Continuation of the QuikSCAT Mission for the Next 4 Years

After close to 10 years of successful operation, QuikSCAT is the first ocean vector wind mission to provide data coverage suitable for a wide range of climate studies. We, the Ocean Vector Wind Science Team, strongly recommend that QuikSCAT continue to collect data for the next four years, or as instrument health allows. QuikSCAT is the baseline mission that can be used to consistently extend the climate data record by cross-calibration (as recommended by GCOS principles) with other current and future scatterometers, such as ASCAT, the soon to be launched ISRO Ku-band scatterometer, and the NRC recommended higher capability NOAA scatterometer. The use of QuikSCAT as part of an international scatterometer constellation will significantly improve the temporal sampling of ocean vector winds, a major challenge in remote sensing of global winds. Global winds with improved temporal resolution will benefit operational and research aspects of weather forecasting, ocean and atmospheric circulation models, and allow for new science studies, such as influences of the global diurnal cycle. Finally, the QuikSCAT data are used for pioneering science research, and we foresee that these science benefits will continue for the life of the satellite.

Need for a Higher Capability Scatterometer After QuikSCAT

Initially foreseen as a three-year mission, the QuikSCAT scatterometer is currently well beyond its expected lifetime. The climate data gap (as defined by GCOS principles) that will occur after QuikSCAT fails must be minimized, since it is not expected that current or future operational scatterometers, such as the ASCAT series, will, by themselves, fulfill the need of the scientific and operational communities for global wind sampling at the appropriate combination of accuracy and temporal/spatial sampling. We, the Ocean Vector Wind Science Team, strongly recommend the prompt launch of higher capability ocean vector wind instruments that will provide all-weather, all-wind wind vector measurements, improve spatial resolution, reduce rain contamination, and provide complementary temporal sampling with scatterometers launched by other space agencies. We are very encouraged by the possible collaboration of NOAA, JAXA, and NASA that promises an opportunity to launch the first of a new generation of higher capability ocean vector winds instruments. We strongly recommend that this partnership move forward in launching this instrument as soon as possible, and that the instrument capabilities be (1) leveraged for scientific and climate applications, beyond the needs of operational agencies, and (2) leveraged to develop future systems (e.g., XOVWM) that meet current operational and scientific goals related to a single instrument.

Cal/Val

1. If a scatterometer does respond to stress, as appears to be the case, then the conversion of equivalent neutral winds to stress is also a function of air density: there is *not* a 1:1 conversion between equivalent neutral winds (as traditionally defined) and stress. We recommend that a new definition of equivalent neutral winds, accounting for density in a manner designed result in more accurate winds, be applied for future calibration efforts. This revised definition is

$$U_{10EN\_new} = \sqrt{\frac{\rho_0}{\rho}} \frac{|\vec{\mathbf{u}}_*|}{k} \ln(10/z_o),$$

where ρ_0 is a reference density with a value of 1 kg m^{-3}. This definition differs from the traditional definition only by the term with the squareroot of the ratio of densities. It has been demonstrated to reduce spatial and seasonal biases in comparisons to in situ observations. Note that air density will still have to be used in the conversion of equivalent neutral winds to stress.

2. Investigations of new products and wind retrievals based on combining AMSR & DFS observations should be encouraged.

3. Investigation of the consequences of random error in H*Wind on the high wind speed portion of model functions should be encouraged. Do these errors account for the saturation seen in model functions estimated using H*Wind? Do they account for the inconsistency with IWRAP observations?

L3 and L4 Products

The lack of information on the characteristics of L3 and L4 products has been a serious detriment to must researchers trying to use these products. Characteristics of vector wind derived products (e.g., L3 and L4 products, and derivative fields) should be better determined, in a manner that is useful to non-specialists using these products. For example, it would be very useful to know the spatial and temporal scales for which products are limited by noise or by smoothing. Knowing these scales provides some information on whether or not a product is reasonable to use for applications under consideration. Similar examinations should be done for spatial derivative fields. A measure of the homogeneity of error characteristics would also be useful, as would an indication of the products ability to smoothly represent propagating features.

Multi-Satellite Applications

One or even two satellites in low Earth orbit cannot globally sample ocean surface winds sufficiently to well resolve the diurnal cycle, which is likely to be important for climate scale studies of the ocean, and could be important for reducing biases in budgets of heat and moisture. Consequently, we encourage the intercalibration of vector and scalar wind sensors, and consideration of complimentary orbits designed for better temporal sampling the surface winds.

New Products

A well calibrated stress product is desired. If a scatterometer does respond to stress, then the conversion of equivalent neutral winds to stress is also a function of air density: there is *not* a 1:1 conversion between equivalent neutral winds and stress. Furthermore, given the large amount of noise in the calibration wind speeds, a product optimized for stress (proportional to wind speed squared or cubed) will not be consistent with the equivalent neutral winds even if density is considered. A product optimized for stress should be developed. A product optimized for gas transfer (dependent on speed cubed in some models) should also be considered after further consultation with the gas transfer community.