

# Wind Stress Curl Differences in QuickSCAT Level 2B Data (R2 vs. R3) and Preliminary OceanSAT-2

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## Abstract

Wind stress curl (WSC) fields based on QuikSCAT Level 2B winds are compared between revisions 2 and 3 (i.e. R2 vs. R3) of the NASA Jet Propulsion Laboratory dataset. Sensitivities and accuracies of WSC estimates are compared on an analytic test case (idealized winds). We compare results for discrete stencil (finite difference like) and line integral (as per the circulation theorem) algorithms for surface winds from regular grids (i.e. involving interpolations and/or bin-averages) and from the reported swath locations (i.e. no interpolation or bin-averages). Pathologies of irregular spacing in the swath data are problematic for high-resolution WSC calculations. WSC field summaries are computed for basin-scale and global temporal averages using the bin-averaged WSC algorithm at 0.25 deg resolution. WSC summaries include implied Sverdrup transports and Ekman pumping estimates.

## References

Bourassa, M. A. and K. M. Ford, 2010: Uncertainty in scatterometer-derived vorticity, *J. Atmos. Oceanic Technol.*, **27**, 594-603.

Milliff, R. F. and J. Morzel, 2001: The global distribution of the time-average wind stress curl from NSCAT, *J. Atmos. Sci.*, **58**, 2222-2231.

## Computing WSC

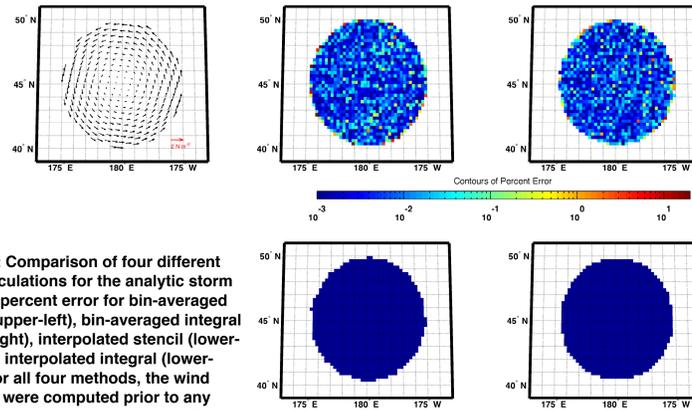


Figure 1: Comparison of four different WSC calculations for the analytic storm (above): percent error for bin-averaged stencil (upper-left), bin-averaged integral (upper-right), interpolated stencil (lower-left), and interpolated integral (lower-right). For all four methods, the wind stresses were computed prior to any interpolation or bin-averaging at 12.5 km resolution. WSC values were then calculated at 0.25 degree resolution.

## Temporal Aggregation: 12-Hour vs. 24-Hour

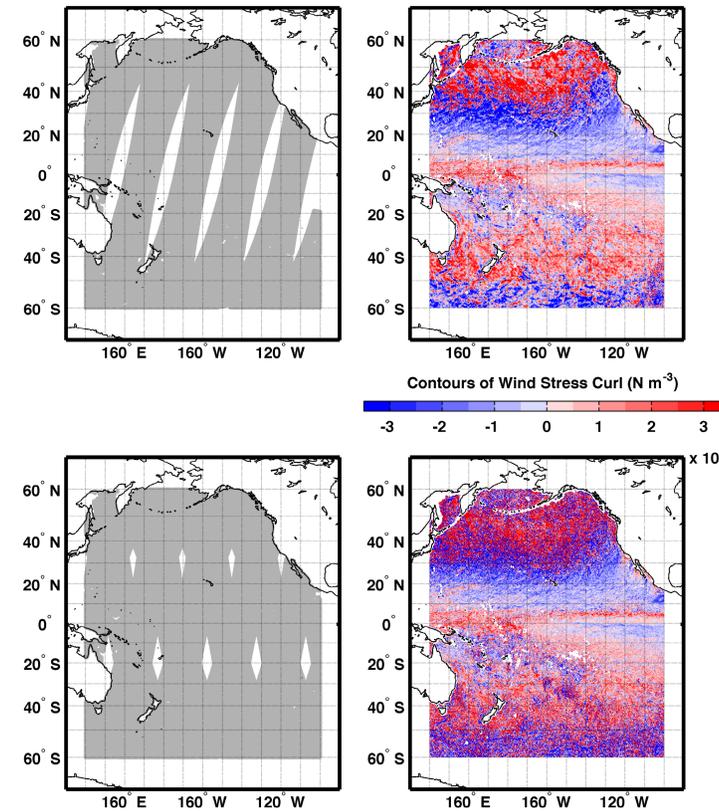


Figure 2: Temporal coverage for 12-hour aggregation (upper-left) and 24-hour aggregation (lower-left). WSC for 12-hour aggregation (upper-right) and 24-hour aggregation (lower-right). The 12-hour window has less coverage and less small-scale variability.

## Retrieval Comparison

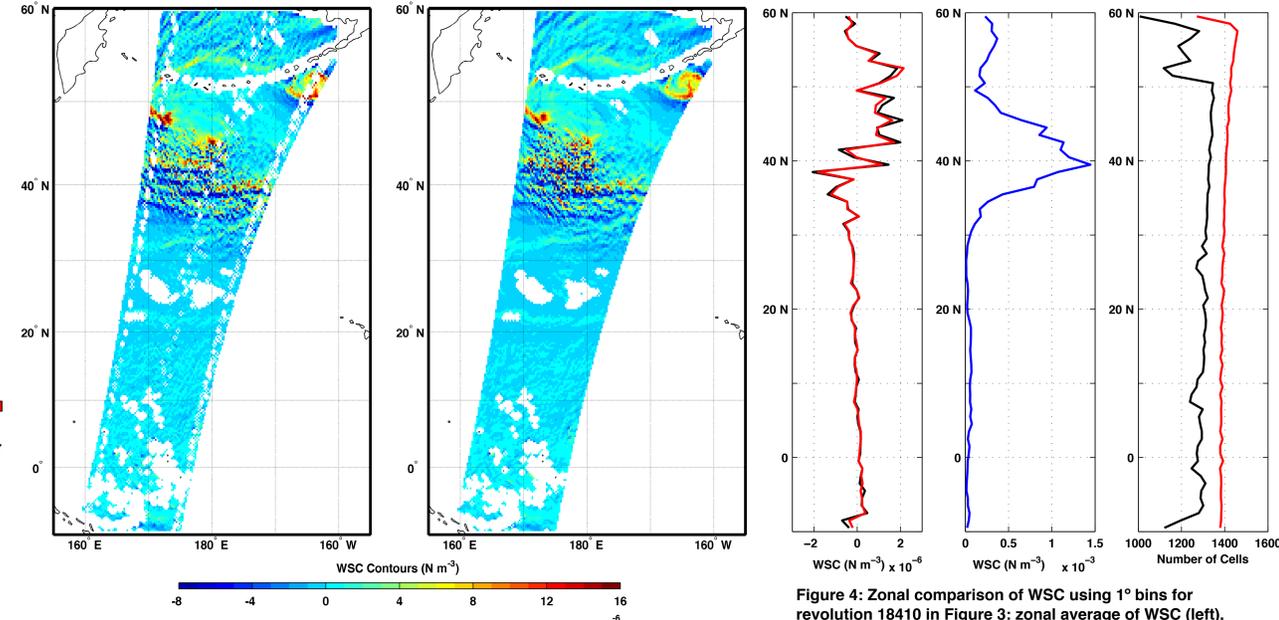


Figure 3: WSC for revolution 18410 during January 2003--R2 (left) and R3 (right).

Figure 4: Zonal comparison of WSC using 1° bins for revolution 18410 in Figure 3: zonal average of WSC (left), zonal aggregate of the absolute difference (middle), and number of cells in each bin (right). Black lines are for R2; red lines are for R3.

## 9-Year Annual Average WSC and Ekman Pumping: R2 and R3

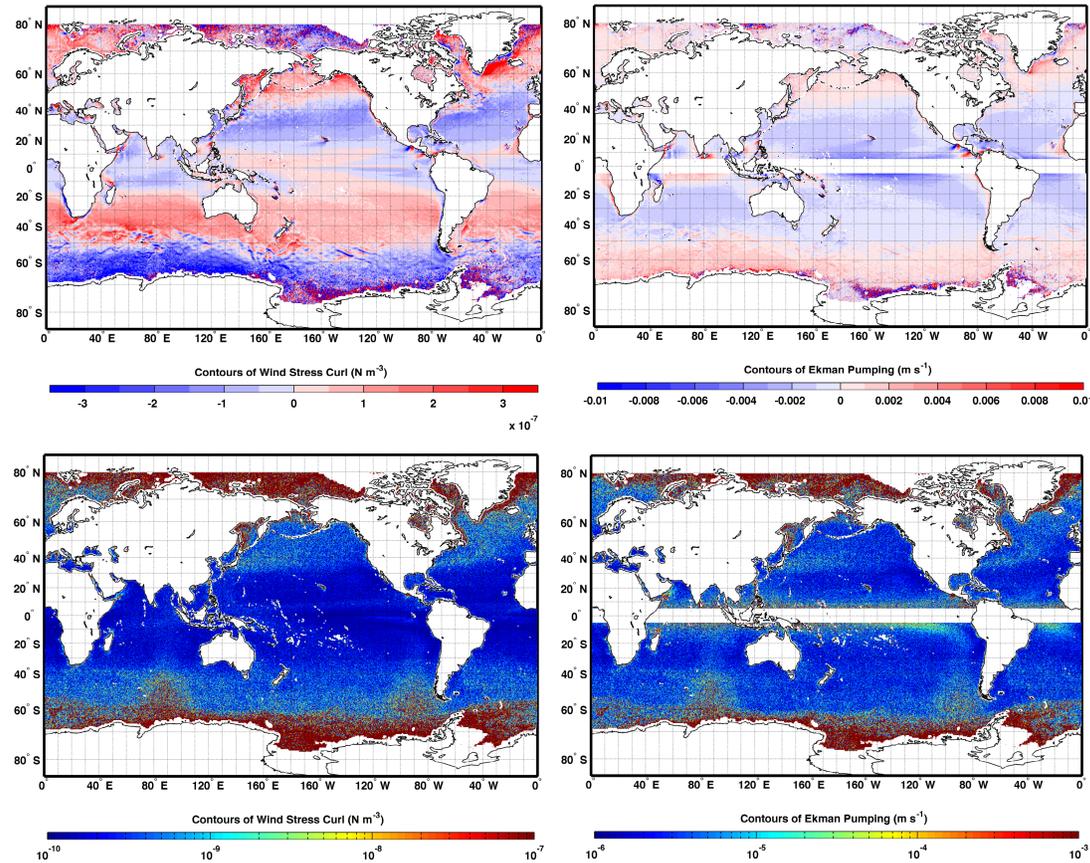


Figure 5: 9-year (2000-2008) annual average of WSC (left column) and Ekman pumping (right column). Figures in the top row are for R3. Figures in the bottom row are for the absolute difference between R3 and R2.

## January-April WSC Comparison: R3 (2000-2008) vs. OceanSAT-2 (2012)

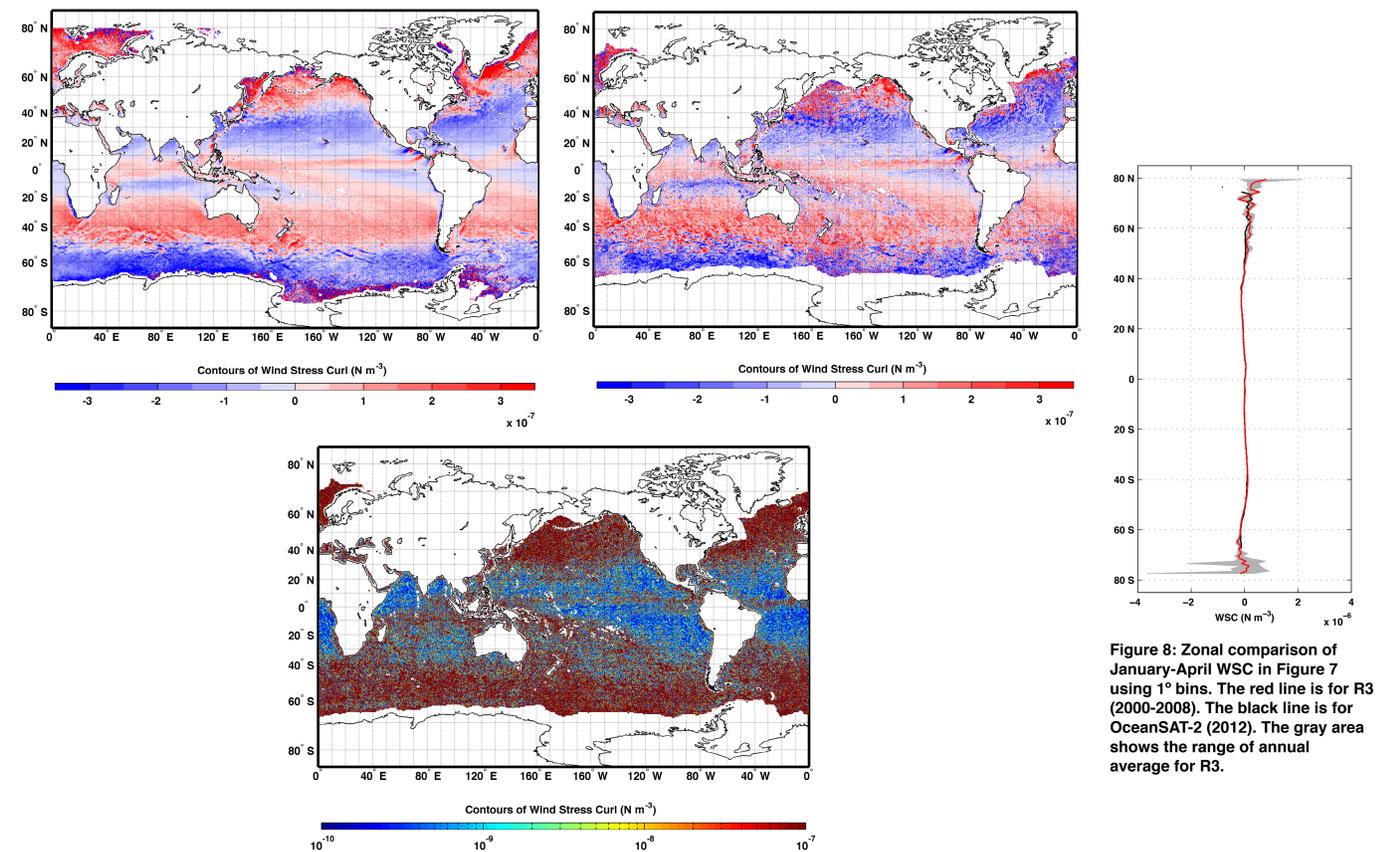


Figure 7: January-April WSC for R3 annual average 2000-2008 (upper-left), OceanSAT-2 2012 (upper-right), and absolute difference between R3 and OceanSAT-2 (bottom).

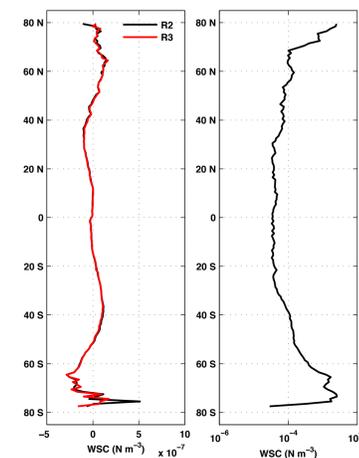


Figure 6: Zonal comparison of WSC using 1° bins for 9-year annual average in Figure 5 (left column): zonal average of WSC (left) and zonal aggregate of the absolute difference (right).

Figure 8: Zonal comparison of January-April WSC in Figure 7 using 1° bins. The red line is for R3 (2000-2008). The black line is for OceanSAT-2 (2012). The gray area shows the range of annual average for R3.