Summary of Aquarius V3.0 Algorithm and Processing Changes from V2.0

1. Changes in radiometer Q/C (quality control) flags and masks:
   a. There are Level 2 masks, which are observations for which no salinity is retrieved.
   b. We have included new Q/C flags. The flags in V2.0 were retained for compatibility.
   c. The flag thresholds have been updated.
   d. Flag use for calibration and Level-3 masking.

2. Changes in radiometer algorithm:
   a. We have updated the Antenna Pattern Coefficients (APC) improving the calibration over land scenes and of the 3rd Stokes parameter.
   b. Addition of Aquarius derived wind speeds (HH and HHH) to be used in the surface roughness correction.
   c. Addition of SWH ancillary data to be used in the surface roughness correction.
   d. The V3.0 roughness correction is using the Aquarius wind speeds, the scatterometer VV-pol, significant wave height (SWH) data and a first guess salinity field, which is an Aquarius derived SSS climatology. Previously versions have used NCEP wind speeds in the roughness correction. The updated roughness correction improves the performance at high wind speeds. e.g. in the Southern Oceans at high latitudes or in tropical cyclones, where high wind events occur.
   e. V3.0 adds an empirical correction to the geometric optics model for the reflected galactic radiation. This empirical correction is based on a zonal symmetrization between the ascending and descending swaths. This change reduces the bias between ascending and descending swaths observed in V2.0 and that were traced to the galaxy correction.
   f. V 3.0 includes an adjusted SSS (called SSS_bias_adj) in addition to the standard SSS product. The adjustment is designed to reduce biases which are observed in the standard SSS product that correlate with SST. The likely cause of these biases are small SST-dependent errors in the dielectric model, oxygen absorption or surface roughness correction, which are part of the geophysical model used in the SSS retrieval algorithm.

3. Changes in the radiometer calibration algorithm:
   a. Version 3.0 implements a correction for both a long term drift and high frequency "wiggles" in the radiometer signals.
   b. The long-term drift is treated as gain correction and removed via an exponential fit. This is unchanged from Version 2.0. The form of the exponential has been updated using the available data.
   c. The method used for the high frequency wiggles has changed from a regional singular value decomposition to an offset (bias) removal. The bias removal is performed at the antenna temperature (TA) level by calculating the difference between measured Aquarius TA after RFI filter and a reference ("expected") TA that is computed from the forward radiative transfer model using the HYCOM reference salinity. The bias is calculated for each orbit and based on a global 7-day running average. A rigorous Q/C is applied in this calculation which uses the new Q/C flags.
   d. This bias is the sum of sensor drifts and residual errors in the geophysical corrections. In V2.0, an estimate of the sensor-only bias was applied instead.

4. Changes in the scatterometer algorithm:
   a. The scatterometer geophysical model function has been updated.

A document providing information on comparisons between the V2.0 and V3.0 datasets themselves is available here. A complete characterization of the V3.0 data will be available in the Aquarius V3.0 Dataset Validation analysis document.