Aquarius Status
Salinity Retrieval and Applications

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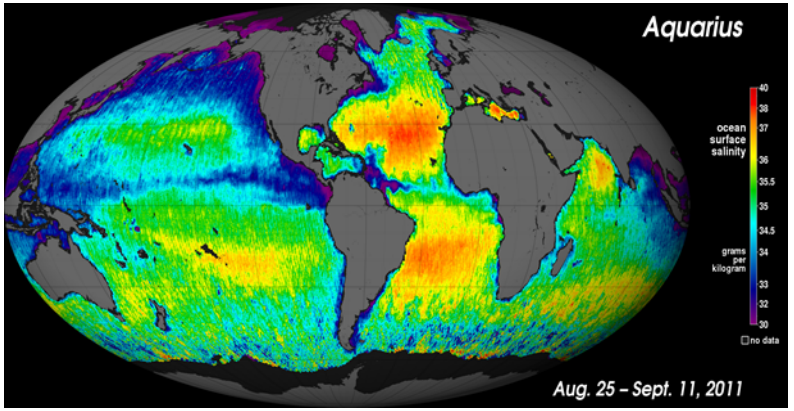
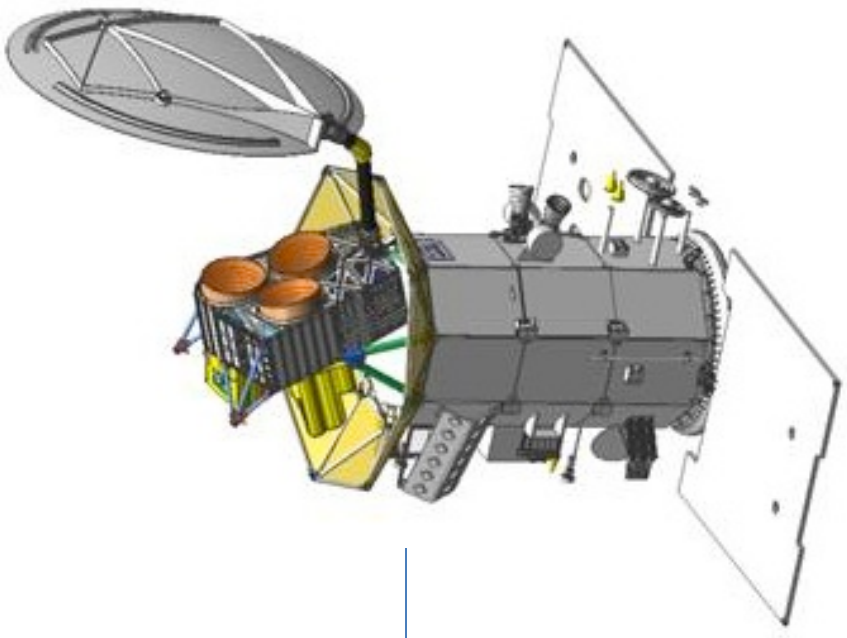
Aquarius/SAC-D Observatory

- Launched: June 2011:
  - August: Aquarius On
  - September: First Salinity Image
  - Continuous Operation Since Aug 25

- Outline of Presentation
  - Introduction to Aquarius
  - Status of the Retrieval
    - Salinity
    - Applications
  - Future



Aquarius/SAC-D



Aquarius

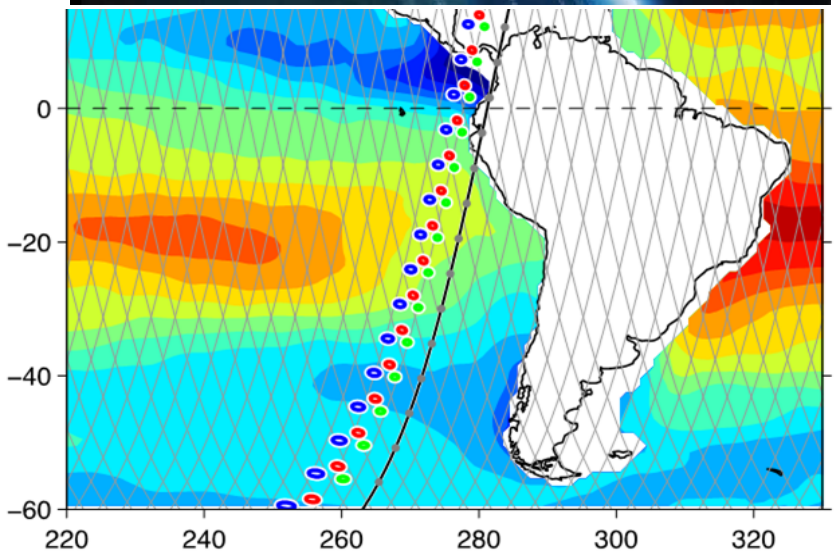
- ***Instrument***
  - ***L-band***
  - ***Radiometer and Radar***
  - ***3 Beam Pushbroom***
  - ***Polarimetric***
- ***Science***
  - ***Global maps of Sea Surface Salinity***
  - ***Accuracy: 0.2 psu; 150 km; monthly***
  - ***Seasonal and annual variations***

SAC-D

- ***Partnership:***
  - ***Argentine Space Agency: CONAE***
  - ***Spacecraft (SAC-D) and operations***
- ***SAC-D Instruments***
  - ***Microwave Radiometer: MWR***
  - ***Infrared & visible cameras: NIRST, HSC***
  - ***Data collection: DCS***
  - ***Radio Occultation (Italy): ROSA***
  - ***Space environment (France): CARMEN***

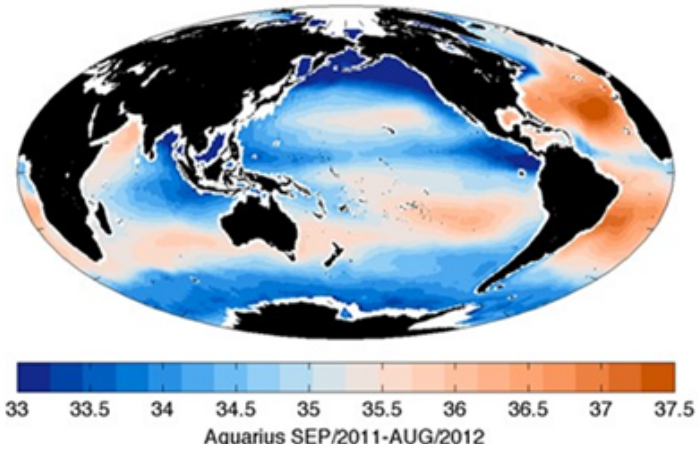
AQUARIUS
Unique Features to Retrieve Salinity

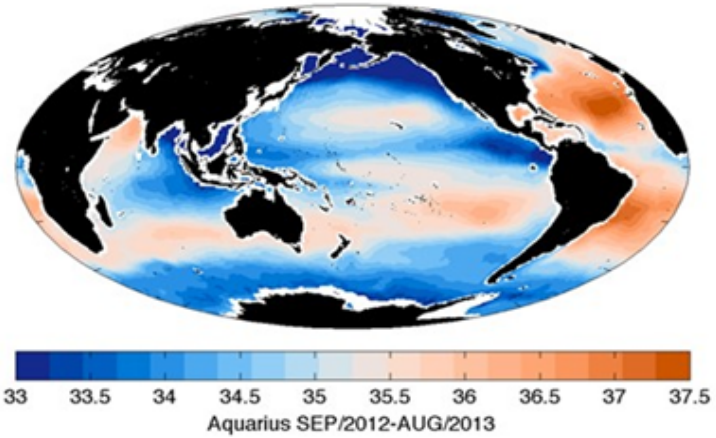
- Active/Passive
  - Radiometer for SSS
  - Scatterometer for roughness correction
- Polarimetric Radiometer
  - T3 to correct for Faraday rotation
- Orbit
  - Sun-synch orbit 6am/6 pm (6 pm asc)
    - Night time look to avoid reflected Sun
  - 7-Day exact repeat
    - Global coverage with averaging
- Engineering Design
  - Thermal Control
    - Passive and active
    - Change of < 0.1 C on radiometer front end
  - Antenna
    - Reduced sidelobes in direction of Sun
  - Rapid Sampling for RFI mitigation
  - Internal calibration



Aquarius Salinity Retrieval

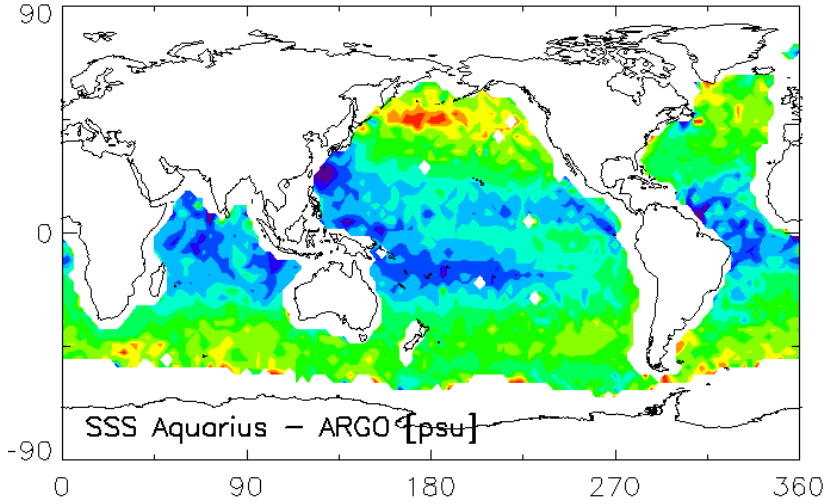
- Previous Versions
  - V1.0: Pre-Cal/Val Evaluation product
  - V2.0: First public release
  - V2.x: Internal evaluation products
- Current Version 3.0: Released in June, 2014
  - Modified drift correction for “wiggles”
  - Improved absolute calibration
    - Revised antenna pattern (backlobes)
    - Additional work underway
  - Updated retrieval algorithm
    - Aquarius generated winds
    - Min Least Square retrieval using both V & H pol
    - Improved galactic background correction
      - Asc/Dsc bias minimized
  - Improved flags and masks
  - SST bias adjustment available

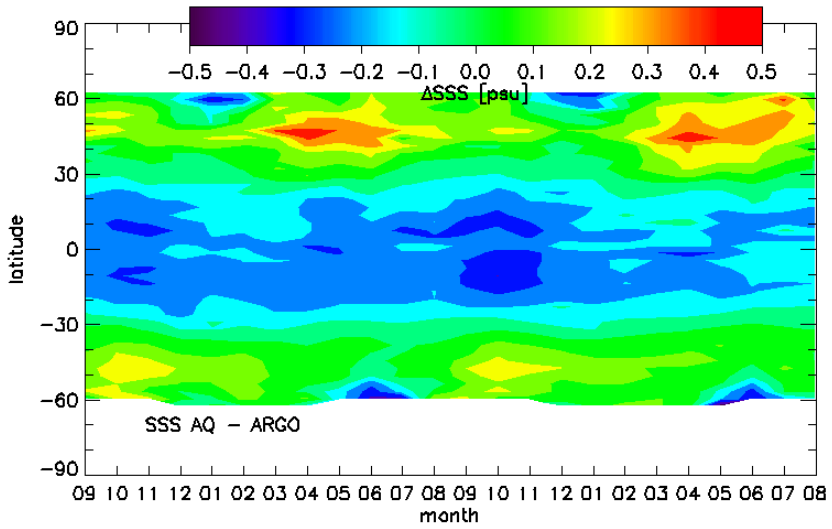


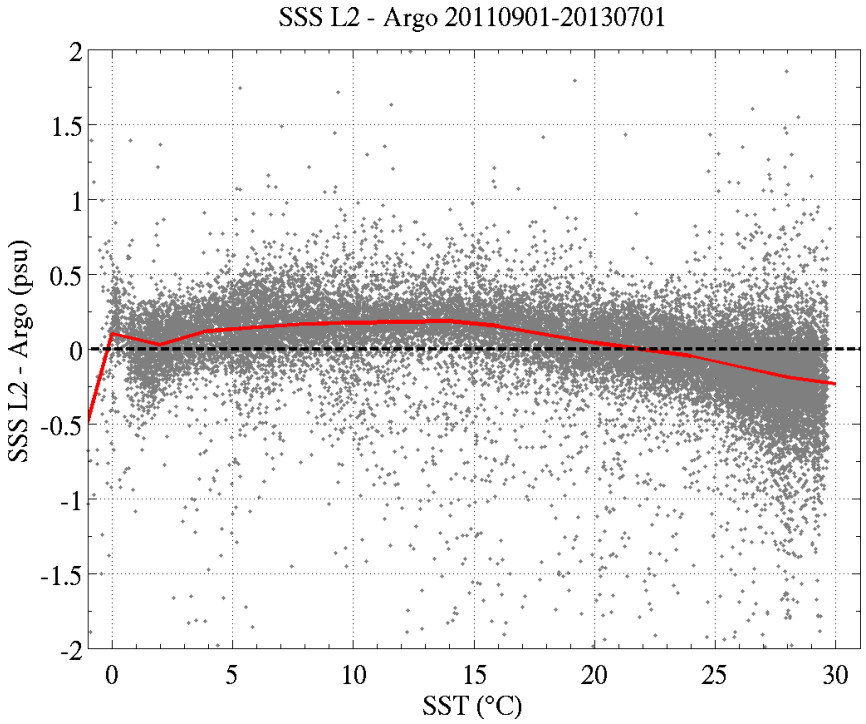


Issue: SST bias

Aquarius SSS – ARGO SSS correlates with SST





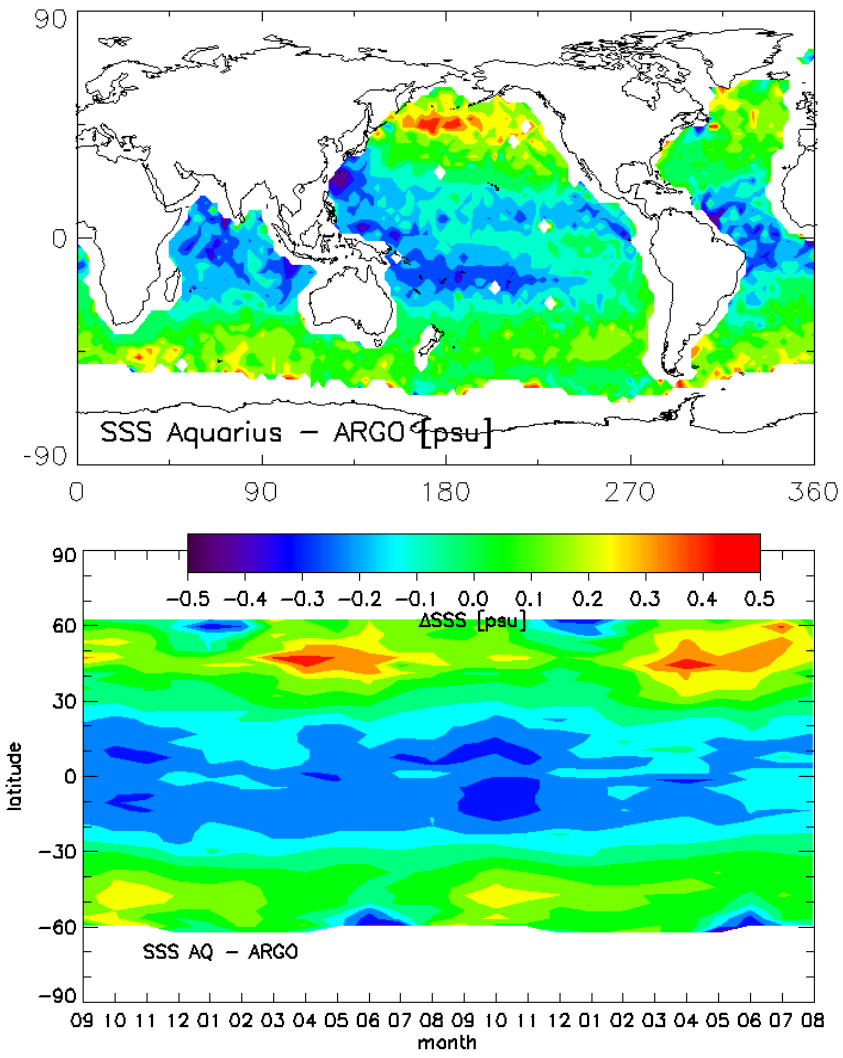


Option in V3.0: Empirical correction to SSS to remove SST-dependent bias:

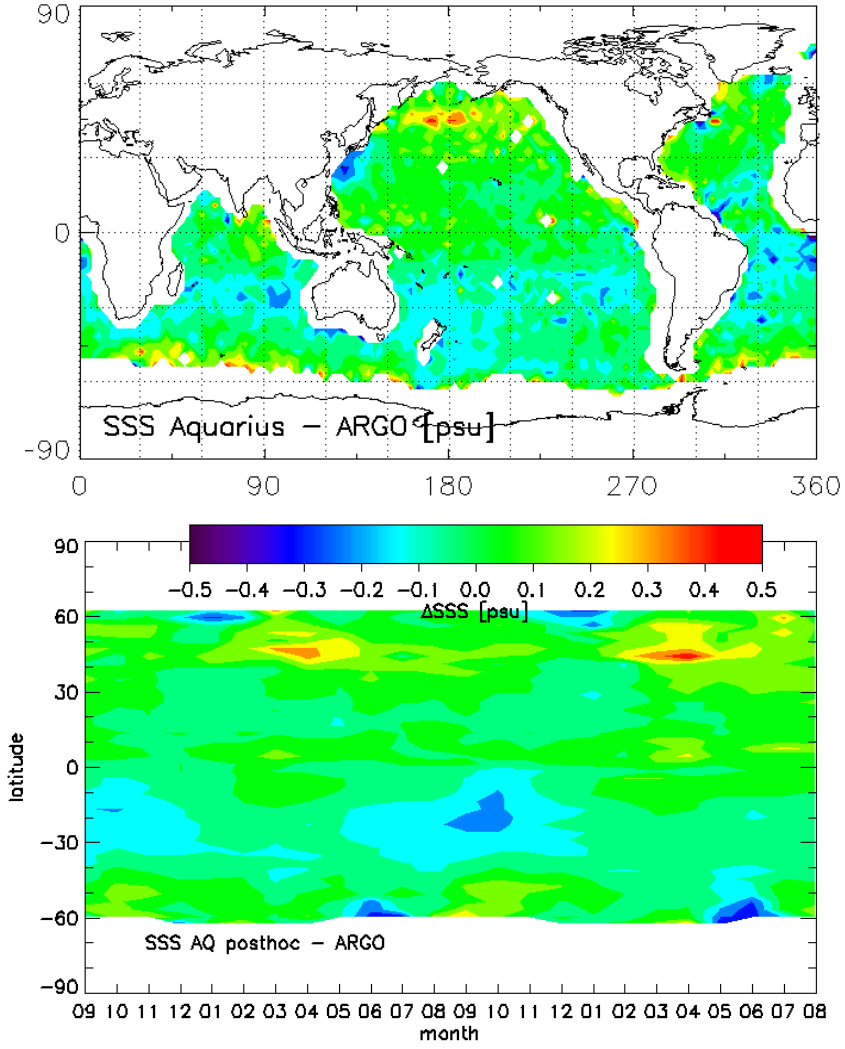
$\Delta SSS = -0.0019594*T^2 + 1.1257*T - 161.4934$

Impact of SST Bias Correction

no adjustment

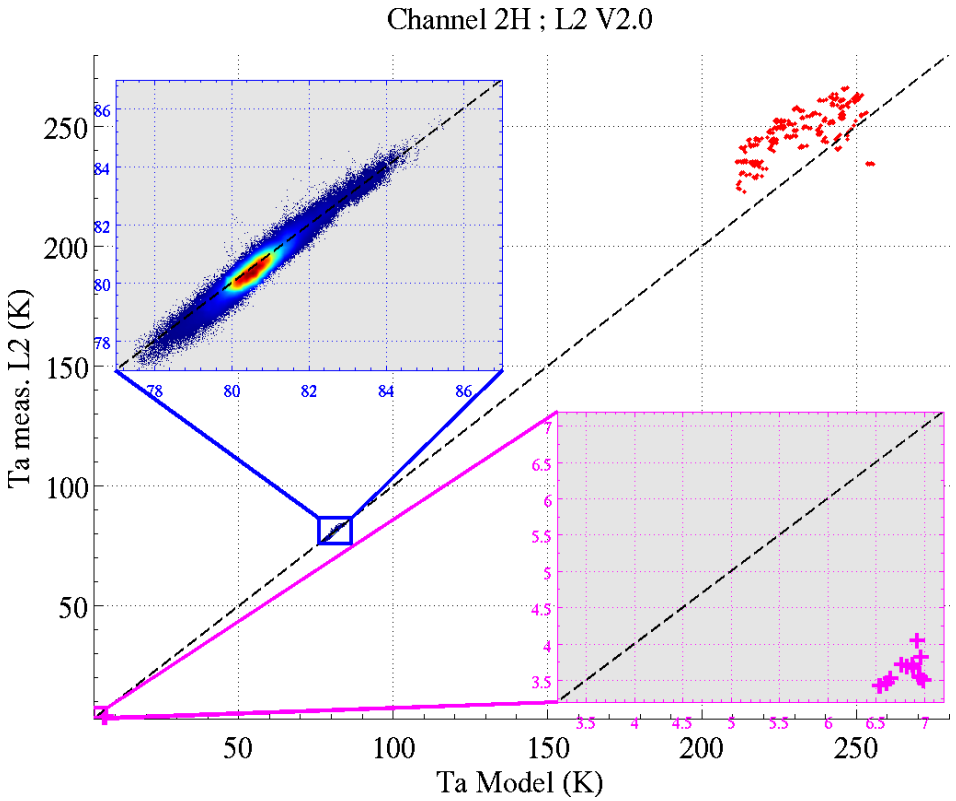


bias adjusted



Issue: Full Range Calibration

- V2.0
  - Ocean OK
  - Land warm and Cold Sky cold
  - Likely cause: Antenna pattern
- Improvements in V3.0
  - Adjusted antenna pattern
    - Corrected “spillover”
  - APC adjusted
- Errors reduced significantly
  - Bias ~ 1 K
  - Good agreement with SMOS
    - Dome-C
    - Soil moisture



Aquarius is Doing Well

- Approaching Goal (0.2 psu)

Triple Location Estimates of Individual Errors [psu]			
	AQUARIUS	HYCOM	ARGO
V3.0	0.27	0.16	0.19
SST bias adjusted	0.22	0.16	0.19

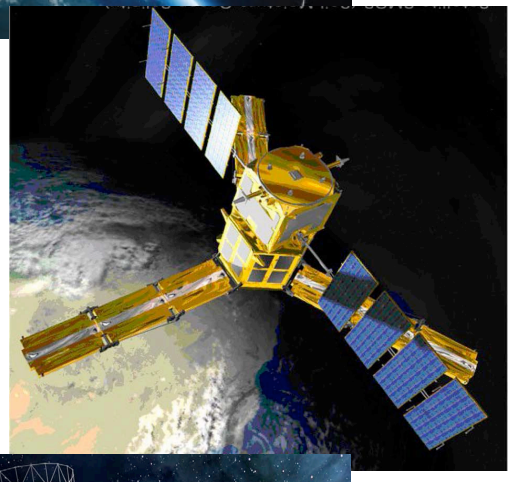
- Future: Extended Mission
  - Nominal end November 30, 2014
  - Extended through September, 2015 (end of Fiscal Year)
  - Proposal due in March 2015 for 2 yr extension

Advertisement

- **L-Band Inter-Comparison Working Group**
  - Objectives
    - Develop approach for inter-comparison
    - Lay ground work to permit merged, validated data sets
  - Next Meeting:
    - SMOS Science 2015: ESA\ESAC (Madrid)
  - **Join** Mailing List
    - Email: David.M.LeVine@nasa.gov

- **Aquarius Data Products**
  - Sea Surface Salinity
  - Soil Moisture
  - RFI Maps
  - Cyrosphere applications

http://aquarius.umaine.edu/cgi/index.htm

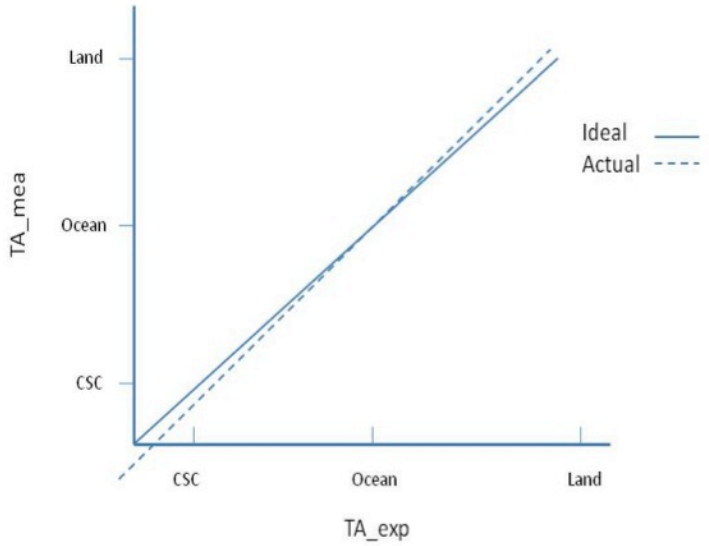


The End

Full Range Calibration

- Likely due to Antenna
  - Error in “spillover”
  -
- Improvements in V3.0
  - Adjusted antenna pattern (hybrid)
  - APC adjusted
- Antenna Pattern Correction (APC)
  - TA = $\int_{Earth} T_b^{Earth} G d\Omega$.
  - TB = $[A]^{-1}$ TA
  - A is 3x3 for Aquarius

$$TA = \int_{Earth} T_b^{Earth} G d\Omega + \int_{Sky} T_b^{Sky} G d\Omega$$

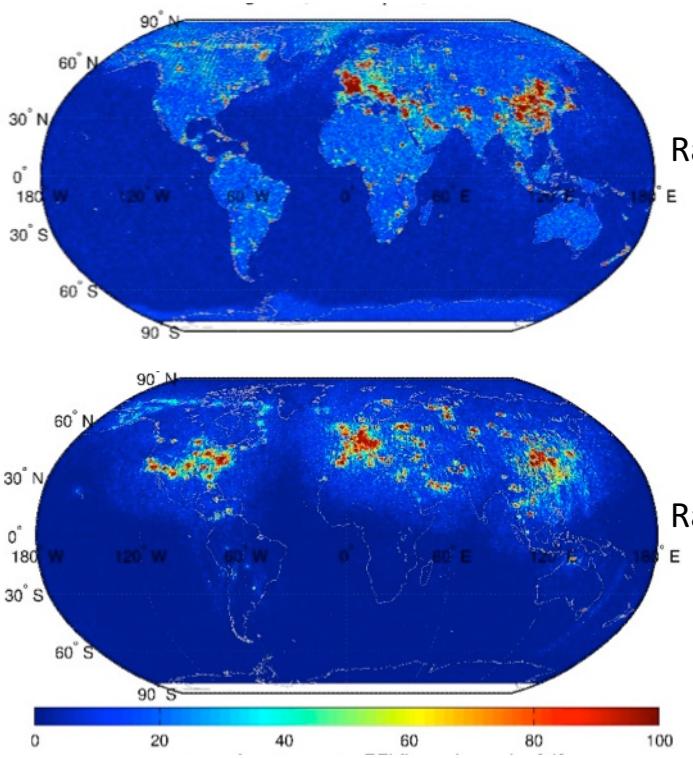


Available Data

- Aquarius Soil Moisture Product
  - USDA: Jackson/Bindlish
  - SMAP tau-omega model
  - Available from NSIDC: http://nsidc.org

- Aquarius SSS Data Products
  - http://podaac.jpl.nasa.gov/aquarius
  - http://ourocean.jpl.nasa.gov/sss
  - http://aquarius.nasa.gov/index.html
    - Updated website (U/Maine)
    - SSS maps
    - Radiometer RFI
    - Scatterometer RFI
  - http://oceancolor.gsfc.nasa.gov/WIKI/AQ%282f%29GS.html
    - Additional documentation
    - Quick look SSS
    - Soil moisture

August, 2011 – April, 2012



Percent of samples flagged as RFI