

MEMORANDUM OF AGREEMENT

ESTABLISHING A

JOINT PROJECT

BETWEEN

THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

U.S. DEPARTMENT OF COMMERCE

AND

THE UNIVERSITY OF MARYLAND, COLLEGE PARK

CONCERNING COLLABORATION BETWEEN THE UNIVERSITY OF
MARYLAND RESEARCH AND ACADEMIC COMMUNITIES AND THE
NOAA CENTER FOR WEATHER AND CLIMATE PREDICTION

Agreement No. 13-032877

I. PARTIES

This document constitutes an agreement between the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce, and the University of Maryland, College Park (UMD-CP), which is a constituent institution of the University System of Maryland, itself a public agency and instrumentality of the State of Maryland.

II. AUTHORITIES

The National Oceanic and Atmospheric Administration has authority to participate in the Collaboration with the University of Maryland, College Park, under:

1. 15 U.S.C. § 313, which authorizes the Secretary of Commerce to forecast weather, collect, distribute, and transmit meteorological information, and to take such meteorological observations as may be necessary to establish and record the climatic conditions of the United States; and

2. 49 U.S.C. § 44720, which authorizes the Secretary of Commerce to promote and develop meteorological science and foster and support research projects in meteorology through the use of private and governmental research facilities and provide for the publication of results unless publication would not be in the public interest; and
3. 33 U.S.C. § 883d, which authorizes the Secretary of Commerce to conduct investigation and research in geophysical sciences, including geodesy, oceanography, seismology and geomagnetism; and
4. 15 U.S.C. § 2901-2908, the National Climate Program Act, which authorizes the Secretary of Commerce to collect, monitor, analyze, and actively disseminate climatological global data, information, and assessments on a continuing basis in order to provide reliable, useful and readily available information; and
5. 15 U.S.C. § 1540, which authorizes the Under Secretary of Commerce for Oceans and Atmosphere to enter into cooperative agreements and other financial transactions with any nonprofit organization to aid and promote scientific and educational activities to foster public understanding of NOAA and its programs; and
6. 15 U.S.C. § 1525, NOAA's Joint Project Authority, which provides that NOAA may enter into joint projects with nonprofit, research, or public organizations on matters of mutual interest, the cost of which is equitably apportioned.
7. P.L. 110-69, § 4002, 121 Stat. 572, The America Competes Act, which directs the Administrator of NOAA to conduct, develop, promote and coordinate formal and informal educational activities at all levels to enhance public awareness and understanding of ocean, coastal, Great Lakes and atmospheric science and stewardship.

III. PURPOSE

This MOU between NOAA and the UMD (collectively referred to herein as the Parties) reaffirms their common interest in numerical weather, climate, and ocean prediction, and the growing emphasis on "earth system science research" to include ecosystems research and development. It provides a basis for future collaboration concerning these and other matters of interest to the Parties as described below.

Pursuant to this agreement, the parties will pursue cooperative activities in areas where mutual interest exists of the following nature:

- A. Engage in potential collaborative research on topics of mutual interest including:
 - Numerical inversion of huge elliptic problems, and iterative solutions of 4-dimensional inversion problems;
 - Efficient parallelization of these large computational problems, since complex atmospheric forecasts have to be run much faster than clock time in order to be useful;

- Very high resolution regional atmospheric models coupled with the national models, including improved assimilation of satellite data for the atmosphere and earth's surface in mesoscale NWP and coupled climate models;
 - Estuary models for the Chesapeake Bay and tributaries coupled with NOAA coastal and atmospheric models;
 - Air quality measurement and air quality and atmospheric dispersion modeling;
 - Physics of cloud and radiation processes;
 - Atmospheric and coastal ocean chemistry, transport of pollutants, and their fate;
 - Study the economic value and cost benefit of the introduction of costly new models and instruments which should result in better quality forecasts;
 - Physics of radiative transfer and the development of new algorithms for the use of satellite data - both within models and for direct forecaster interpretation and use;
 - Hydrological models and models representing the interaction between the biosphere, the soil and the atmosphere;
 - More efficient methods of transfer of large amounts of data to users;
 - Coupled ocean-atmosphere-land models for short term weather to seasonal to inter-annual prediction methods; to apply theories of chaos and dynamical systems to estimate forecast reliability and utility;
 - Improved geostationary satellite rainfall algorithms for flash floods and heavy precipitation improved determination of land surface characteristics including development of soil moisture algorithms;
 - Ozone research and application to climate studies, human effects of radiation and air quality;
 - Application of satellite data for climate models and diagnostic studies;
 - Analysis of climate variability and change;
 - Calibration of satellite instruments and satellite navigation;
 - Satellite instrument development;
 - Physical oceanographic applications -e.g., sea surface temperature development and analysis of ocean waves;
 - Biological oceanographic studies, e.g., coral reefs
 - Coastal zone applications of satellite data, including studies of Chesapeake Bay.
 - High performance computing technology development, advancement, management and procurement planning and execution; and
- B. Provide opportunities for NOAA Center and UMD scientists and researchers to present lectures on advances in fields of mutual interest; and
- C. Develop mechanisms for increasing interactions between NOAA Center scientists and UMD graduate students, including supervision of graduate student research at the NOAA Center, and post – doctoral scientists; and
- D. Develop opportunities for UMD students to intern or participate in research at the NOAA Center; and

- E. Develop opportunities for NOAA Center researchers and UMD faculty to interact through sabbatical appointments, joint seminars, visits, guest lecture series, Intergovernmental Personnel Act exchanges, educational programs, and other mechanisms; and
- F. Develop opportunities for NOAA Center scientists and staff to participate in existing UMD instructional programs and contribute to the development of new instructional programs in such areas as data assimilation, numerical modeling, coupled modeling, data analysis, computational fluid dynamics, remote sensing, and algorithm development; and
- G. Subject to mutually agreed terms and required approvals, provide opportunities whereby NOAA could support a percentage of the salary for new UMD tenure track faculty for a mutually agreed time period (pending availability of funds); and
- H. Provide, as mutually agreed, training courses for NOAA Center personnel in areas of interest to NOAA where UMD faculty have particular expertise and help NOAA develop its educational programs; and
- I. Collaborate to develop UMD research programs specifically targeted toward NOAA's future needs; and
- J. Improve research capabilities in weather, climate, ocean, coastal, ecosystems, and atmospheric chemistry and transport models; and
- K. Use the research facility in weather, climate and ocean modeling, Earth System Science Interdisciplinary Center (ESSIC), located in MSquare adjacent to the NOAA Center, to facilitate interaction between the Parties; and
- L. Cooperate in the recruitment and selection of scientists in fields of mutual interest to NOAA and UMD; and
- M. Facilitate transportation between the NOAA Center and the UMD campus to encourage co-located research and participation in cross-campus research activity, including seminars and relevant classes; and
- N. Provide opportunities as mutually agreed for the shared use of the facilities, models, data, and computer and communication infrastructure of both Parties in support of education and research programs of common interest.

This project is necessary and essential to further the mission of NOAA in that it will enhance the ability to:

- forecast weather, collect, distribute, and transmit meteorological information, and to take such meteorological observations as may be necessary to establish and record the climatic conditions of the United States (15 U.S.C. § 313), and
- promote and develop meteorological science and foster and support research projects in meteorology through the use of private and governmental research facilities and provide for the publication of results unless publication would not be in the public interest (49

U.S.C. § 44720), and

- collect, monitor, analyze, and actively disseminate climatological global data, information, and assessments on a continuing basis in order to provide reliable, useful and readily available information (15 U.S.C. § 2901-2908).

NOAA has determined that their mission cannot be done as effectively without the participation of UMD because of the unique capabilities inherent in both groups and their close proximity at the NOAA Center for Weather and Climate Prediction (the “NOAA Center”), adjacent to the University of Maryland Research Park, “MSquare.”

The NOAA Center houses personnel from the National Weather Service (NWS), National Environmental Satellite Data and Information Service (NESDIS), and Oceanic and Atmospheric Research (OAR). These organizations are charged with providing atmosphere and ocean monitoring and prediction services and related research supporting these activities for the Nation. This new facility houses approximately 800 NOAA personnel.

The University of Maryland (UMD) has a long tradition of atmospheric and climate research, and has positioned itself to become a national and world leader in research and education in the areas of weather and climate prediction, global change, and related mathematical, physical, natural, and computer sciences. NOAA, through NWS and NESDIS, and UMD have collaborated in the area of meteorology, climate, and satellite climatology research for over two decades. Building the NOAA Center near the UMD has better facilitated and increased these collaborative “earth system” and environmental research efforts by providing UMD faculty and students access to the considerable NOAA resources used in real-time operational environmental monitoring and prediction. NOAA will benefit from a streamlined product development, science and technology transfer in which UMD-based basic research is transformed efficiently to applied research and operational applications and products. NOAA OAR’s Air Resources Laboratory (ARL) has a growing collaboration with UMD on topics such as air quality facilitated by ARL’s presence in the NOAA Center. It is expected that the benefits of this collaborative arrangement will also extend to other NOAA components such as NOAA’s Ocean Service (NOS) and National Marine Fisheries Service (NMFS).

IV. MUTUAL INTEREST OF THE PARTIES

This MOU is of mutual interest to the Parties because NOAA will gain improved access to a university with strong academic and research programs in Earth System Science, including numerical weather and climate prediction, data assimilation and remote sensing, and the UMD will gain access to NOAA scientists who have complementary research and operational expertise in these fields. NOAA has shown how a collaborative relationship between its Weather Forecast operations and the academic and research communities can lead to improved weather warnings and forecasts for the nation.

In the 1990's, NOAA's National Weather Service (NWS) realized that if its weather offices were collocated with academic and research organizations, synergy would result. Thus, as part of the modernization of the NWS, NOAA, wherever possible, collocated its offices with academic and research organizations. As a result, more than 20 weather service offices were collocated with universities or research organizations. The synergy took the form of improved forecast and warnings and faster transition of new science and technology into its forecast operation. Examples of improved forecasts and warnings are Raleigh-Durham, NC and the Albany, NY forecast offices. At the Raleigh-Durham office, which is collocated with North Carolina State University, the probability of detection (POD) of severe thunderstorms rose from 59 percent to 89 percent in less than two years. Improvements at the Albany office, which is collocated with the State University of New York, Albany, are equally impressive. For example, the NWS Weather Forecast Office, Albany, increased the lead time for severe weather warnings to greater than 25 minutes and achieved an 80 percent improvement in their flash flood accuracy. Both offices attribute their performance improvement to collocation and subsequent close collaboration with universities. This project continues NOAA's effort to gain synergy through collocation with academic institutions.

Atmospheric and related climate science lies at the nexus of physics, chemistry, applied mathematics, and computer science. Indeed the concept and study of chaos arose out of meteorology. Atmospheric science has also been the principal driver for environmental modeling, prediction, and justification of non-defense related supercomputing. On the day-to-day weather time scale, the role of land surface processes is viewed with increasing importance. On seasonal to inter-annual time scales, the role of the oceans is critical. In fact, operational oceanography, from ocean weather to ocean climate, is coming into its own as a new area of products and services. Taken as a whole, the monitoring and predictive aspects of atmosphere-ocean-land interactions are growing in importance and developing into a central area for applied science.

The UMD has an opportunity to be at the vanguard of this rapidly growing area of environmental monitoring, prediction, products and services. Being in close proximity to the NOAA Center will provide UMD faculty and students with day to day access to the considerable NOAA resources used in environmental monitoring and prediction: suite of models, computational resources, operational data streams, and personnel/expertise, which can be expected to have a transformative effect on UMD research and educational programs. In return, NOAA benefits from and provides a focus for streamlined product development and technology transfer in which university based research is transformed efficiently to applied research and operational applications and products. The synergy flowing from this remarkable configuration of diverse operations and research expertise will largely be gained through a sharing of unique operational and research infrastructures which would be difficult to develop or duplicate at any other single site. In addition, the overriding commitment of service improvement throughout the NOAA Center would provide faculty and students with ample opportunity for both applied and

theoretical studies, as well as serve as a catalyst for continued growth with the NOAA staff.

With regards to education, the NOAA Center will provide the possibility for unique undergraduate, graduate, postdoctoral, and career employment opportunities. This aspect of “hands on” experience for students and the possibility of post-graduation employment are expected to be an extremely attractive recruiting tool for the best and brightest to the UMD. The co-location with NOAA is expected to have a positive impact on the UMD’s curriculum at the B.S., M.S., and Ph.D. levels. Simultaneously, some of these students may continue into regular positions in NOAA, thereby helping NOAA achieve its projected need for trained personnel at each one of these levels. Just one example is in the subfield of data assimilation. Data assimilation is becoming increasingly important in many areas (e.g., regional and global atmospheric models, ocean models, land models, marine ecosystems, coupled models, atmospheric chemistry models). Moreover, the satellite operational systems of NESDIS together with those of NASA’s Earth Science Enterprise produce huge amounts of new data types, making data assimilation even more important. A national need exists to train students in support of this new science.

The possibility exists to support tenure track faculty appointments at the UMD whose work would directly contribute to NOAA’s mission. In return NOAA would provide a matching percentage of the salary for a mutually agreed to time period (handled through a separate funding mechanism). The UMD and the National Institute for Standards and Technology have already used this model with great success in the area of material science. Such appointments would aid in the integration of research, development and operations effort between the UMD and NOAA. Another possibility exists to develop opportunities for leading NOAA scientists to become involved within the research of graduate students engaged in research of interest to the NOAA mission, teach courses in their expertise, or conduct research in specific UMD facilities.

V. RESPONSIBILITIES OF THE PARTIES

- A. The Parties agree that this MOU cannot detail how any one collaborative effort will be implemented, administered, or funded, in the light of the breadth and variety in form and substance of the anticipated collaborations. As a result, the Parties acknowledge that they will need to enter into separate subsidiary agreements regarding shared use of facilities for each collaboration established in the context of this MOU, which agreements will address the scope of work; each Party’s contributions and obligations to the project; the administration, coordination and implementation of the project, the rights of each Party to use intellectual property that is developed by one or both Parties in the course of the collaboration, and other issues mutually agreed to by the Parties.
- B. The Parties further agree that all collaborative projects conducted under the auspices of this MOU must be consistent with each Party’s policies and protocols, including faculty appointment policies and intellectual property policies.

- C. Ownership of intellectual property developed, conceived or first actually reduced to practice in the course of performing activities undertaken pursuant to this MOU shall be determined in accordance with applicable federal law. Ownership and each party's right to use such intellectual property shall be addressed in each subsidiary agreement entered into by the Parties with respect to a particular collaborative undertaking.
- D. Researchers, scientists and faculty of either Party may initiate discussions on collaborative projects to be conducted under this MOU, but only persons authorized by NOAA and the UMD to execute agreements on their behalf shall have the right to commit a Party to participate in particular collaborative projects.

VI. EQUITABLE APPORTIONMENT OF COSTS

The Parties expect that costs under this agreement will be equitably apportioned:

- A. Nothing in this MOU obligates either Party to make specific commitments of funds, personnel, equipment, or space to this collaborative effort. The provision of such support by either Party will be based on available resources and provided in accordance with each Party's rules, regulations, laws, and policies.
- B. This MOU does not provide for, or otherwise authorize, the transfer of funds from the UMD to NOAA or the transfer of funds from NOAA to the UMD. Should NOAA determine to fund any specific research or education project proposed to be carried out by the UMD, such awards shall be made solely by appropriate NOAA officials in accordance with the laws, regulations and policies governing the awarding of financial assistance by the U.S. government.

VII. CONTACTS

The contacts of each party to this agreement are:

- A. The UMD designates the Dean of the College of Computer, Mathematical and Natural Sciences to serve as its primary representative on all matters related to the overall implementation of this MOU. As of the Effective Date, the Dean is Dr. Jayanth Banavar 2300 Symons Hall, University of Maryland, College Park, MD 20742; Telephone: 301-405-2316; Facsimile: 301-314-9949; E-mail: banavar@umd.edu.
- B. NOAA designates the Deputy Undersecretary for Operations to serve as its primary representative on all matters related to the overall implementation of this MOU. As of the Effective Date, the Deputy Undersecretary for Operations is VADM Michael S. Devany, Department of Commerce, National Oceanic and Atmospheric Administration, 14th Street & Constitution Avenue, NW, Room 7316, Washington, DC 20230; Telephone: (202) 482-4569; Facsimile: (202) 482-1041; E-mail: mike.devany@noaa.gov.

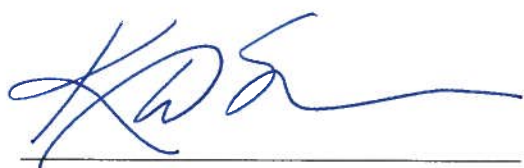
VIII. PERIOD OF AGREEMENT AND MODIFICATION/TERMINATION

- A. The initial term of this MOU shall last for a period of five years from the date of signature.
- B. The parties will review this agreement at least once every three years to determine whether it should be revised, renewed, or canceled.
- C. The Parties may terminate this MOU at any time upon written agreement. In addition, either Party may terminate this agreement upon 120 days prior written notice to the other Party. Any subsidiary agreements the parties may have executed under the auspices of this MOU that are in effect as of the date of termination shall continue until expiration unless the Parties expressly agree in writing to terminate them.
- D. The Agreement may be extended or renewed upon mutual written agreement of the Parties.

IX. OTHER PROVISIONS

- A. Nothing herein is intended to conflict with current NOAA or UMD policy.
- B. This MOU does not affect any existing MOUs, financial assistance awards, contracts or other legal instruments entered into between NOAA and the UMD.
- C. A determination that any term of this MOU is invalid for any reason, including inconsistency with a directive or policy of either Party, shall not affect the validity of the remaining terms of this MOU
- D. Should disagreement arise on the interpretation of the provisions of this agreement, or amendments and/or revisions thereto, that cannot be resolved at the operating level, the area(s) of disagreement shall be stated in writing by each party and presented to the other party for consideration. If agreement on interpretation is not reached within thirty days, the parties shall forward the written presentation of the disagreement to respective higher officials for appropriate resolution.
- E. This MOU is and will be available for disclosure to the general public.
- F. This MOU is an agreement between NOAA and UMD and does not create or confer any right or benefit on any other person or party, private or public.
- G. The Parties are and shall remain independent contractors and nothing herein shall be construed to create a partnership, agency, joint venture, or teaming agreement between the Parties. Nothing herein shall be construed as implying that either Party's employees are employees of the other.

- H. This MOU may not be assigned, in whole or in part, by either Party without the prior written approval of the other Party to the Agreement.
- I. Under the Inspector General Act of 1978, as amended, 5 USC App. 3, a review of this agreement may be conducted at any time. The Inspector General of the Department of Commerce, or any of his or her duly authorized representatives, shall have access to any pertinent books, documents, papers and records of the parties to this agreement, whether written, printed, recorded, produced, or reproduced by any mechanical, magnetic or other process or medium, in order to make audits, inspections, excerpts, transcripts, or other examinations as authorized by law.



Kathryn D. Sullivan, Ph.D.
Acting Under Secretary of Commerce
for Oceans and Atmosphere
National Oceanic and Atmospheric Administration
U.S. Department of Commerce
14th Street & Constitution Avenue, NW, Room 51030
Washington, DC 20230

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[Date]



Wallace D. Loh, Jr., Ph.D.
President
University of Maryland
2300 Symons Hall
College Park, MD 20742

03-12-14

[Date]