

National Aeronautics and Space Administration

# Clean-up of Level-2 Data Products

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Understanding  
the Interaction  
Between Ocean  
Circulation, the  
Water Cycle,  
and Climate by  
Measuring  
Ocean Salinity



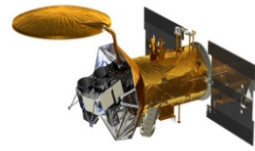
Aquarius/SAC-D



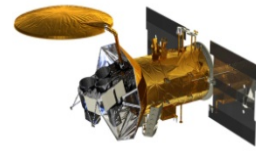
# Aquarius Science Cal/Val Workshop

March 31 – April 1, 2015

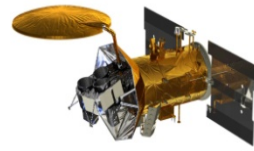
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- Determine if any science data parameters can be removed from the Aquarius Level-2 data products for V4.0.
- Determine any parameters that need to be added, either for evaluation or the official release.



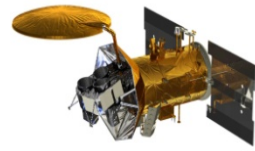
- We can make different products (i.e., with different parameters) for any version of the data product.
- A number of parameters are included in the products to support the algorithm team's evaluation activities that may not have any value to the general community.
- The official release products would be "cleaner" (i.e., easier to understand) if these parameters were not included.
- There will ALWAYS be a final evaluation version that will use the exact same algorithms as the official release, and can contain more parameters for evaluation.
- In addition, some quality flags are now obsolete and could be removed.



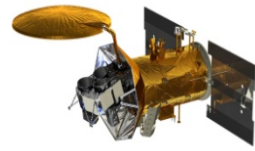
The current Aquarius Level-2 products contain:

- 68 Radiometer parameters total, 32 unique types.
- 28 Scatterometer parameters total, 11 types.
- 17 Ancillary data parameters

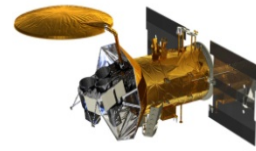
Radiometer parameters include multiple versions of some fields (e.g., Tb with and without land and roughness corrections).



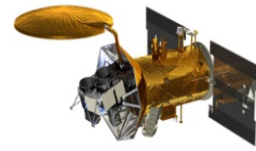
- Parameters that are not used in the final validated SSS (e.g., those without land correction).
- Quality flags that were superseded in V3.0 but not removed.



- V3.4 added the radiometer SST bias emissivity correction.
- Others?



# Backup Slides



## Radiometer Parameters

**rad\_TaX0**, X = {V, H, 3}: Radiometer antenna temperature

**rad\_TaX**, X = {V, H, 3}: Radiometer antenna temperature corrected for instrumental errors.

**rad\_TfX0**, X = {V, H, 3}: Radiometer antenna temperature after RFI removal

**rad\_TfX**, X = {V, H, 3}: Radiometer antenna temperature corrected for instrumental errors and RFI removal.

**rad\_toi\_X**, X = {V, H, 3}: Brightness temperature from the surface at the radiometer

**rad\_toa\_X\_nolc**, X = {V, H}: Brightness temperature at the top of the atmosphere (TOA)

**rad\_toa\_X**, X = {V, H}: Brightness temperature at the top of the atmosphere (TOA) with a correction for land contamination.

**rad\_far\_TaH**: Faraday rotation angle determined from the ratio of the third and second Stokes parameters.

**rad\_galact\_Ta\_dir\_X**, X = {V, H, 3}: Celestial background radiation at L-band impinging directly on the radiometer antenna

**rad\_galact\_Ta\_ref\_X**, X = {V, H, 3}: Celestial background radiation at L-band after reflection from the Earth surface

**rad\_galact\_Ta\_ref\_GO\_X**, X = {V, H}: Celestial background radiation at L-band after reflection from the Earth surface, derived from geometric optics with no empirical adjustment.

**rad\_galact\_dTa\_X**, X = {V, H}: Empirical adjustment to the correction for reflected celestial background radiation at L-band.

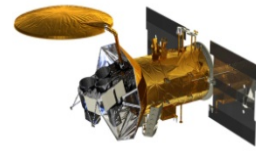
**rad\_solar\_Ta\_dir\_X**, X = {V, H, 3}: Direct radiation from the Sun.

**rad\_solar\_Ta\_ref\_X**, X = {V, H, 3}: Reflected radiation from the Sun.

**rad\_solar\_Ta\_bak\_X**, X = {V, H, 3}: Sun glint. Radiation from the Sun which is scattered from the ocean surface.

**rad\_moon\_Ta\_ref\_X**, X = {V, H, 3}: Radiation from the Moon at polarization X after reflection from the Earth.





## Radiometer Parameters (cont.)

**rad\_TbX**, X = {V, H}: Brightness temperature at the surface prior to making a correction for roughness.

**rad\_TbX\_nolc**, X = {V, H}: Brightness temperature at the surface prior to making a correction for roughness but without the correction for land in the antenna sidelobes.

**rad\_TbX\_rc**, X = {V, H}: Brightness temperature at the surface after making a correction for roughness.

**rad\_TbX\_rc\_nolc**, X = {V, H}: Brightness temperature at the surface after making a roughness correction but without making a correction for land in the sidelobes.

**rad\_Tb\_consistency**: Magnitude of the difference between the measured brightness temperature at the surface after all corrections (**rad\_TBX\_rc**) and the predicted values obtained using the derived SSS (not HYCOM) and a flat surface

**rad\_Tb\_consistency\_nolc**: Same as **rad\_Tb\_consistency** but using the measured values before land correction

**SSS**: Retrieved sea surface salinity.

**SSS\_bias\_adj**: Retrieved sea surface salinity with SST adjustment.

**SSS\_error**: Estimated uncertainty in **SSS**; not currently implemented.

**SSS\_nolc**: Retrieved sea surface salinity with no land sidelobe correction.

**rad\_exp\_TaX**, X = {V, H, 3}: Model derived radiometer antenna temperature

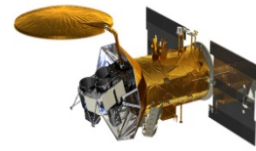
**rad\_exp\_TaX\_hhh**, X = {V, H, 3}: Model derived radiometer antenna temperature using the derived wind speed

**rad\_exp\_TbX**, X = {V, H}: Predicted brightness at the surface using the HYCOM salinity field.

**rad\_exp\_TbX0**, X = {V, H}: Brightness temperature of an ideal surface (i.e. flat, with no waves

**rad\_hh\_wind\_speed**: Wind speed derived using the measured scatterometer sigma-0 and sigma-0 wind model function at HH-pol

**rad\_hhh\_wind\_speed**: Wind speed derived using the scatterometer sigma-0 at HH-pol and the radiometer Tb at H-pol



## Scatterometer Parameters

**scat\_X\_ant**,  $X = \{VV, HH, HV, VH\}$ : Estimated normalized radar cross-section (NRCS, or  $\sigma_0$ ) at the antenna

**scat\_X\_toa**,  $X = \{VV, HH, HV, VH\}$ : Estimated normalized radar cross-section at the top of the atmosphere

**scat\_tot\_toa**: Estimated normalized radar cross-section for the total power received by the radar for each beam

**scat\_wind\_speed**: Estimated wind speed at the ocean surface.

**wind\_uncertainty**: Estimated uncertainty in wind speed at the ocean surface.

**scat\_esurf\_X**,  $X = \{V, H\}$ : Excess surface emissivity due to wind.

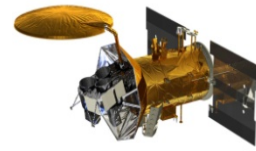
**scat\_esurf\_X\_uncertainty**,  $X = \{V, H\}$ : Estimated uncertainty in excess surface emissivity .

**Kpc\_X\_ant**,  $X = \{VV, HH, HV, VH\}$ : Statistical uncertainty for the antenna  $\sigma_0$

**Kpc\_X\_toa**,  $X = \{VV, HH, HV, VH\}$ : Statistical uncertainty for the top-of-atmosphere  $\sigma_0$

**Kpc\_total**: Statistical uncertainty for the total power  $\sigma_0$ .

**scat\_X\_exp**,  $X = \{VV, HH, HV, VH\}$ : Estimated normalized radar cross-section



## Ancillary Data Parameters

**anc\_wind\_speed:** The wind speed from NCEP GFS GDAS at 10 m.

**anc\_wind\_dir:** The wind direction over the ocean is obtained from the NCEP GFS GDAS 10 meter level.

**anc\_cwat:** The total columnar liquid water above the viewed location.

**anc\_swe:** The snow water equivalent from NCEP GFS GDAS.

**anc\_surface\_temp:** The surface temperature over the ocean is the NOAA OISST (Reynolds) product.

**anc\_surface\_pressure:** Atmospheric pressure is obtained from the NCEP GFS GDAS.

**anc\_subsurf\_temp:** The subsurface temperature over the land from the NCEP GFS GDAS for the layer (0-10 cm).

**anc\_SSS:** The reference sea surface salinity used for computing **rad\_exp\_TbX**.

**anc\_trans:** A measure of attenuation through the atmosphere.

**anc\_Tb\_up:** A measure of the upwelling radiation from the atmosphere at L-band.

**anc\_Tb\_dw:** A measure of the downwelling radiation from the atmosphere at L-band.

**anc\_sm:** The soil moisture content when over land

**anc\_swh:** The significant wave height data from NCEP.

**rad\_land\_frac:** The gain weighted land fraction.

**rad\_ice\_frac:** The gain weighted fraction of sea ice in the radiometer footprint.

**scat\_land\_frac:** The gain weighted fraction of land in the scatterometer footprint.

**scat\_ice\_frac:** The gain weighted fraction of sea ice in the scatterometer footprint.