Preliminary Evaluation of ScatSat Winds

Lucrezia Ricciardulli, Richard Lindsley, and Frank J. Wentz

Remote Sensing Systems, Santa Rosa, California, USA; e-mail: Ricciardulli@Remss.com

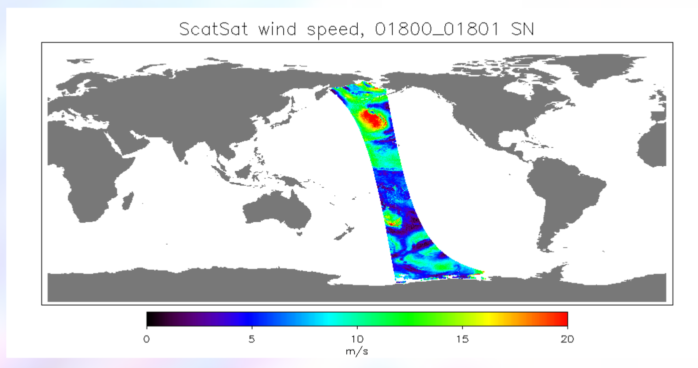
IOVWST meeting, May 2017, Scripps Institute for Oceanography, La Jolla, CA, USA

Acknowledgements
This work is supported by the NASA Ocean Vector Wind Science Team

1. ScatSat Mission

ScatSat is a Ku-band scatterometer (13.5 GHz) developed by the Indian Space Research Organisation (ISRO) as a quick replacement after the failure of OSCAT on Oceansat-2. It was launched on September 26, 2016, on a 9:30am/pm polar orbit. ScatSat's design is similar to OSCAT and QuikSCAT, with two concentric conically scanning beams, V-Pol (49.3º) and H-Pol (42.7º), with total swath width of 1800 km.

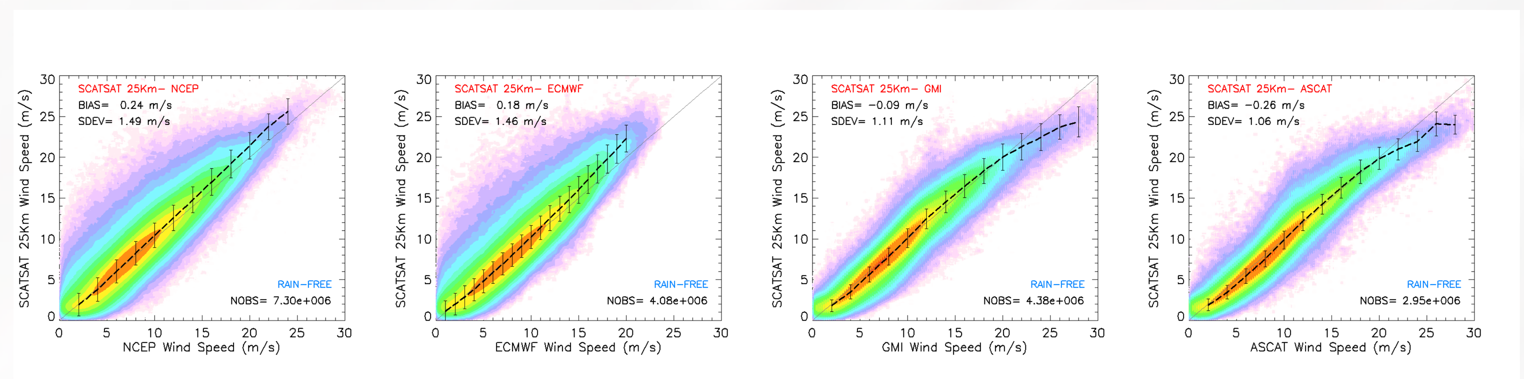
Initial ScatSat wind retrievals were released promptly within a few weeks after launch, in mid-October 2016. A newer version V1.1.1 was introduced in January 2017, starting from orbit number 1655. L2B swath files are provided at 25 km and 50 km resolution.



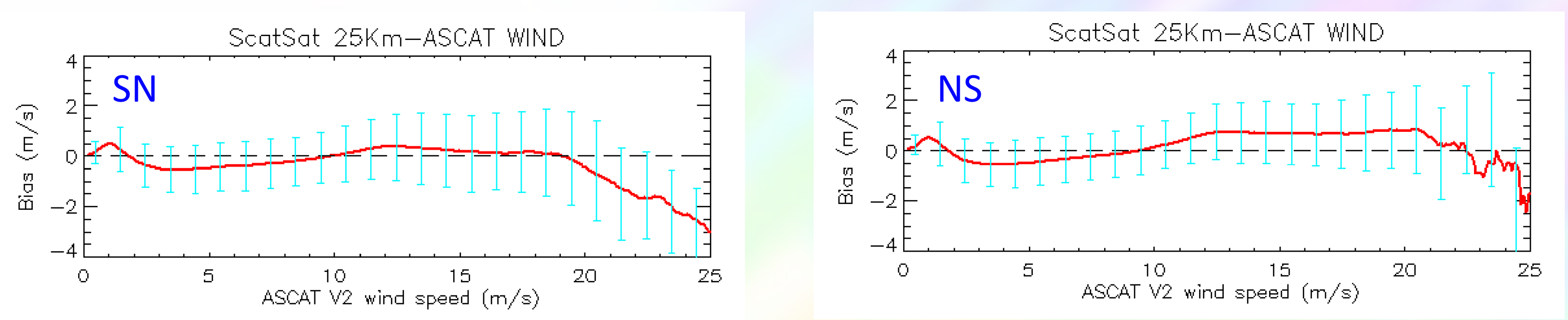
2. Wind Speed Validation: Methodology

Here, we illustrate results of a preliminary validation of the ScatSat 25 km swath winds, for orbits 1655-2448 (Jan 18 to Mar 14, 2017). In order to select rain-free data, we colocated the ScatSat winds with the rain measurements from microwave radiometers processed at RSS (GMI, WindSat, AMSR2, SSMI/S) and discarded any potentially rain-contaminated ScatSat wind observations when any radiometer measured rain within 90 minutes. We also applied additional ice/land masking. We then validated these rain-free winds versus the 90-min colocated radiometer winds, the RSS ASCAT-A winds, and versus NCEP and ECMWF winds, interpolated at the time of the ScatSat observations. Due to ScatSat local time of ascending node (LTAN) at 9:30am, the best colocation matches are with ASCAT (descending at 9:30pm), and with GMI (non-sun-synchronous). AMSR2, WindSat and SSMI/S F17 and F18 colocations are mostly located poleward of 45 degrees.

3. Wind Speed Bias and Standard Deviation 0-30 m/s



Joint PDFs for rain-free ScatSat wind speed versus NCEP, ECMWF, GMI and ASCAT are shown above. Overall, the biases at global scale are very small, less than 0.25 m/s, and with standard deviations less than 1.5 m/s, indicating a very good quality. Biases become larger than 10% (2 m/s) at wind speeds greater than 20 m/s. No significant asymmetry was found between biases in the ascending and descending passes (figure below), except for high winds where there is little data for the analyzed orbits.

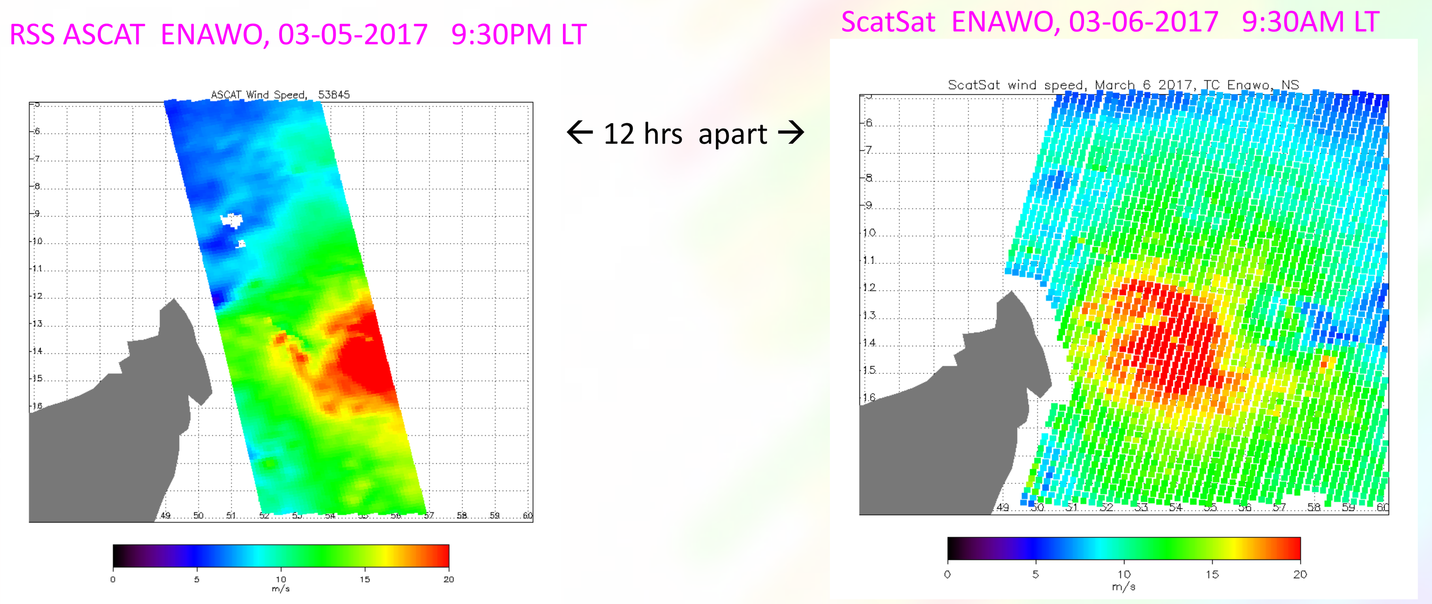


4. Storm Example

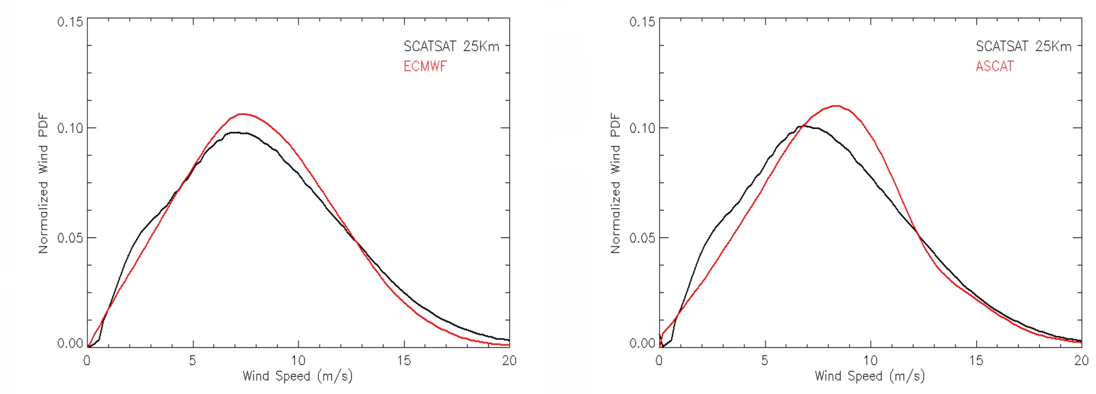
RSS ASCAT ENAWO, 03-05-2017 9:30PM LT

← 12 hrs apart →

ScatSat ENAWO, 03-06-2017 9:30AM LT

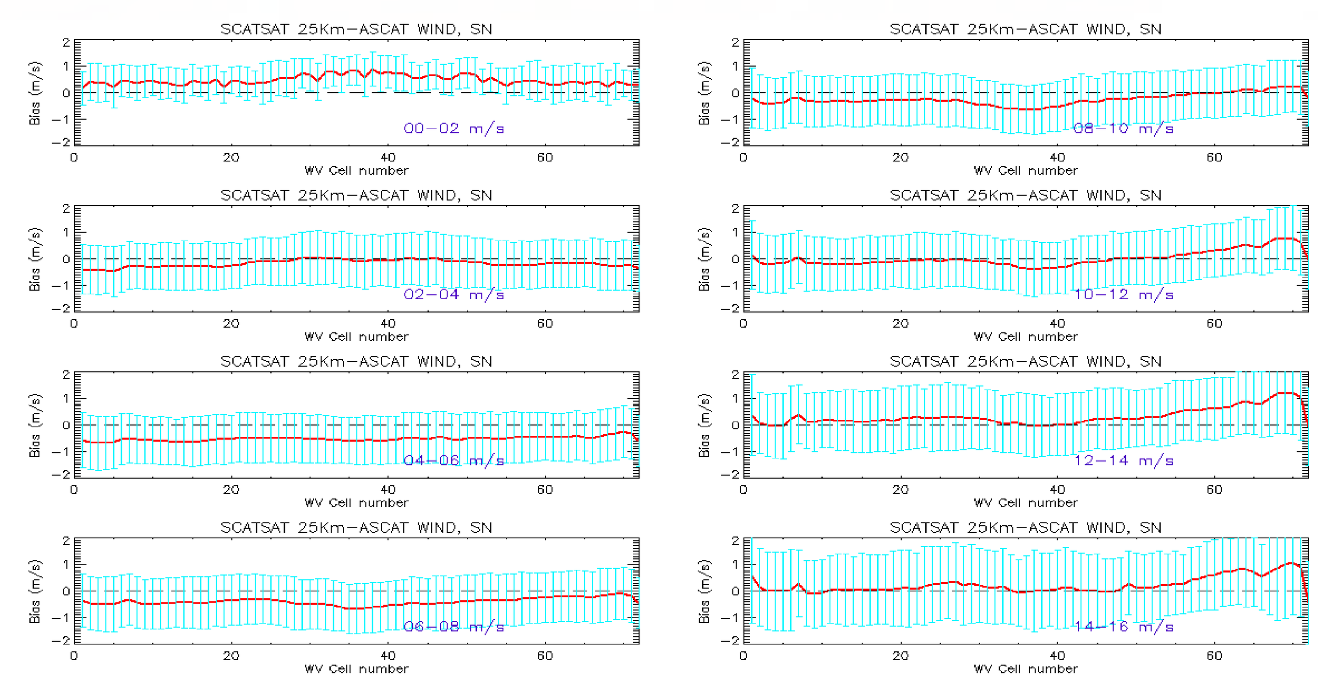


5. Wind Speed PDFs



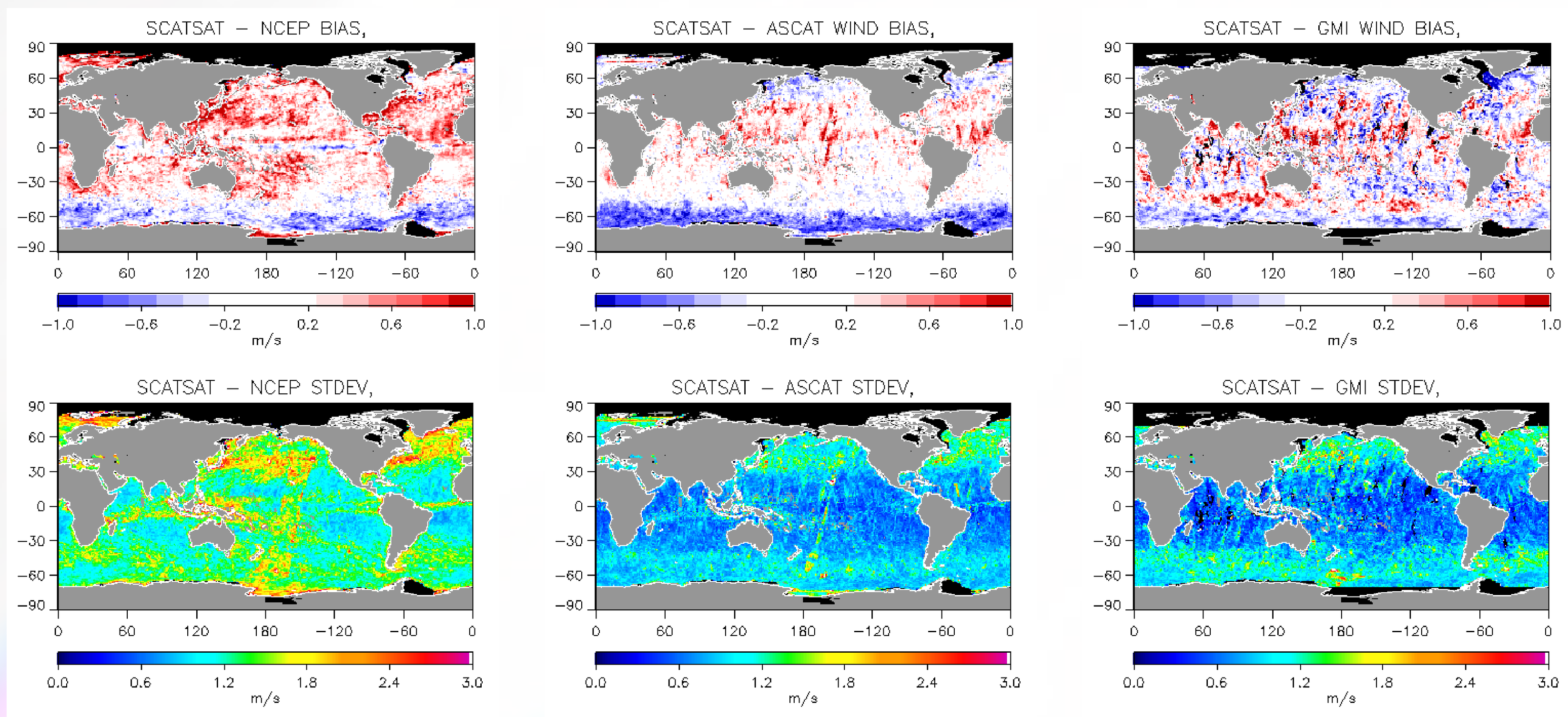
ScatSat 25 km wind speed PDFs are in reasonable agreement with ECMWF, and with ASCAT. The bump in the PDF for winds below 5 m/s is a common spurious feature for scatterometers' PDFs, and is likely due to a small discontinuity in the Geophysical Model Function for winds below and above this wind speed. It can be easily be fixed by imposing a smoother transition for the GMF coefficients.

6. Across-track Bias



The figure above displays ScatSat wind speed bias compared to ASCAT as a function of the wind vector cell (WVC) position along the swath, and for different wind regimes. ScatSat wind speeds are remarkably free of across-track bias for 0-10 m/s wind speeds, for both descending (figure above) and ascending (not shown) passes. For winds greater than 10 m/s, a bias up to 1 m/s emerges on the left side of the swath for both asc/desc passes.

7. Global Bias and Standard Deviation Maps



Shown above are global maps of ScatSat wind speed bias and standard deviation compared to NCEP, ASCAT, and GMI. In all cases, data displayed were rain-flagged in a very conservative way, using only ScatSat wind observations for which radiometers rain observations were available within 90 minutes. Overall, ScatSat winds display a negative bias in the Southern Ocean, likely due to the impact of cold SSTs on Ku-band radar backscatter. Another regional bias appears in the Northern mid-latitudes.

8. Conclusions

Our preliminary evaluation indicates that ScatSat winds are of good quality for meteorological applications. Some small biases can be easily corrected with minor recalibration, and with small changes in the GMF used for processing, mostly at low and at high winds.