

# Oceans Community Letter

Oct. 30, 2009

To: John Holdren  
Director of the White House Office of Science and Technology Policy

From: Concerned Members of the Operational, Science, and Climate Communities  
(See the attached list of signatories)

Subject: The Future of Ocean Surface Wind Measurements from Space

***The United States of America is about to lose its ability to measure wind speed and direction over the ocean. Immediate action is needed to restore these crucial measurements, or risk significantly higher future costs and delays as the Nation's environmental satellite observing system infrastructure continues to degrade.***

Winds over the ocean play a crucial role in transferring heat, gases (such as the CO<sub>2</sub> greenhouse gas), kinetic energy, and momentum between the atmosphere and ocean. Winds also play a key role in El Niño, affecting weather and climate globally, power the Gulf Stream and Kuroshio currents that moderate the climate in the western United States and Europe, and are a key consideration in marine ecosystems. In their most violent expression, they produce hurricanes, typhoons, and midlatitude winter storms that threaten international shipping and the lives and property of people along the coasts.

With the advent of the QuikSCAT scatterometer and its precursors, the last decade has seen a revolution in our understanding of global vector winds. The achievements related to the QuikSCAT scatterometer have been recognized with the prestigious William T. Pecora award, given jointly by NASA and the US Department of the Interior, “[f]or the advancement of Earth science research and contributions toward improved environmental predictions” [1]. In a recent Congressionally mandated Earth Science Senior Review of operating satellites [2], the QuikSCAT mission was rated “Outstanding” for scientific merit by an independent scientific panel and “very high utility” by a panel representing the National Interest. The QuikSCAT scatterometer, seven years beyond its design life, is currently ailing and is expected to become non-operational in a matter of months.

The QuikSCAT scatterometer has also made major contributions to our nation’s ability to forecast weather. Starting in 2000, data from QuikSCAT has been used by NOAA’s weather forecasters. Organizations like the NOAA, the European Centre for Medium-range Weather Forecasting, the UK Met office, and the Japanese Meteorological Agency routinely assimilate the data provided by QuikSCAT to improve numerical weather models. The operational utility of QuikSCAT for weather was recognized at a special workshop of NOAA and Navy users in 2006 [3], where it was hailed as “revolutionary”. The impact of QuikSCAT winds in the marine forecasting and warning environment was also highlighted in a recent issue of Oceanography [9].

Among QuikSCAT’s major weather forecasting and warning accomplishments has been the discovery that hurricane level winds are more common than previously thought in the midlatitude winter storms of the Atlantic and Pacific oceans and the Bering sea.

These winter storms impact the U.S. West, East and Alaskan coastlines. These extreme storms pose a grave danger to ocean shipping, which the majority of international trade is based on. An independent assessment [4] of the impact of the resulting improvements to warning and forecast services concluded that the container and bulk shipping industry saved \$135 million annually by reducing their exposure to hurricane force winds in non-tropical storms by 44% over the North Pacific and North Atlantic.

Winds over the ocean are highly variable, and a single satellite in low-Earth orbit cannot sample the changes in the wind adequately. The need for a constellation of satellites is well understood, and other nations are contributing to implement the constellation. At present, the QuikSCAT instrument is flying with the European ASCAT satellite. The Indian space agency has recently launched an experimental scatterometer, and another one is expected to launch from China in a few years. However, these instruments do not provide the same spatial resolution or sensitivity to high winds as QuikSCAT. Furthermore, it is unknown whether the data from India and China will be available to support operational weather forecasting and warnings. When QuikSCAT becomes non-operational, the global ocean vector wind constellation will be broken, with major consequences to both weather forecasting and the continuation of a unique climate data record.

The US National Research Council (NRC) of the National Academies, a blue-ribbon panel of scientists asked by NASA and NOAA to recommend the highest priority missions to be flown in the next decade [5], strongly recommended that the next generation scatterometer instrument, called the Extended Ocean Vector Wind Mission (XOVWM), be launched by NOAA in the 2013 to 2016 timeframe to mitigate the likely loss of QuikSCAT. Both the NRC [5] and the operational data users [3] have emphasized the need to go beyond QuikSCAT's capabilities. This message, as well as the need for continued cross-calibrated observations by a constellation of satellites, was endorsed by an international meeting of scientists to chart the future of ocean observation [6], by a NASA/NOAA/JAXA sponsored meeting to assess the impact of scatterometers on climate science [7], and by the NASA Ocean Vector Winds Science Team.

The improvements required for the next-generation instruments are driven by the need to better study hurricanes, typhoons and coastal zones, with better fidelity across the wind speed range and higher spatial resolution. QuikSCAT and ASCAT capabilities are limited due to rain contamination or spatial resolution. Improved capabilities, which have been endorsed by users at the National Hurricane Center, the Central Pacific Hurricane Center, the NOAA Alaska, East and West coast forecasting offices, and the scientific community, would enable significantly better monitoring of hurricanes and other tropical cyclones, improving the safety of coastal populations. These capabilities would also allow better scientific study of key process related to weather, the ocean, and climate. Improved coverage of the coastal regions will lead to better estimates of wind and wave power available for electrical energy generation.

A solely US built instrument launched on a US rocket would be the fastest and least complicated solution. NOAA asked NASA's Jet Propulsion Laboratory to design the XOVWM system recommended by the NRC. The design [8] was shown to be feasible with current technology, but required more resources for a US launch than are available at NOAA currently. To overcome this obstacle, NOAA and NASA have formed a partnership with the Japanese space agency, JAXA, to examine the feasibility of flying a

next generation instrument in JAXA's GCOM satellites. This unique opportunity would provide a low-cost solution (JAXA would provide the launch vehicle, satellite, and a complementary instrument) for the US to meet its needs for ocean wind monitoring.

Planning for the next generation scatterometer (called the Dual-frequency Scatterometer or DFS) on GCOM has made significant progress over the last year. Five 3-agency technical meetings have concluded that accommodating the instrument on JAXA's 2016-launch GCOM-W2 mission is feasible. An international science team has met multiple times and defined the mission goals and requirements that are consistent with the research and operational needs described above. The GCOM-W2 DFS/radiometer combination will be the first system to provide multi-frequency active and passive simultaneous microwave observations, allowing for the optimal intercalibration of all wind measurement systems.

**The GCOM-W2 mission, with the DFS instrument onboard, is ready to proceed to a mission concept review and a full mission start. Unfortunately, this unique opportunity is currently at risk.** In order to fit in the GCOM schedule, an investment must be made by the US during fiscal year 2011. The current FY10 draft budgets in Congress do not contain any funds for the DFS. The Department of Commerce has not included any scatterometer as part of its budget request for the next year even though the Nation's environmental satellite observing system infrastructure continues to degrade. It would be a tragedy if this opportunity to meet critical U.S. needs for weather and climate wind measurements, at substantial savings to the taxpayer, were wasted. Failure to act now might easily set us back a decade, endanger our coasts, ocean going commerce, and reduce our ability to monitor a key variable needed to understand, monitor, and forecast climate change.

## Links

[1] <http://remotesensing.usgs.gov/pecora.php>

[2] <http://nasascience.nasa.gov/about-us/science-strategy/senior-reviews/2009SeniorReviewSciencePanelReportFINAL.pdf>

[3] [http://manati.orbit.nesdis.noaa.gov/SVW\\_nextgen/](http://manati.orbit.nesdis.noaa.gov/SVW_nextgen/)

[4]

[http://manati.orbit.nesdis.noaa.gov/SVW\\_nextgen/QuikSCAT\\_maritime\\_report\\_final.pdf](http://manati.orbit.nesdis.noaa.gov/SVW_nextgen/QuikSCAT_maritime_report_final.pdf)

[5] [http://www.nap.edu/catalog.php?record\\_id=11820](http://www.nap.edu/catalog.php?record_id=11820)

[6] <http://www.oceanobs09.net/blog/?p=59>

[7] [http://coaps.fsu.edu/scatterometry/meeting/past.php#2009\\_august](http://coaps.fsu.edu/scatterometry/meeting/past.php#2009_august)

[8] <http://winds.jpl.nasa.gov/publications/index.cfm>

[9]

[http://www.tos.org/oceanography/issues/issue\\_archive/issue\\_pdfs/22\\_2/22.2\\_chang.pdf](http://www.tos.org/oceanography/issues/issue_archive/issue_pdfs/22_2/22.2_chang.pdf)