reduction effort called NPOESS Preparatory Program (NPP) with NASA and other elements of NOAA to launch and evaluate new sensors on experimental polar satellites prior to their implementation on NPOESS operational platforms. The recommendation seems to suggest that ORA should explore a geostationary counterpart to NPP, a "GPP", within the NESDIS, NASA, and GOES user community. The opportunity afforded by NASA's GIFTS program should be fully exploited, with full encouragement and support by NESDIS and NOAA management.

Special attention should be given to delivery of well-calibrated satellite data via calibration/validation efforts that include ORA working with other instrument and remote sensing specialists, as well as academia. Satellite data from instruments with known characteristics are essential to both basic algorithm performance and the development of long-term climate records.

Long term coordinated programs with other satellite data providers and users should be developed with the support of NESDIS management ORA initiatives to mainstream satellite oceanography and coastal remote sensing are timely and relevant, and should be encouraged and supported by NESDIS.

ORA should include relevant social science objectives in its research portfolio. Since social science is not its primary mission, ORA should at the least address how satellite data can be provided to users so that the data are amenable to social science studies. ORA should then engage in collaborative research partnerships with *s*ocial scientists. The outcomes of such studies would also help ORA quantify the value of satellite data and products as well as support societal research. ORA should support and exploit social science aspects being undertaken by programs with which it is involved, such as USWRP.

c) ORA Actions

In 2002, the NASA/NOAA Joint Center for Satellite Data Assimilation (JCSDA) was created. This center physically co-located employees from NESDIS/ORA, NWS/NCEP, NASA and DOD and is exploiting satellite data for improving weather prediction. Data assimilation from advanced sounders such as GIFTS is a science priority and is currently being studied using the NASA Advanced IR Sounder (AIRS). Launched in May, 2002, these data are already being used in parallel-runs at NCEP and other major weather centers, marking a record time for research data to reach the operational centers. With respect to GIFTS, a product and application development plan has been developed and approved that outlines NOAA participation in this geostationary "risk-reduction" effort.

Long-term data analyses, calibration and validation of operational and research systems has taken on special importance in the intervening two years since the SAB review. Attention on "climate services" has resulted in major participation in "climate observational systems" panels, the CEOS Working Group on calibration and validation, a review and formal response to the NRC study on long-term satellite data, establishment of formal science teams between ORA and our sister organization, the National Climatic Data Center, direct connections with NCEP Climate Prediction Center, and the NPOESS Preparatory Program, which has the charter of defining operational "Climate Data Records". ORA's role is to maintain in-depth knowledge of instruments and their pre-launch and postlaunch characteristics to ultimately reduce system errors that contribute to the overall variance in the climate signals deduced from satellite data. Further, we are working to identify the highest priority data that should be reprocessed for climate, especially to include the AVHRR and microwave data.

In order to reinforce the Oceanography side of its activities, ORA will award a new Cooperative Institute for Satellite Ocean Oceanography in the first quarter, FY03. This is the first competitively awarded NOAA Cooperative Institute and marks a milestone for "satellite oceanography" by formally recognizing remote sensing as a specialty within a major oceanographic academic institute. Within ORA, we have a new ocean division chief who is enthusiastically leading the charge to "operationalize" satellite oceanography. He has formed inter-office and agency science teams around each of the major observables (sea temperature, color, wind, ice, and height) in order to produce a suite of validated products for input into forecast systems and use by coastal managers for real-time applications.

The inclusion of social sciences is done through the Cooperative Institutes and in particular will be an essential part of the Coop Inst for Climate Studies (CICS) at the Univ. of Maryland through the collaboration of ORA scientists with the geography and social science departments. In addition, ORA recently acquired GIS technology and is hiring a contractor to establish and teach the connections between space and demographic data so that ORA researchers can learn to prepare science products that are of relevance and utility to social scientists. Finally, all of our major appropriated programs have been organized around five essential elements: Internal (directed) research, External (competitive) research, education, outreach, and infrastructure. Collaborative work in social sciences will be achieved through the external and outreach components of these programs.

3. Partnerships

a) EST Recommendations

Recommendation 15: The ORA will need to be much more sensitive to its potential customers and to form new partnerships with research and development laboratories that are external to its existing base of partners. Clearly, senior management recognizes this imperative with respect to the use of satellite data in Numerical Weather Prediction (NWP); however, strong partnerships must be established with other application domains.

Recommendation #16: The EST also views the use of cooperative institutes as an effective strategy to advance the work of the ORA and supports the addition of more oceanographic efforts in these Institutes and the addition of a new Cooperative Institute for Ocean Remote Sensing as proposed by ORAD during this review.

Recommendation #17: It is recommended that a broader outreach be established to engage the inventiveness and energy and resources of

universities other than those represented by the Cooperative Institutes and of other agencies that have interests similar to ORA.

Recommendation #19: It is imperative that close relations be maintained between the NWP model development group of the National Center for Environmental Prediction (NCEP) and ORA if the goal of improving the use of satellite data in NWP models is to be realized. In addition, if ORA and NCEP were collocated with NASA and university associates, then their synergy would most probably result in significant payoffs.

c) ORA Interpretation: ORA research and development activities and data products have value to an increasingly large audience. ORA must partner with a global network of informed users and developers, as well as the R&D components of other satellite operators, to achieve full utilization of our data, to increase our understanding of user needs, to identify critical, new science issues, and to leverage our own and external talent.

d) ORA Actions

ORA by the creation of Joint Centers and Cooperative Institutes, has successfully collaborated with other parts of NOAA, the Federal Government and Academia. ORA is committed to maintain and expand these collaborations. ORA also has public announcements of opportunity via its appropriated programs in which work of other academic institutions is solicited.

In addition, with the creation of the Coastal Remote Sensing Program established in close collaboration with NOAA/NOS, ORA is reaching out to state and local agencies as well as the private sector.

ORA has a strong program for Post-doctoral Fellows and Visiting Scientists that brings both new ideas and potential new employees.

The Office recently received NESDIS' approval to reorganize into divisions that will facilitate partnerships and explicit connections to strategic areas: satellite climatology and meteorology, satellite oceanography, and Cooperative Research Programs, which manages all of the cooperative institutes in a division for better coordination of research and activities.

4. Technology Transfer

a) EST Recommendations

Recommendation #4: The EST is of the view that a stronger effort needs to be made to ensure that product development is connected with the prime customers (who we expect to be within NOAA and in particular the NWS).

Recommendation #20: The EST must re-emphasize the ORA's unique and important role as a transition laboratory and that it must be more deliberate in its work to maintain a healthy balance between development and transitions. Other NOAA laboratories have budgetary lines that clearly define the relative effort between development and transitions. The ORA does not.

Recommendation #21: It is important that management foster a view to distant research horizons and not allow pre-occupation with instant results for the web pages to dominate the agenda (identical to #7).

b) ORA Interpretation

ORA occupies a critical, transition link between remote sensing science and the operational remote sensing services that NESDIS has the mission to provide. ORA scientists study and contribute to the scientific body of knowledge pertaining to remote sensing physics, but are distinct from pure academicians, in that they specialize in the application of that knowledge to solving current, real-world problems, which often exist in non-scientific constituencies. Those individuals who are successful in the bridging role between research and operations need appropriate levels of management support to initiate and follow transitions from the research domain all the way into an operational product. ORA must track and quantify its scientific success not only in conventional terms of publications and scientific reputations, but also in terms of the operational value of new services that ORA's scientific activities help bring on-line. Similarly, ORA, with its customers' involvement, should develop initiation, traceability, funding and quantifiable success measures pertinent to the successful implementation and appraisal of a new product. NESDIS should identify methods to support and reward successful, timely transitions.

c) ORA Action

ORA is taking full advantage of the Mission Development Requirements list established for various NOAA Line Offices and is using those to guide the development of its programs. The Director is a member of the newly established NOAA Research Council that has the aim of developing a corporate science strategy and programmatic balance for NOAA.

ORA has been actively involved in an extensive analysis of the research-tooperations process at NESDIS, with an eye both to improving the timeliness of real-time product transitions and also using the process to address "climate" and "archive" products. This work is being coordinated with the activities associated with the NOAA Program Review so as to incorporate as much of the new strategies, requirements, architecture, and science directions as possible.

ORA has also participated as an "expert witness" in two NRC studies on technology transfer of remotely sensed data into applications.

5. Capacity Building, Education and Diversity

a) EST Recommendations

Recommendation #11: Given the very necessity and worthiness of addressing the advent of new instruments and their ensuing data sets, obtaining the necessary resources and recruiting, retaining, and rewarding the requisite personnel, the EST recommends that NESDIS and NOAA management should be cognizant of the resource needs and support the ORA insofar as possible.

Recommendation #18: The EST clearly notes that the existing infrastructure is a major challenge as it relates to the effectiveness of the ORA and encourages the ORA, working with the management of the NESDIS and NOAA, to be alert to opportunities to obtain housing facilities that adequately allow the mission, intent, and purpose of the ORA to be sustained as described in previous sections.

Recommendation #22: The ORA, NESDIS, and NOAA should explore new approaches to attract, educate, retain, and reward personnel that have the talents and potential needed to advance their goals. Special emphasis within that broad objective should be placed on identifying, encouraging, and recruiting underrepresented minorities. Programs should exist within the ORA to educate, encourage and promote minorities and women into management. The statistics provided to the EST by the ORA management on the status of women and minorities within the organization were not representative of an organization that encourages diversity.

Recommendation #23: It is recommended that the statistics regarding the status of women and minorities within ORA be reviewed by NESDIS and, in turn, NESDIS should formulate a plan to address diversity. The importance and attractiveness of the NOAA mission and the attendant contributions that a properly trained individual can provide for the benefit of mankind should be emphasized within this plan.

Recommendation #24: The EST applauds the recognition given to ORA researchers for their outstanding achievements. The EST believes that the

ORA should continue to promote and encourage individuals and groups to seek NOAA-wide and other special awards in recognition of their outstanding achievements. This is a sound approach to increasing NESDIS/ORA visibility to the internal and external community.

b) ORA Interpretation

ORA's science mission can only be accomplished by employing the best human talent available. ORA's population demographics should be examined to determine how to take advantage of the diversity that the nation's scientific community offers in order to fully tap the available talent pool. The educational activities underway at ORA's Institutes and at MSIs should be encouraged and strongly supported by management. ORA must be more deliberate in its recruitment efforts to reach the widest possible candidate audience. Once the employees are at ORA, a continued supportive environment, with opportunity to grow and be recognized, as well as modern facilities are necessary to retain the special talent needed. It is recognized that the ORA needs to be housed in a superior science environment facility, and to that end ORA should act with other elements in NOAA to relocate to an up-to-date scientific environment.

c) ORA Actions

ORA was a full participant in the NOAA-wide SFA process and has identified several actions that should improve the quality of its workforce and quality of life for the workforce.

In addition, exploration of the relocation of ORA on the University of Maryland College Park Campus is being actively pursued. However, the construction of the building as well as the move is not expected before 2007-2009 and is subject to receiving adequate funding from Congress. Meanwhile, ORA is currently renovating all of its spaces within the World Weather Building to provide better use of space and windows, provide new furniture, and improve safety.

In 2001, under a new program, a Cooperative Institute for Remote Sensing Science and Technology was created at the City University of New York, New York Campus, with a consortium of five other minority serving institutes. This program has the express purpose of matriculating minority students in environmental sciences.