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The Aquarius Salinity Product: Intercomparison with SMOS and In-Situ Observations and Importance of the Ocean Surface Roughness Correction

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The Aquarius L-band radiometer/scatterometer system is designed to provide monthly salinity maps at 150 km spatial scale 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 first part of the presentation gives an overview over the major features of the Version 2.1 Aquarius Level 2 salinity retrieval algorithm:
1. Antenna pattern correction: spillover and cross polarization contamination.
2. Correction for the drift of the Aquarius internal calibration system.
3. Correction for intruding celestial radiation, foremost from the galaxy.
4. Correction for effects of the wind roughened ocean surface.
We then present a thorough validation study for the salinity product, which consists in a 3-way intercomparison between Aquarius, SMOS and in-situ buoy salinity measurements. The Aquarius – buy comparison shows that that the Aquarius Version 2.1 salinity product is very close to meet the aforementioned mission requirement of 0.2 psu.
We demonstrate that in order to meet this accuracy it is crucial to use the L-band scatterometer for correcting effects from the wind roughened ocean surface, which turns out to be the major driver in the salinity retrieval uncertainty budget. A surface roughness correction algorithm that is based solely on auxiliary input of wind fields from numerical weather prediction models (e.g. NCEP, ECMWF) is not sufficient to meet the stringent Aquarius mission requirement, especially at wind speeds above 10 m/s. We show that presence of the Aquarius L-band scatterometer together with the L-band radiometer allows the retrieval of an Aquarius wind speed product whose accuracy matches or exceeds that of other common ocean wind speeds (WindSat, SSMIS). By comparing SMOS and Aquarius salinity fields with the in-situ observations we assess the importance of the roughness correction and the presence of the L-band scatterometer, which is a major difference between the two missions.