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Status of AMSR-E Science Team Investigation at Remote Sensing Systems

Frank J. Wentz
Peter Ashcroft
Chelle Gentemann

1. **Update on method for computing Teff**
2. **Aug-Sept 2003 Aqua pitch error**
3. **RFI from Geostationary TV satellites**
4. **Initial Analysis of Midori-2 AMSR (active-passive wind comparisons)**
5. **WindSat helping AMSR-E**
6. **Chelle Gentemann's SST work**
   Blending AMSR-E and TMI SST via OI
   Working with MODIS Team at U Miami
   Working with Dick Reynolds on incorporating MW into his standard product.
   Continuing hurricane cold wake analysis.
   Unified GODAE SST product: microwave, IR, in situ

New Method of Computing Effective Temperature of the Hot Load

Based on Assumption that Teff is independent of polarization
Uses Climate Vapor and Cloud

$$T_X = T_V - 0.53T_H \qquad \textit{very insensitive to vapor or cloud}$$

$$\Delta T_B = \frac{T_B}{T_h}\Delta T_h \qquad \textit{relationship between } T_B \textit{ and hot load } T_h$$

$$\Delta T_h = \frac{T_h}{T_V - 0.53T_H}\left(T_{Xmea} - T_{X\,\mathrm{mod}}\right) \approx 2.4\left(T_{Xmea} - T_{X\,\mathrm{mod}}\right)$$

$$T_{X\,\mathrm{mod}} = F\left(\textit{reynolds sst, ncep wind, climate vapor and cloud}\right)$$

Advantages:

- Global Collocations
- Coincident Satellite Observations not Required

Effective Temperature of the Hot Load

Computed Teff used to obtain thermistor regression coefficients

$$T_{eff} = \sum_{i=0}^{8} a_i \left(t_i - 303\right) + \sum_{i=0}^{8} b_i \left(t_i - 303\right)\sin\omega + \sum_{i=0}^{8} c_i \left(t_i - 303\right)\sin 2\omega$$

$t_0 = 1, \quad t_{1-8} =$ thermistor

$\omega =$ orbit angle relative to ecliptic plane

A Non-Linear Calibration Equation is used for 7 GHz

$$T_{AE} = T_{AE,linear} + \kappa\left(T_{AH0} - T_{AC}\right)\frac{\left(C_H - C_E\right)\left(C_E - C_C\right)}{\left(C_H - C_C\right)^2}$$

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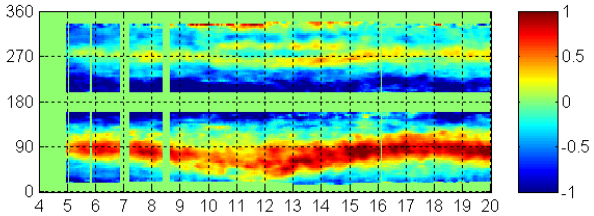
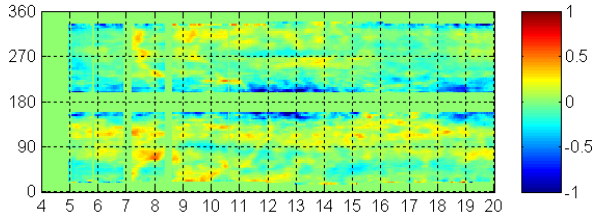
Effective Temperature of Hot Load Minus 11-37 GHz Average (Versus Orbit Position and Month)

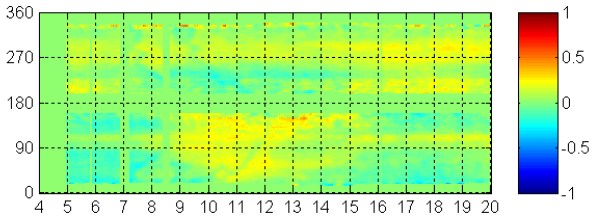
7 GHz



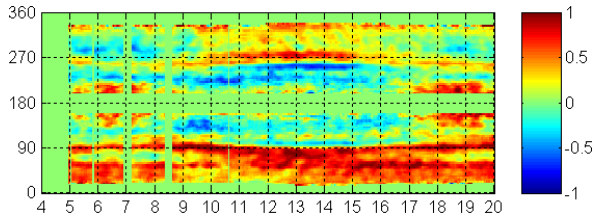
11 GHz



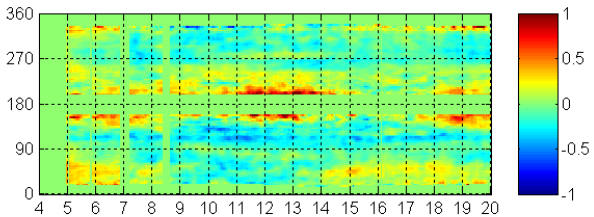
19 GHz



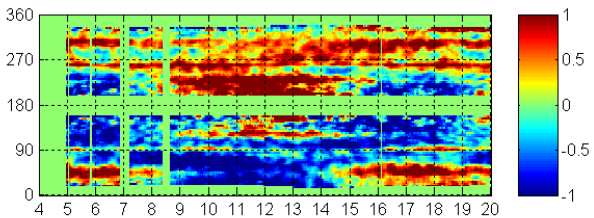
23 GHz



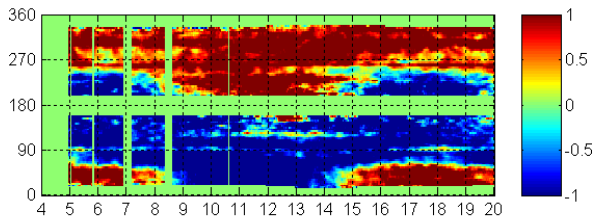
37 GHz



89A GHz



89B GHz



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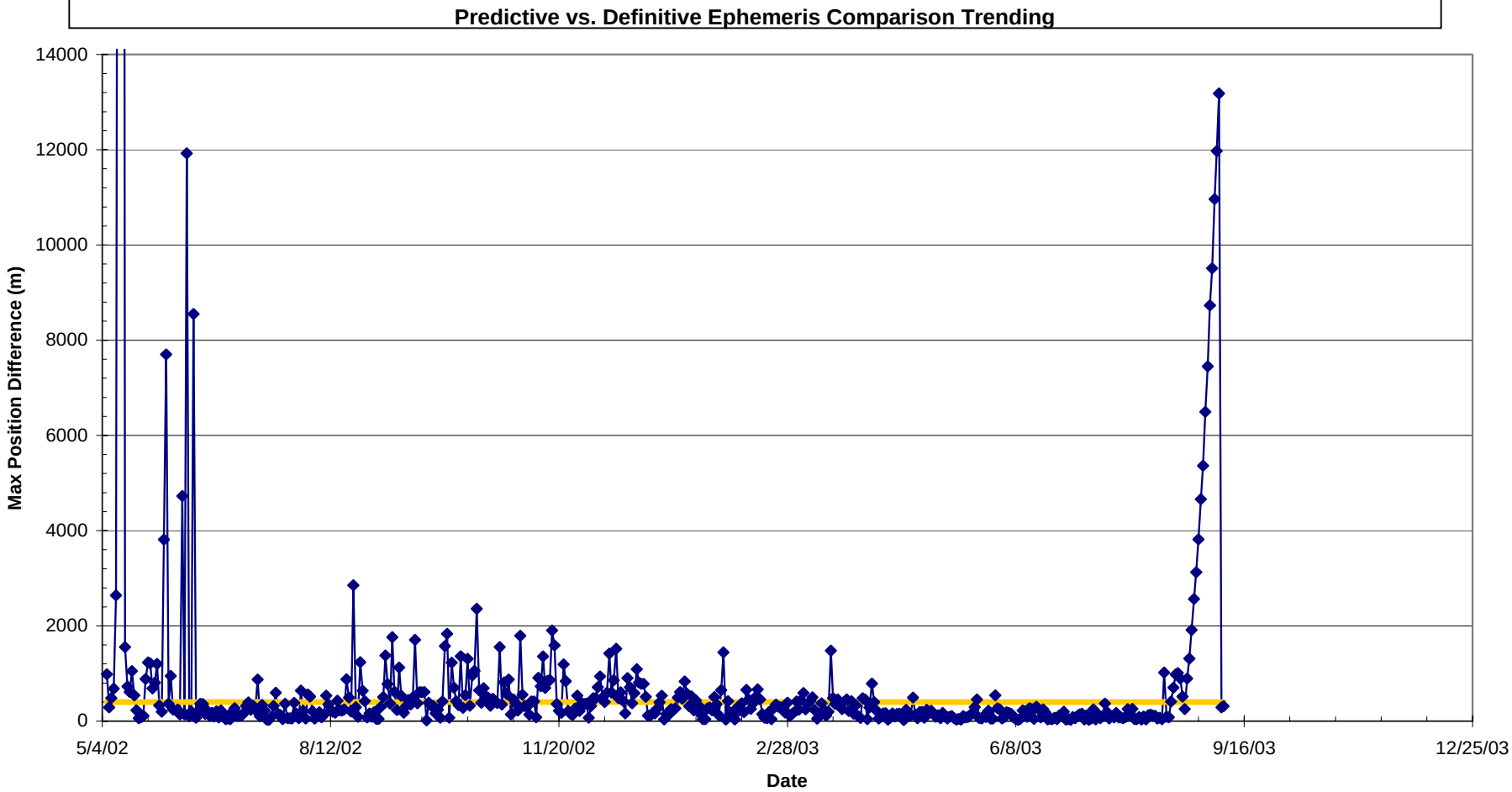
Predictive vs. Definitive Position Differences



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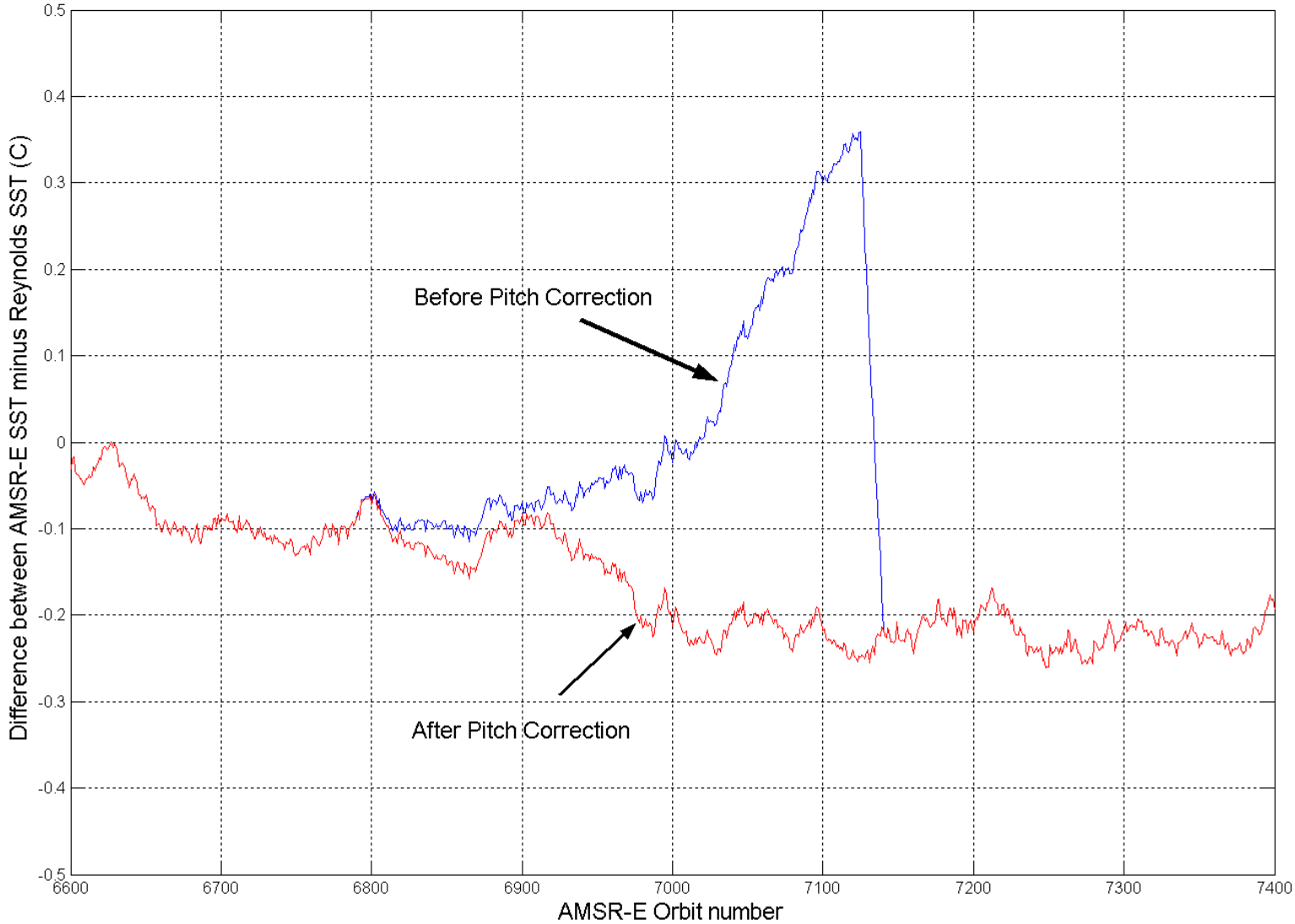
SST Retrieval Error Resulting from Pitch Error



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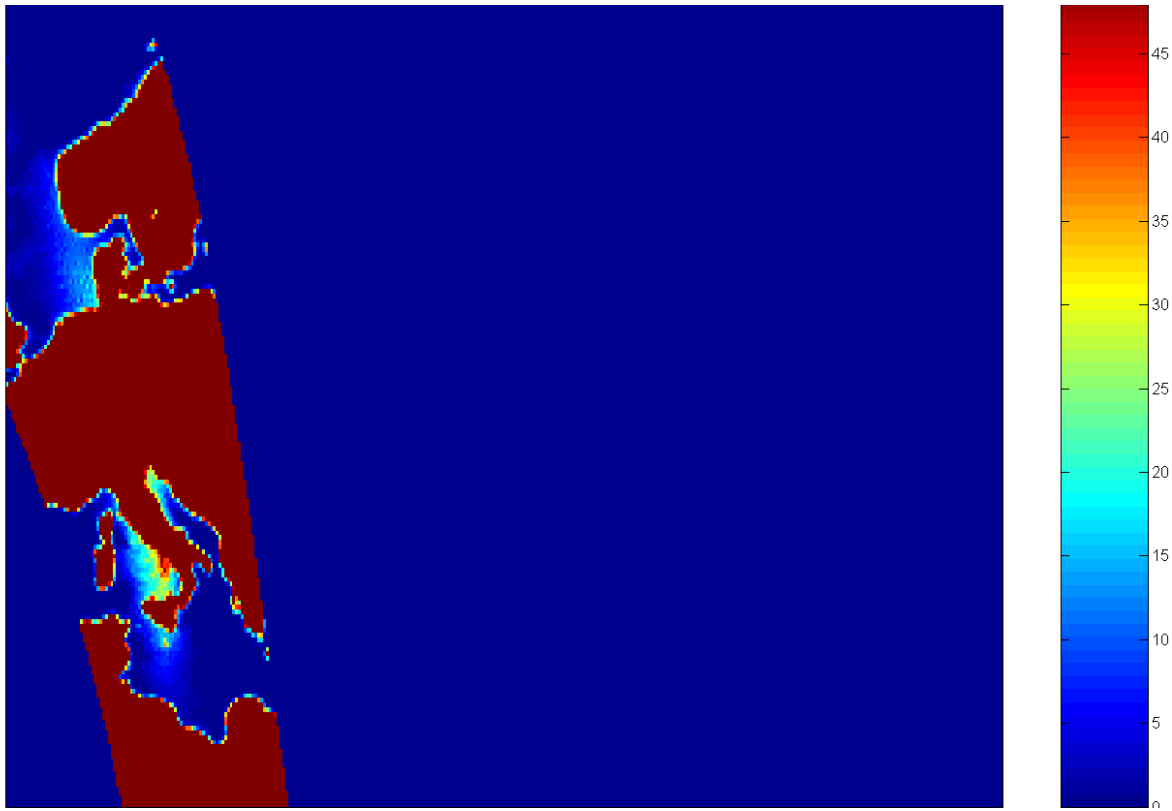
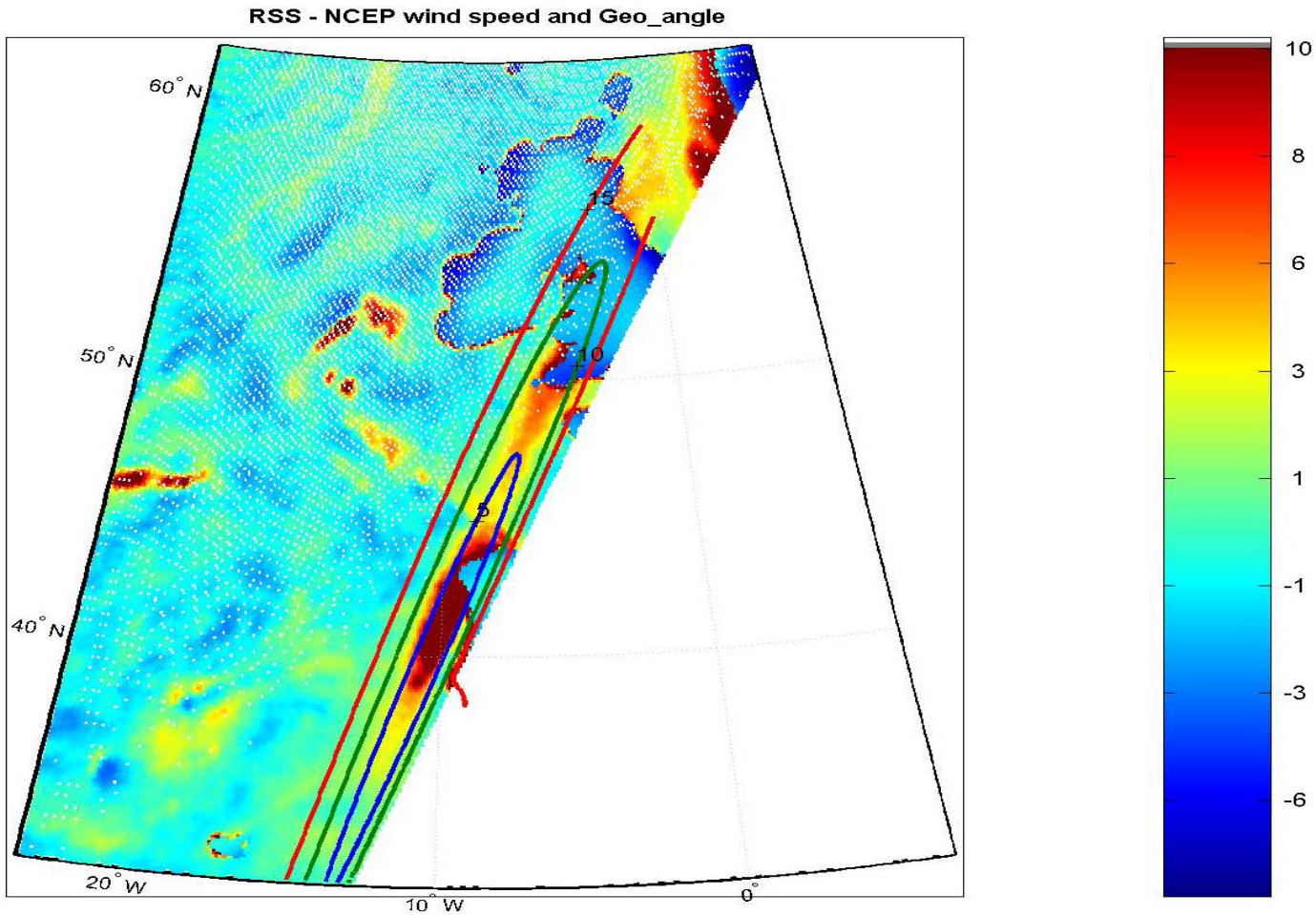
RFI from European Television Satellites Reflecting off the Ocean

WindSat Orbit 3097: Ascending pass over Europe, 10.7 GHz h-pol

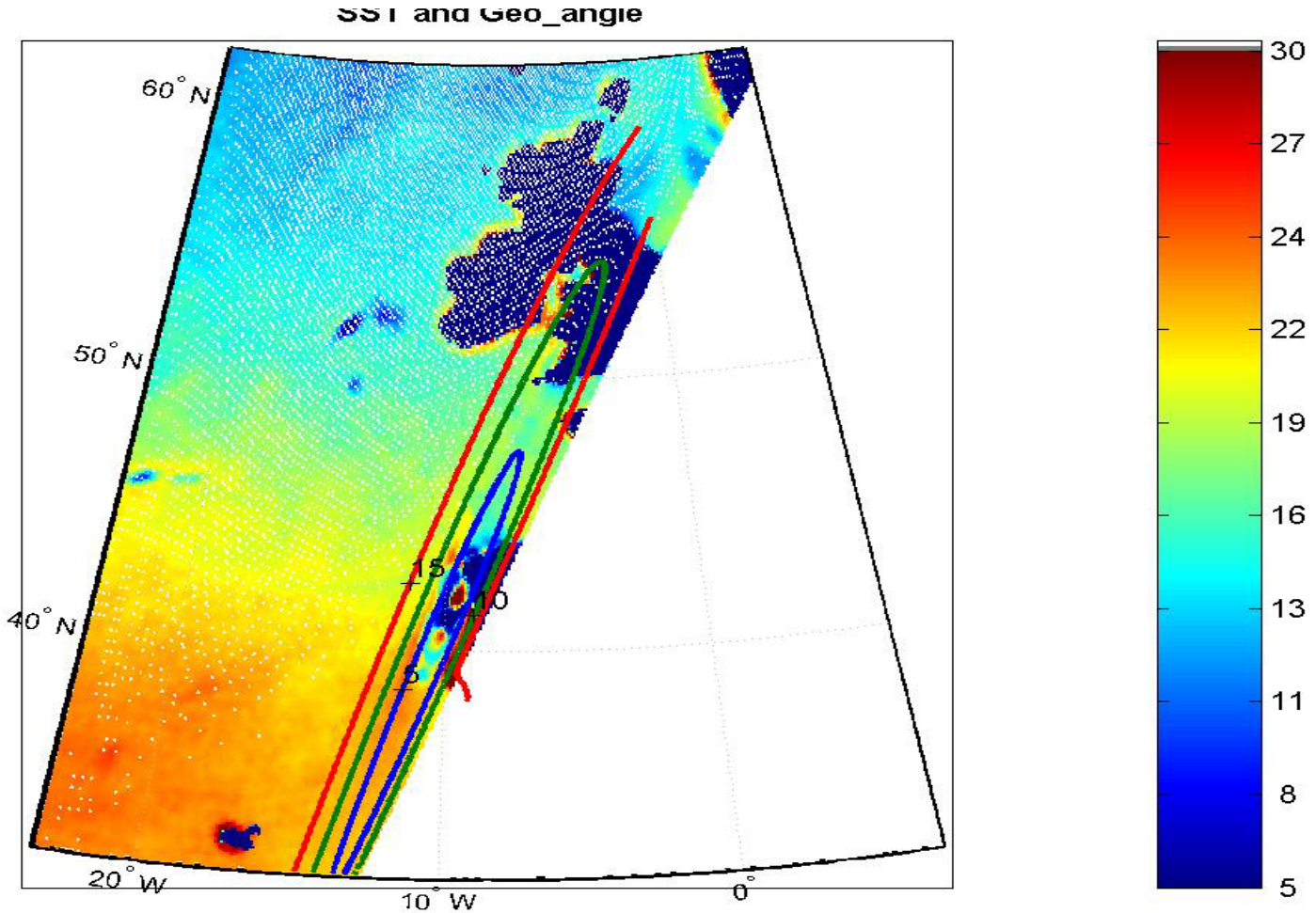
Average of forward and aft observations. RFI just seen by aft observation, so true effect is twice that of what is show here



Effect of RFI on Wind Retrieval



Effect of RFI on SST Retrieval



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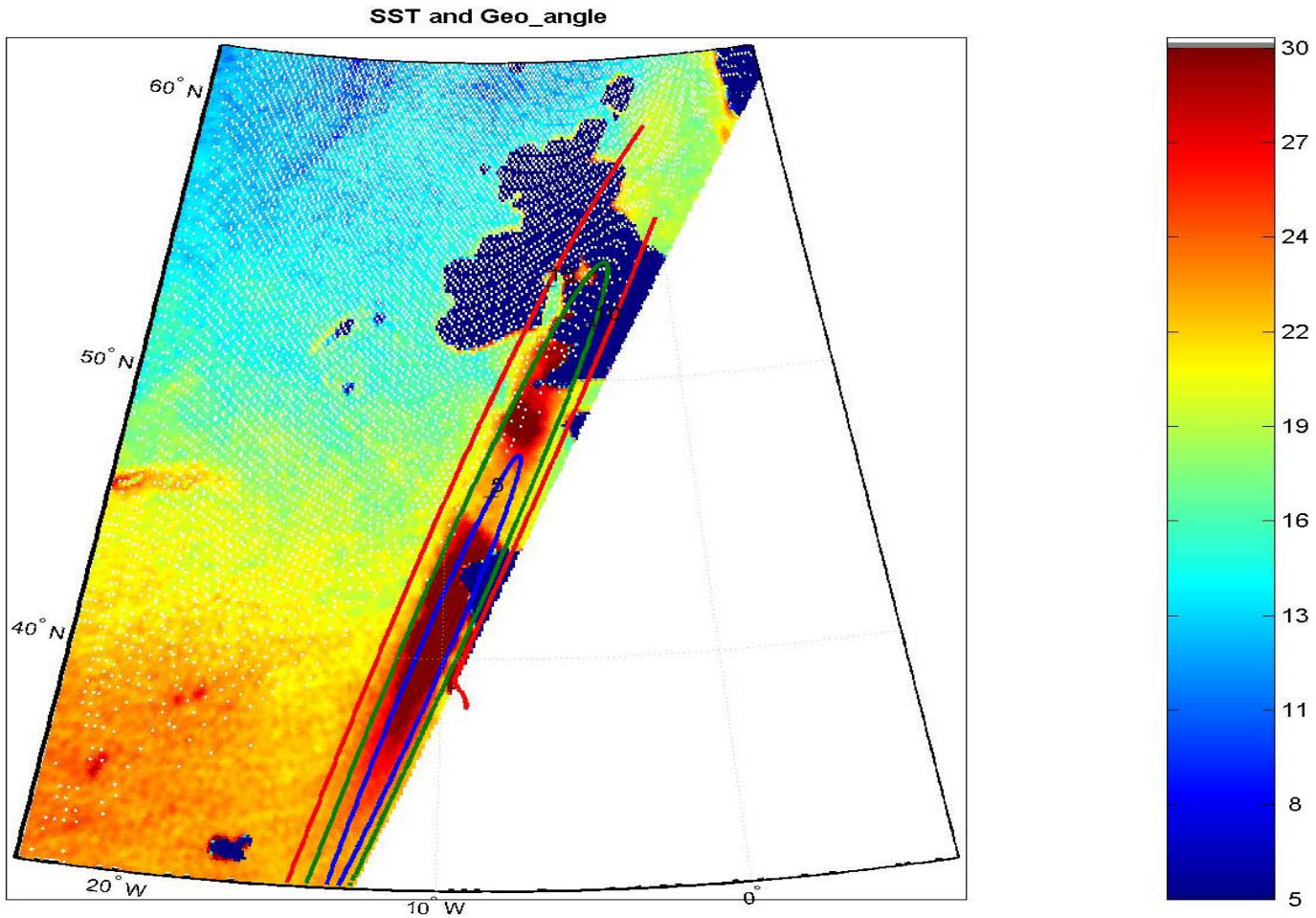
Effect of RFI on 10.7 GHz SST Retrieval



Initial Analysis of Midori-2 AMSR

- Completed an initial analysis of Midori-2 AMSR data in preparation for generating Level-2A dataset.
- Hot Load characteristics somewhat different than that for AMSR-E (less spectral consistency)
- Method for computing effective hot load temperature modified slightly to accommodate both AMSR-E and AMSR. (effectively inter-calibrates to the satellite sensors)
- Initial Ocean Retrievals done to verify the calibration.

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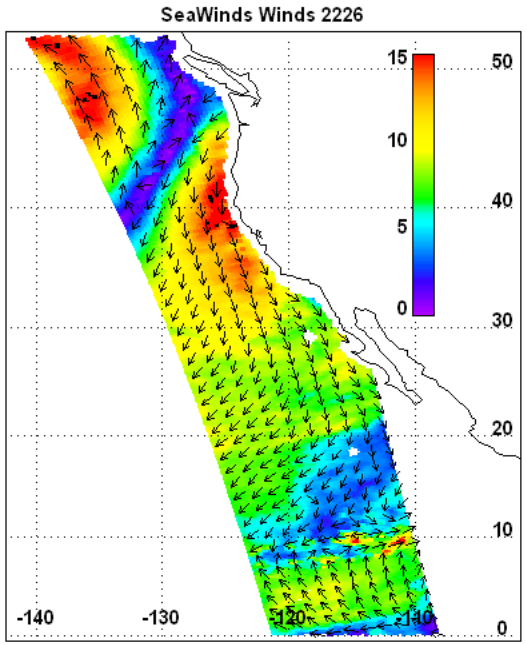

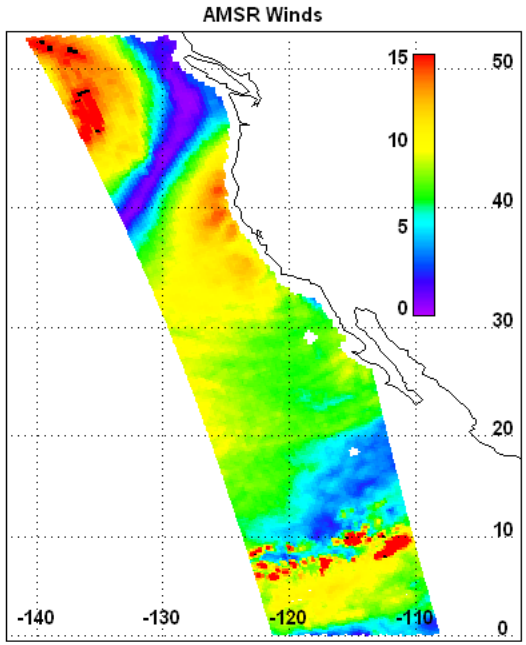

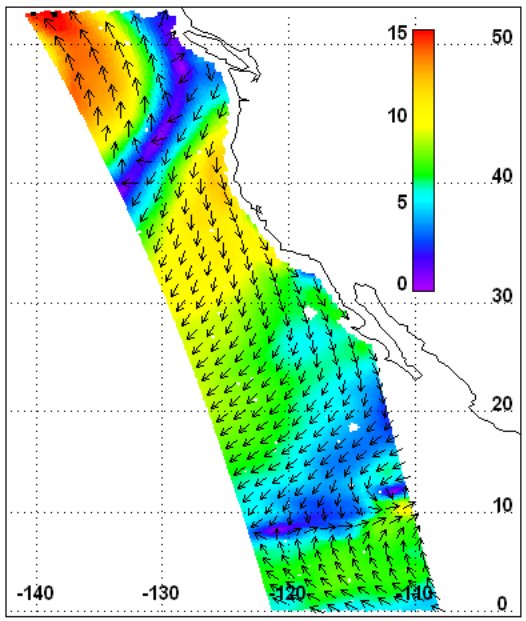

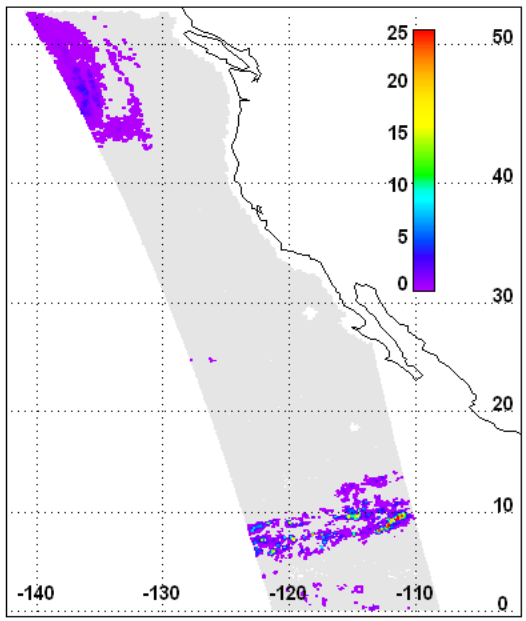

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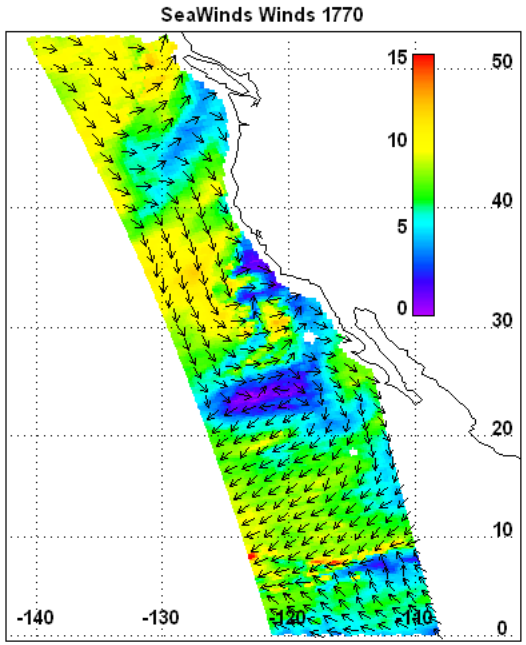

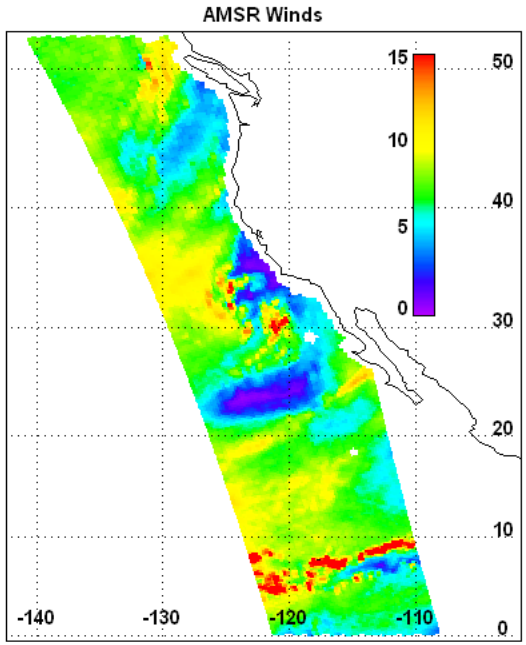

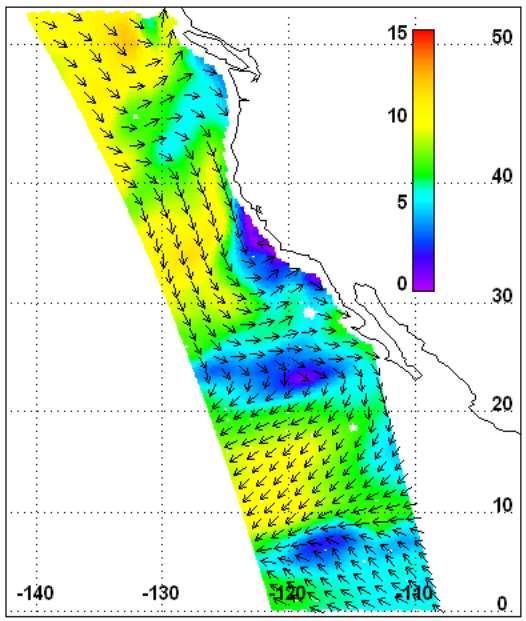

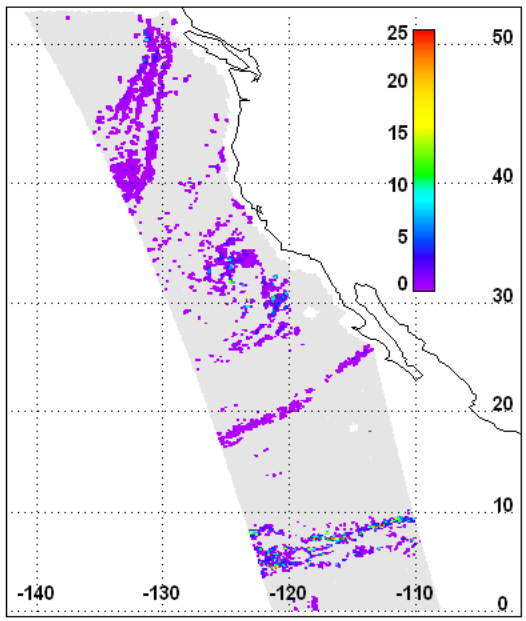

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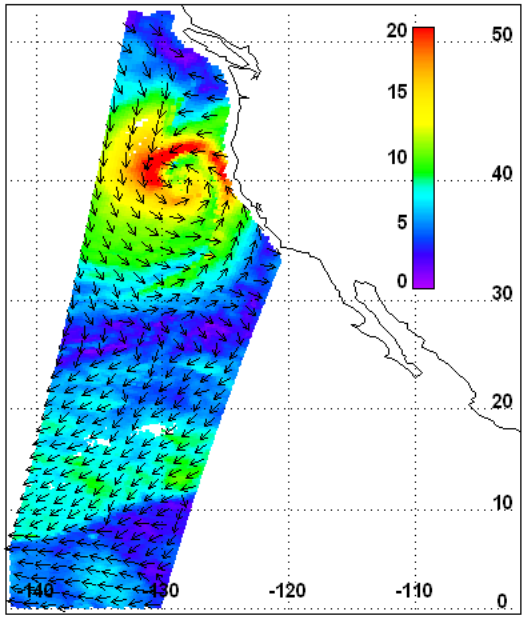
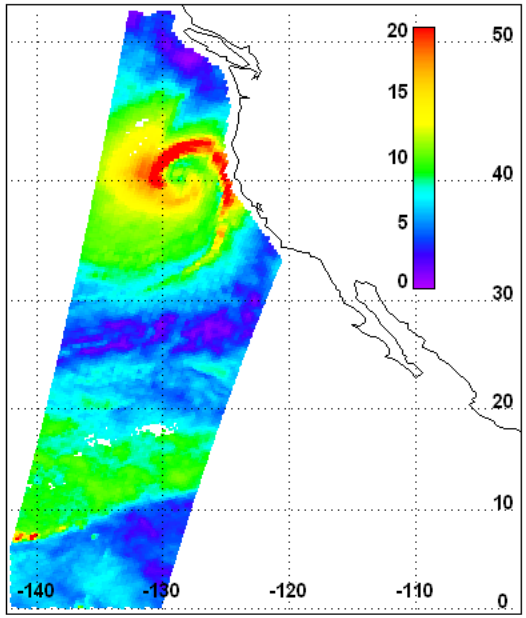
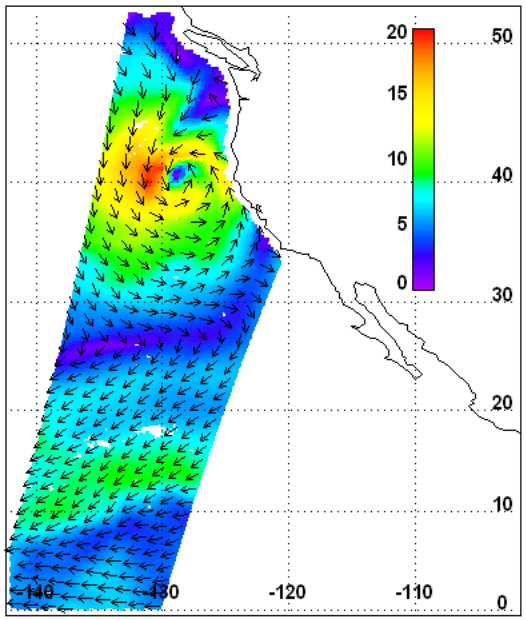
SeaWinds Winds 1920



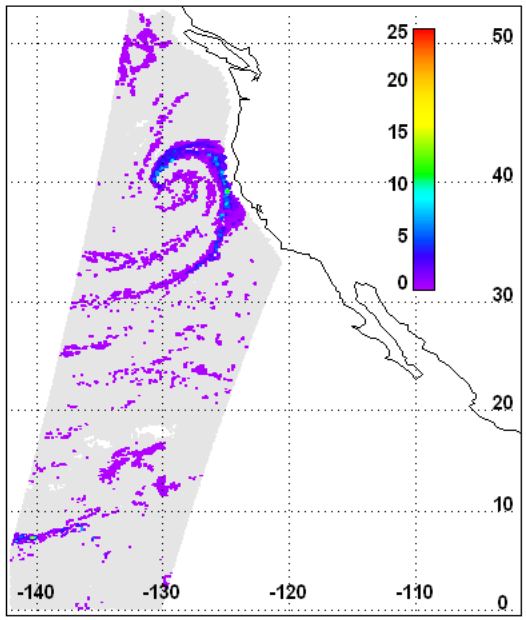
AMSR Winds



NCEP Winds



AMSR Rain Rate



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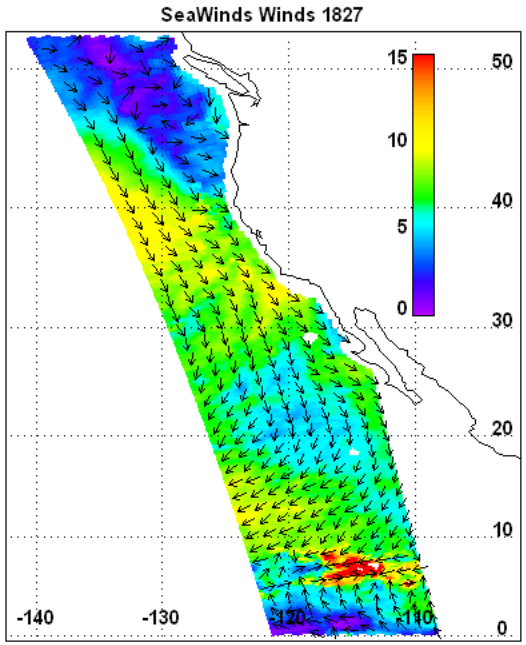

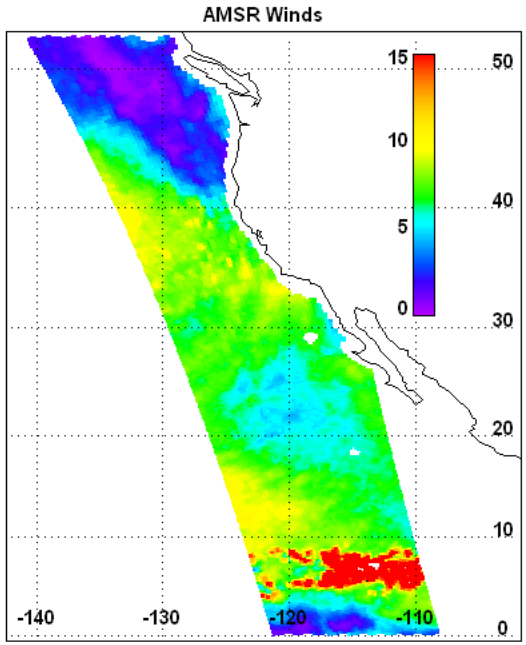

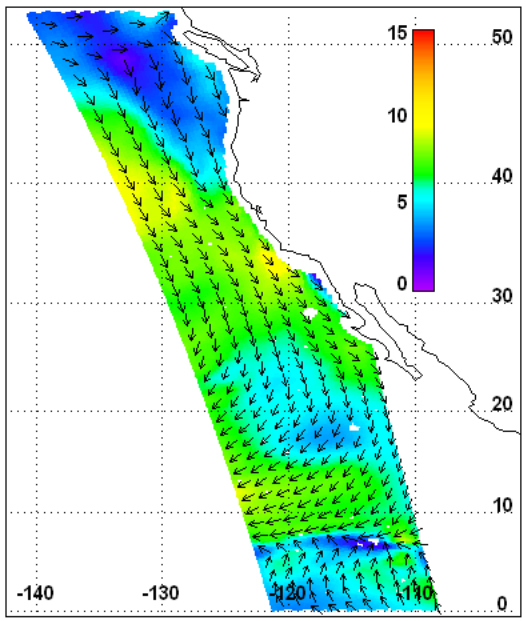

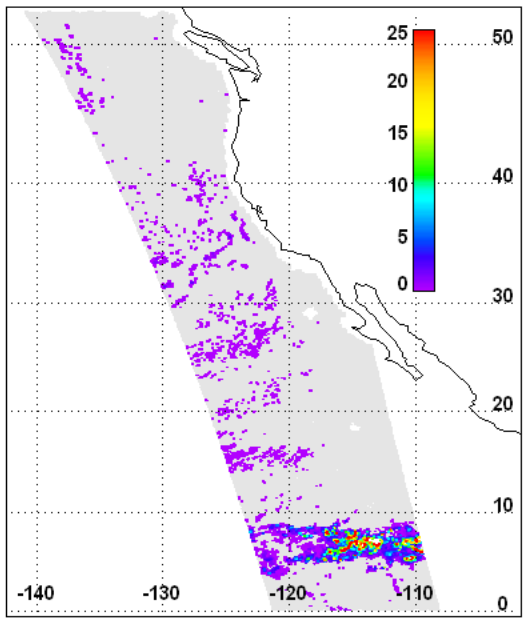

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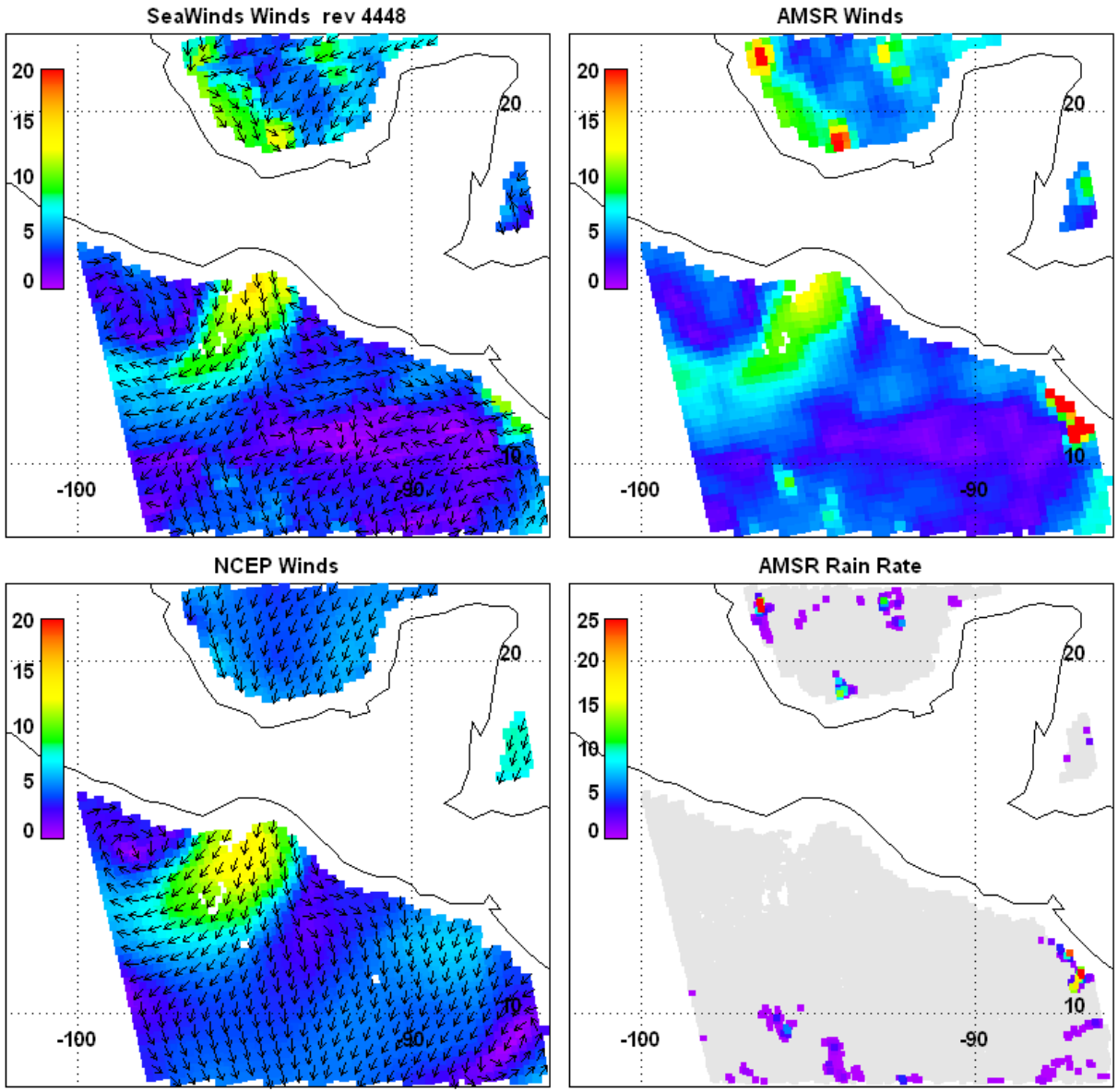

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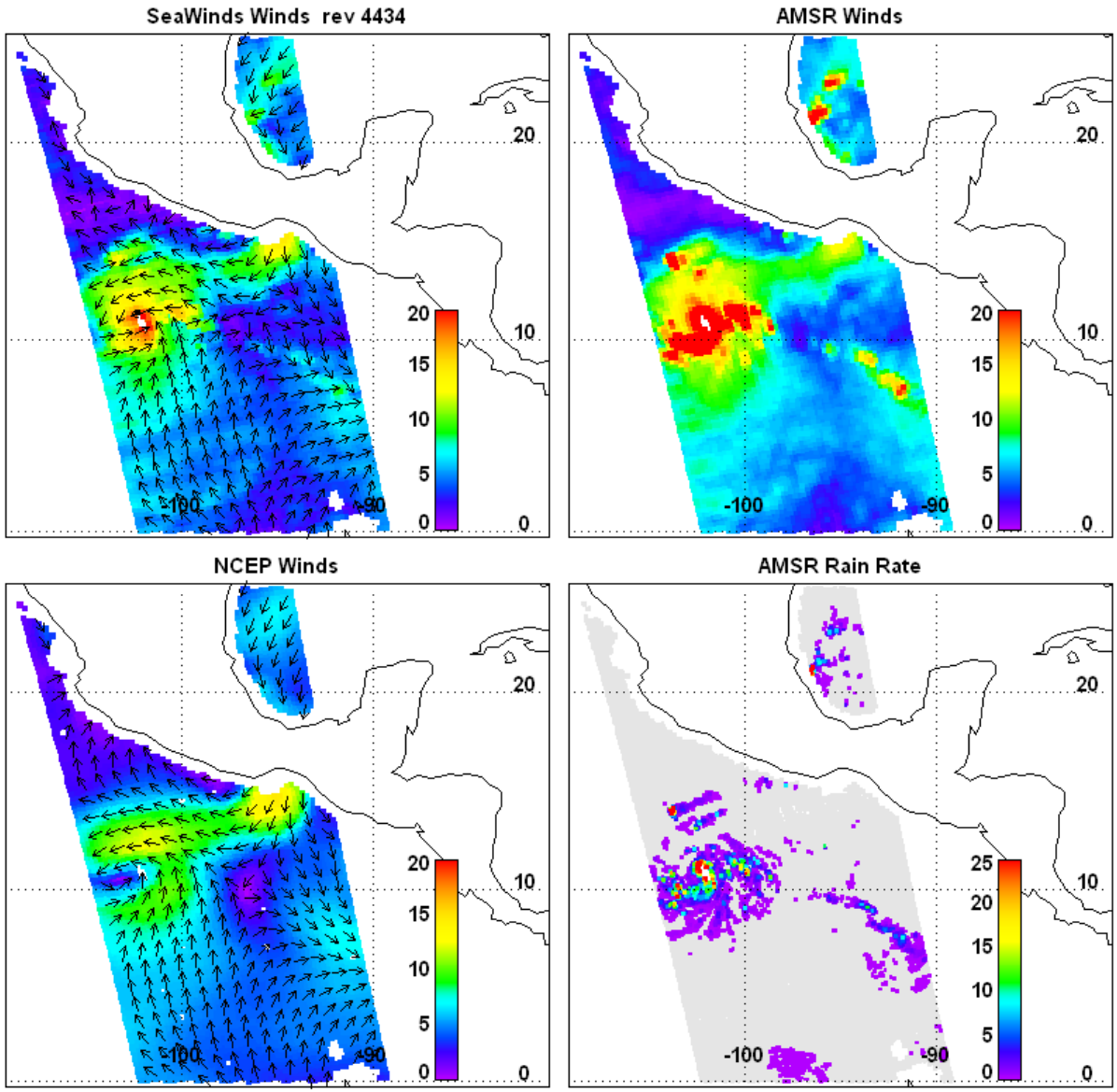

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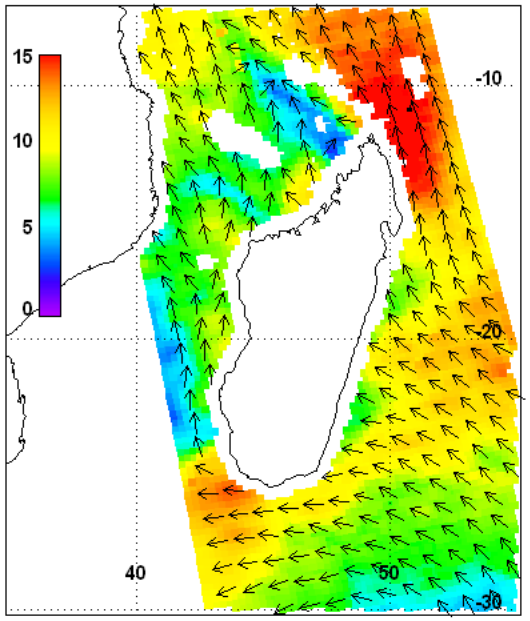
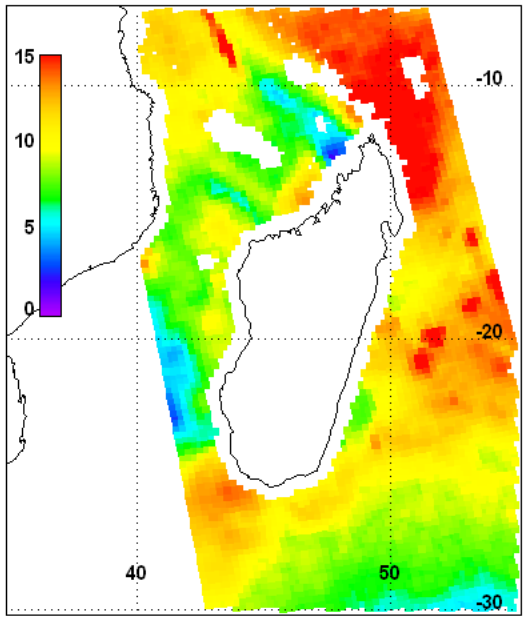
SeaWinds Winds rev 2975



AMSR Winds



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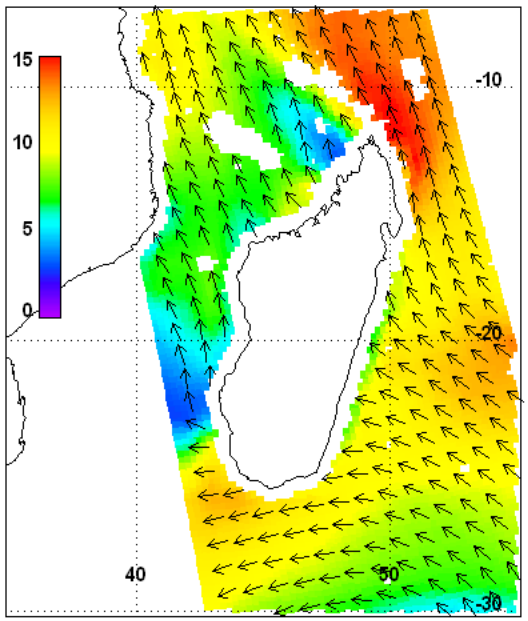
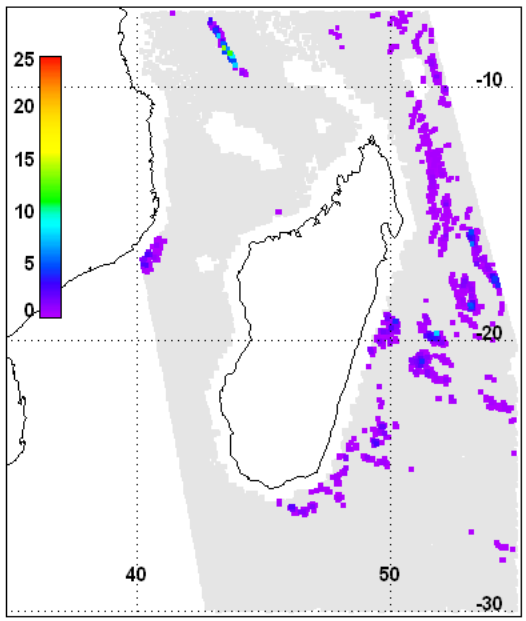


AMSR Rain Rate



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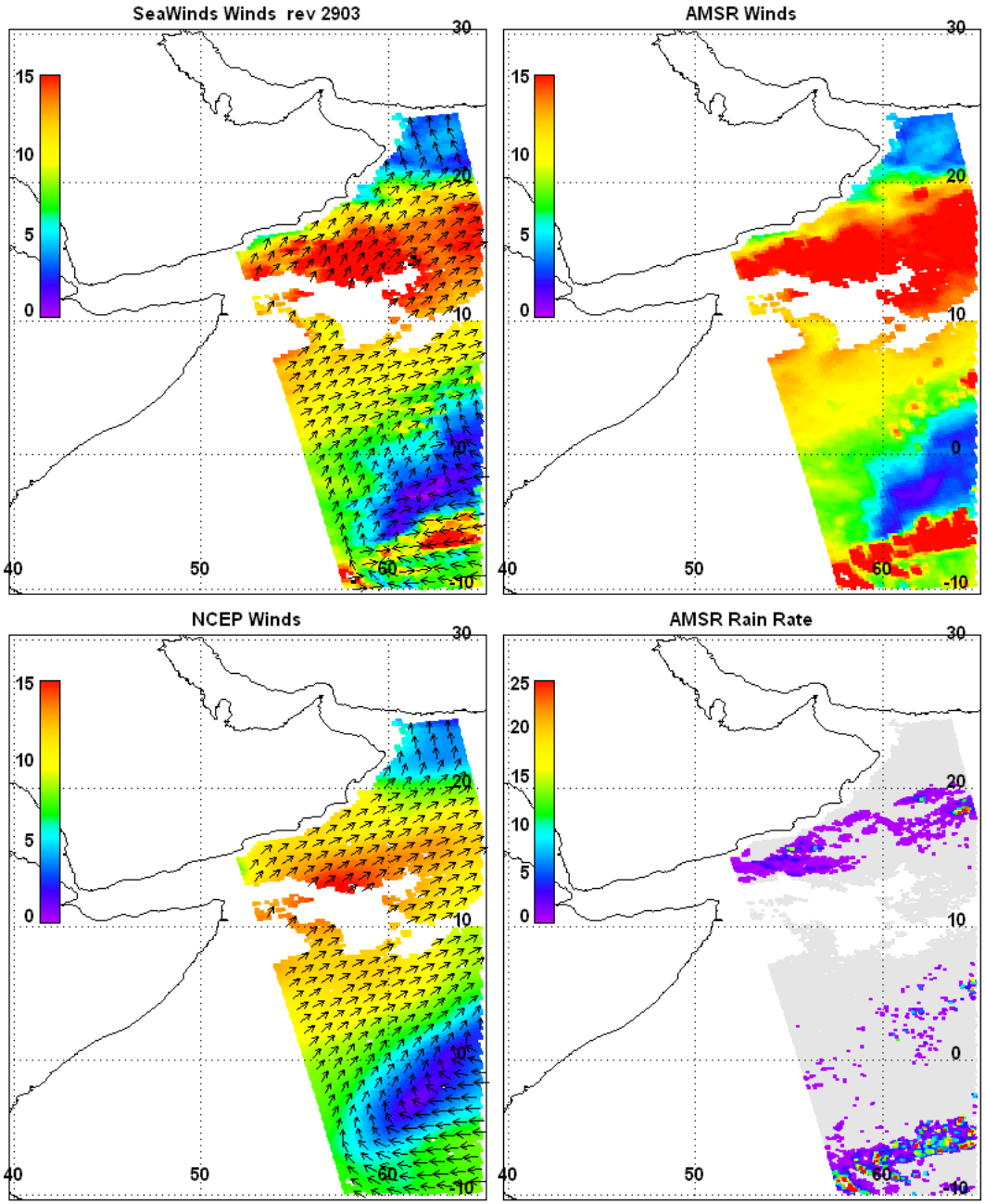

WindSat Analysis
(Supported by NPOESS CMIS)

- 6 Month of WindSat RDR (Aug 03 – Jan 04)
- Processed to a Condensed Level-1a
  (data volume reduced by a factor of 25)
- Offset for Spacecraft roll and pitch applied
- Resampled to common spatial resolution on a Earth-fixed grid.

- Provides a test for our hot-load correction
- Will be used to calibrate AMSR over land.

WindSat Analysis (cont.)

Difference between WindSat observations and RSS RTM

	$T_{A,MEA} - T_{A,RTM}$ (Kelvin)	$T_{A,MEA} - T_{A,RTM}$ (Kelvin)
7 GHz V&H	-3.1	-1.5
11 GHz V&H	-0.7	-0.8
11 GHz P&M	-1.0	-0.6
11 GHz L&R	-1.0	-0.7
19 GHz V&H	-1.8	-0.7
19 GHz P&M	-1.7	-1.5
19 GHz L&R	-1.4	-1.7
24 GHz V&H	-1.6	-1.4
37 GHz V&H	0.1	0.1
37 GHz P&M	-0.1	0.2
37 GHz L&R	1.0	0.9

WindSat Roll and Pitch Correction