The Aquarius Salinity Retrieval Algorithm

Thomas Meissner*, **Frank J. Wentz and Kyle Hilburn**

Remote Sensing Systems, Santa Rosa, California, USA e-mail: meissner@remss.com

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Remote Sensing Systems
www.remss.com

Download this poster at: http://www.remss.com/people/thomas_meissner.html

Data available at: **ftp://Aquarius:saltyH2O@aq.remss.com**

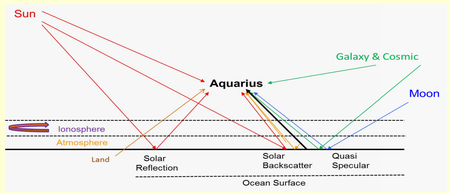
Summary

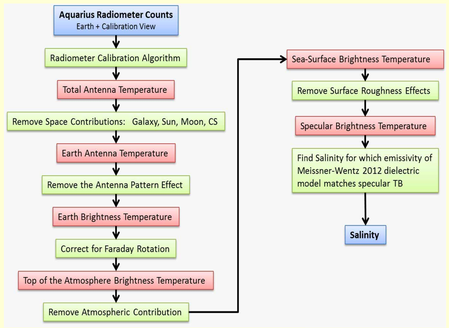
The Aquarius L-band radiometer/scatterometer system is designed to provide monthly salinity maps at 150 km spatial scales to an accuracy of 0.2 psu. The sensor was launched on June 10, 2011, aboard the Argentine CONAE SAC-D spacecraft. The L-band radiometers and the scatterometer have been taking science data observations since August 25, 2011.

This poster summarizes the major steps of the **Aquarius Level 2 salinity retrieval algorithm** that is run by the **Aquarius Data Processing System ADPS** and **improvements that are currently in progress**:

1. Version 2.0 that is currently implemented uses wind speed fields from the NCEP GDAS Numerical Weather prediction model in order to correct for the roughness of the ocean surface. **The roughness correction can be significantly improved by using wind speed fields that are derived from the Aquarius L-band scatterometer.**
2. Version 2.0 exhibits **biases between the retrieved salinities of the ascending and descending swaths by more than 1.5 psu**, which vary with season and location. Most of them can be traced to the **correction for the galactic radiation** that is reflected from the ocean surface. Adding a small **empirical adjustment to this correction reduces the ascending – descending biases** significantly.
3. **In-situ validation** of the **Aquarius SSS** against **drifting buoys** shows that with the planned algorithm improvements **Aquarius meets is mission requirements of 0.2 psu** accuracy for temporal - spatial averages of 1month and 150 km.

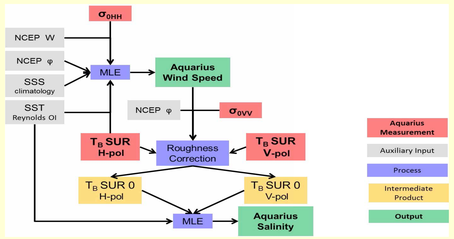
Basic Algorithm Flow

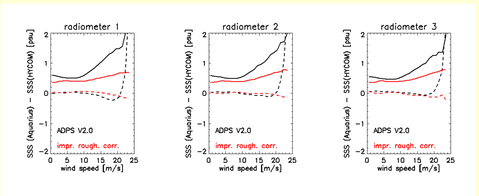




Improved Surface Roughness Correction

Optimized combination of radiometer and scatterometer channels for wind speed and salinity retrievals



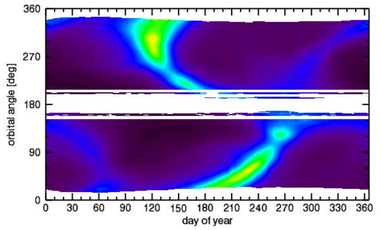


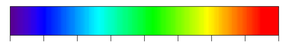
Dashed lines = bias Full lines = standard deviation

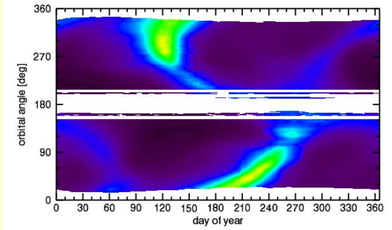
Ascending/Descendig Biases – Galactic Radiation

$$T_B(\mathbf{k}_s,\mathbf{P}_s)=\tau^2\iint dz_u dz_c T_B(\mathbf{k}_i)(\mathbf{k}_s\bullet\mathbf{n})\frac{P_z(z_u,z_c)}{(\mathbf{k}_s\bullet\mathbf{z})(\mathbf{n}\bullet\mathbf{z})}\Upsilon$$

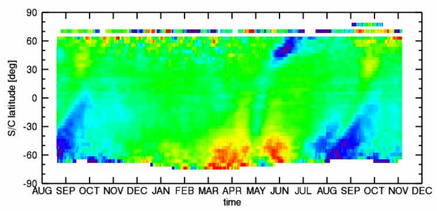
The reflection of galactic radiation at the ocean surface is modeled by tilted facets (geometric optics).
The computation involves a 4-fold integration over wave slopes and antenna patterns.

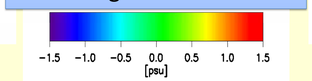


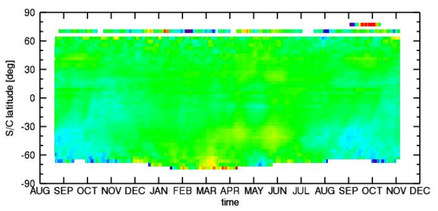




Left: Reflected galactic radiation used in ADPS V2.0.
Right: Small empirical adjustment in *strength* and *width* (10%). The width is determined by roughness and antenna pattern, which lead to a smear effect.







Left: Salinity difference between descending and ascending Aquarius swaths in ADPS V2.0.

Right: After adding empirical adjustment to reflected galactic radiation.

In-Situ Validation

PMEL buoys: TAO, TRITON, PIRATA, RAMA
Daily salinity measurements at **1m depth.**
Map shows location and number of months.

Triple collocation statistics for monthly 150 km averages
(RMS values [psu])

Aquarius - HYCOM	0.254
Aquarius – Buoy	0.230
HYCOM - Buoy	0.276

Aquarius	**0.143**
HYCOM	0.210
Buoy	0.180