



# AMSR-E Geolocation Analysis

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- **AMSR-E TB imagery showed marked ascending-descending differences**
- **Islands and coastline were misplaced in both JAXA and RSS data**
- **Assume MODIS would have found any time-dependent problems**
- **AMSR-E geolocation should depend on a few parameters**
- **(Geolocation analysis should have been done first)**

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# Geolocation Approach



## Trial and Error:

- Start scan angle changed by 0.05 deg (which is 0.7 km)
- Cone Angle was change by 0.025 deg (which is 0.9 km)
- Required changes in scan angle are between -0.1 and +0.2 deg
- Required changes in cone angle are between -0.05 and +0.05 deg
- Roll error of 0.09 deg discovered last
- Total repositioning is about 5 km depending on channel and swath position (not including 0.05 deg longitude adjustment discussed on next slide)

## Three Methods:

- Kauai location
- Global, ascending-descending differences
- Global, left-right swath differences

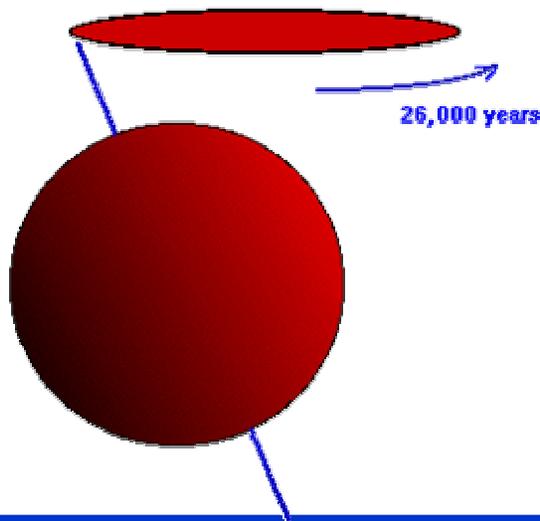


# Precession of Earth Axis



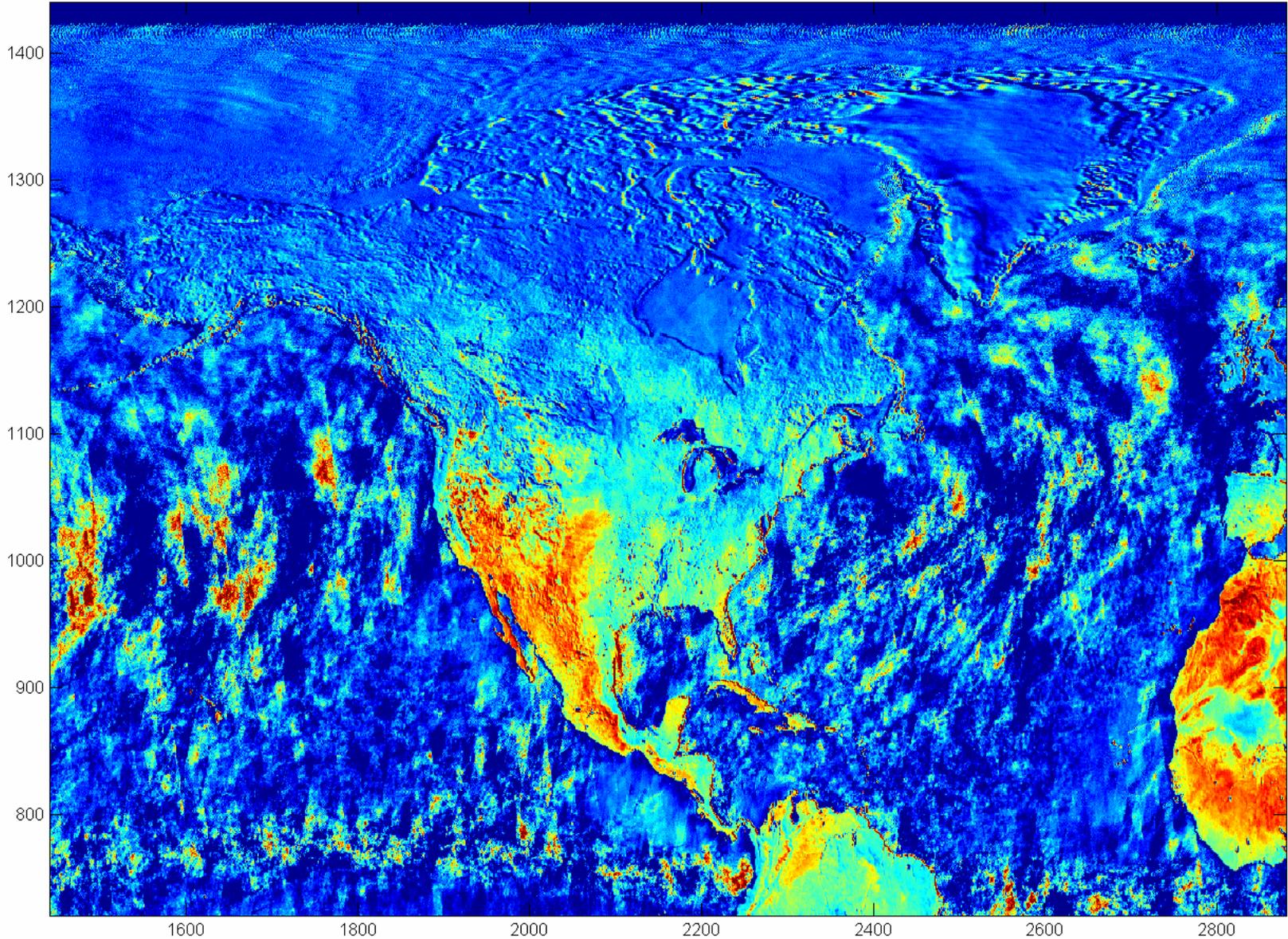
- After doing alignment, all longitudes were still off by 0.05 deg
- I had been assuming the Aqua coordinate system was fixed to the Earth spin axis. Actually the Aqua coordinate system is called J2000 in which the z-axis is aligned with the 'mean' spin axis as of Jan 1 2000.
- Every 26,000 years the Earth's spin axis precesses 360 deg. relative to the stars.
- In four years (2000-2004), the rotation is  $(4/26000) * 360 = 0.06$  deg

**26,000 Year Precession Period**



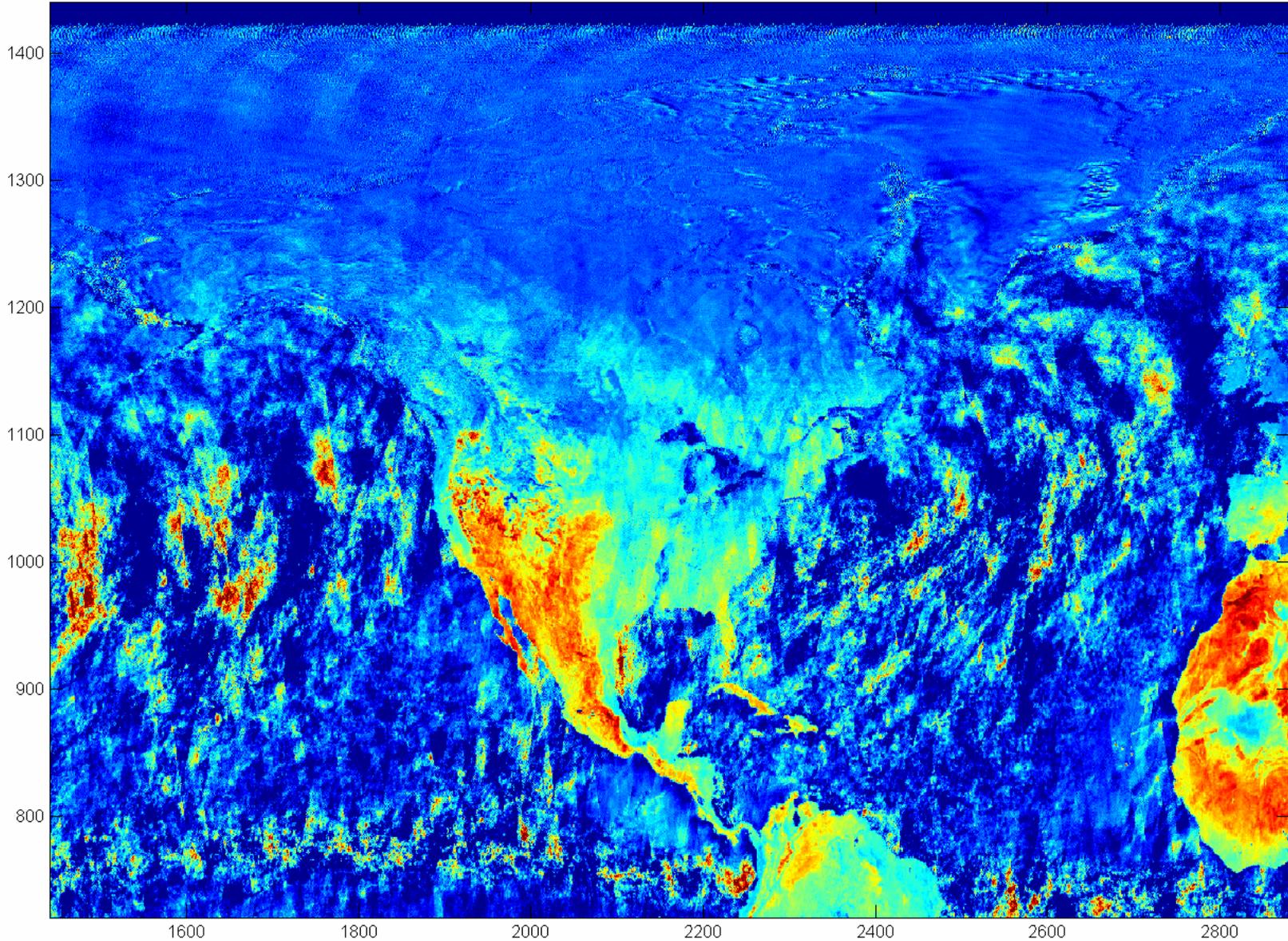


# 37H, ascending minus descending, before



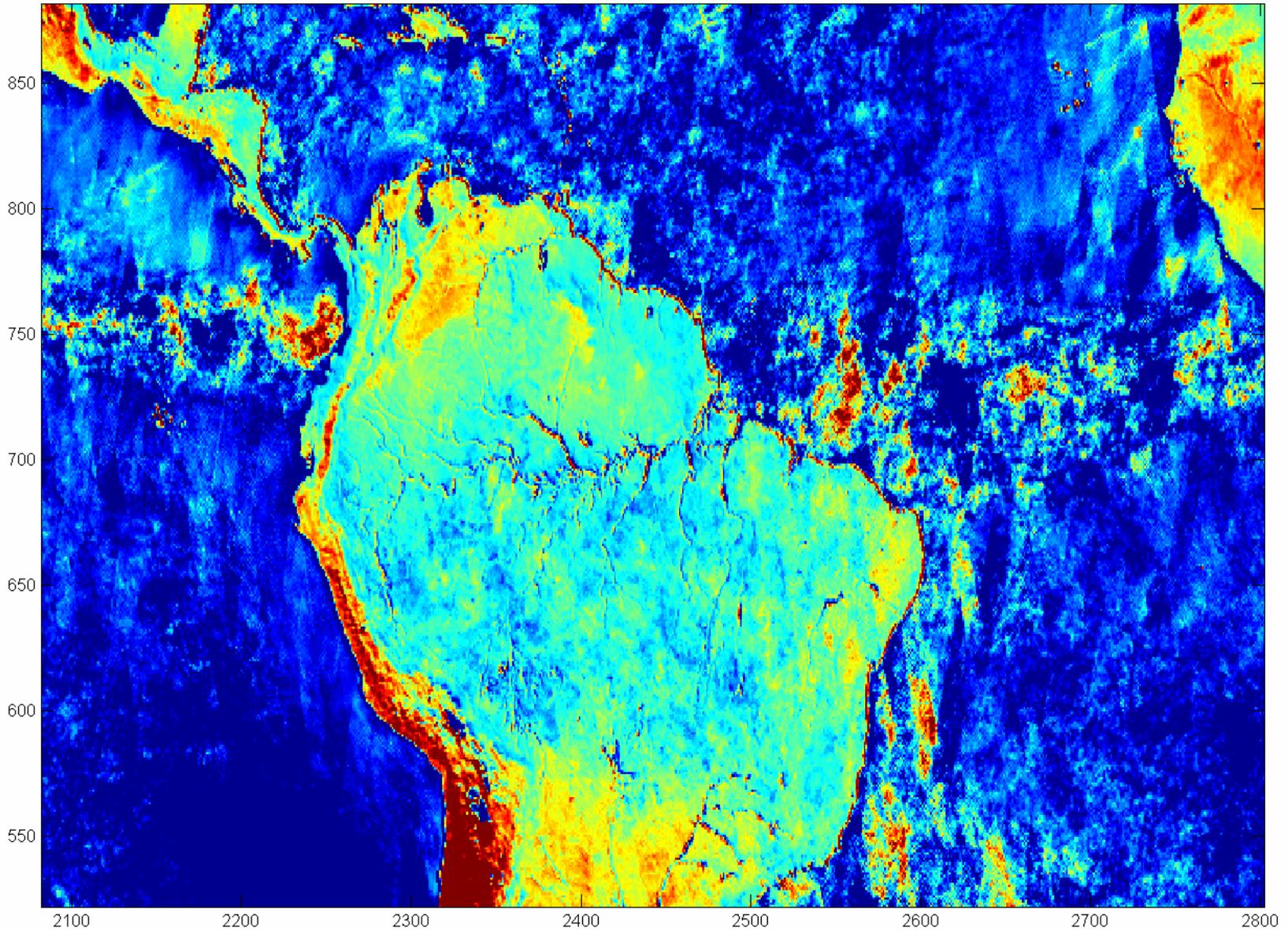


# 37H, ascending minus descending, after



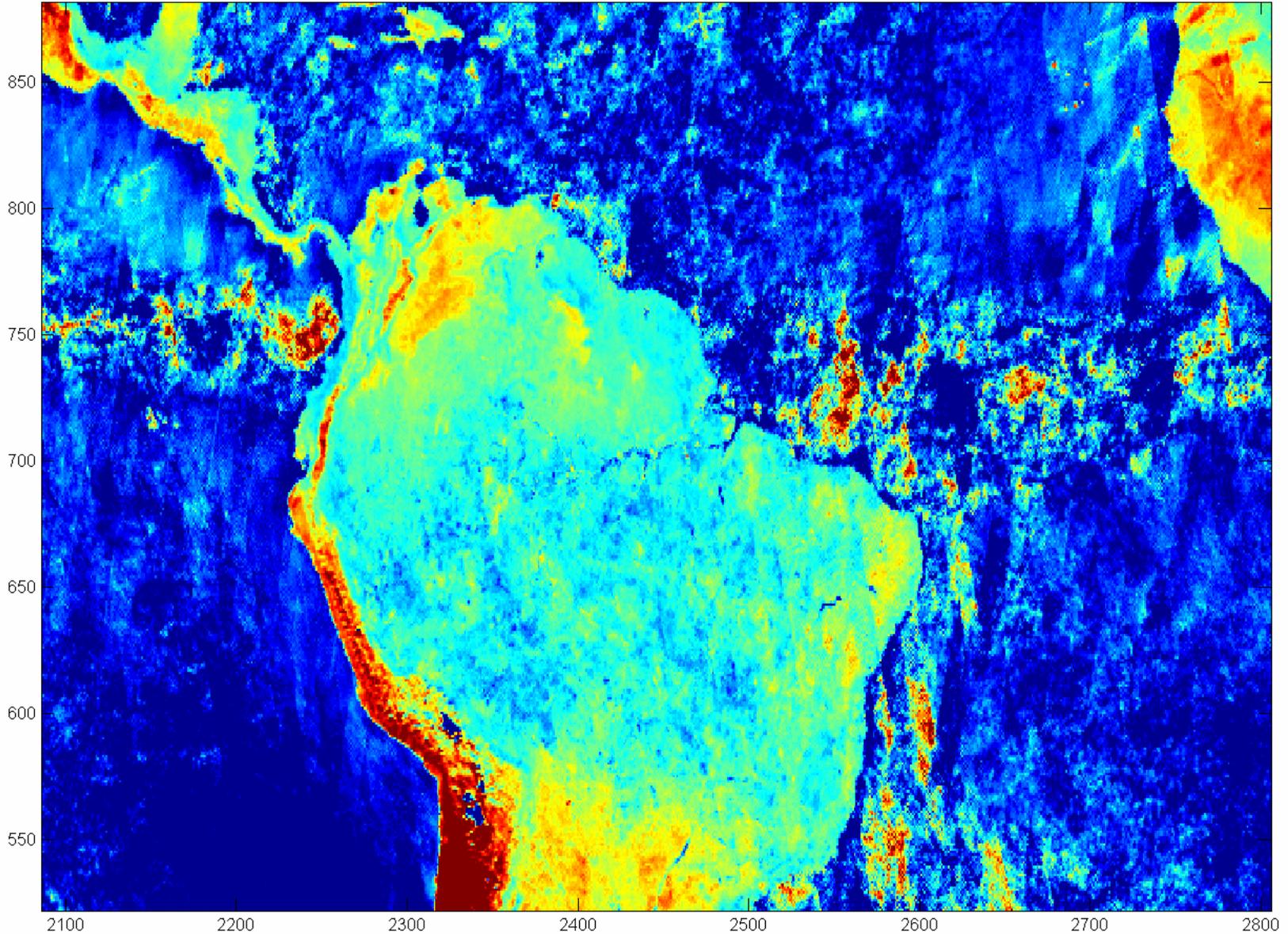


# 37H, ascending minus descending, before



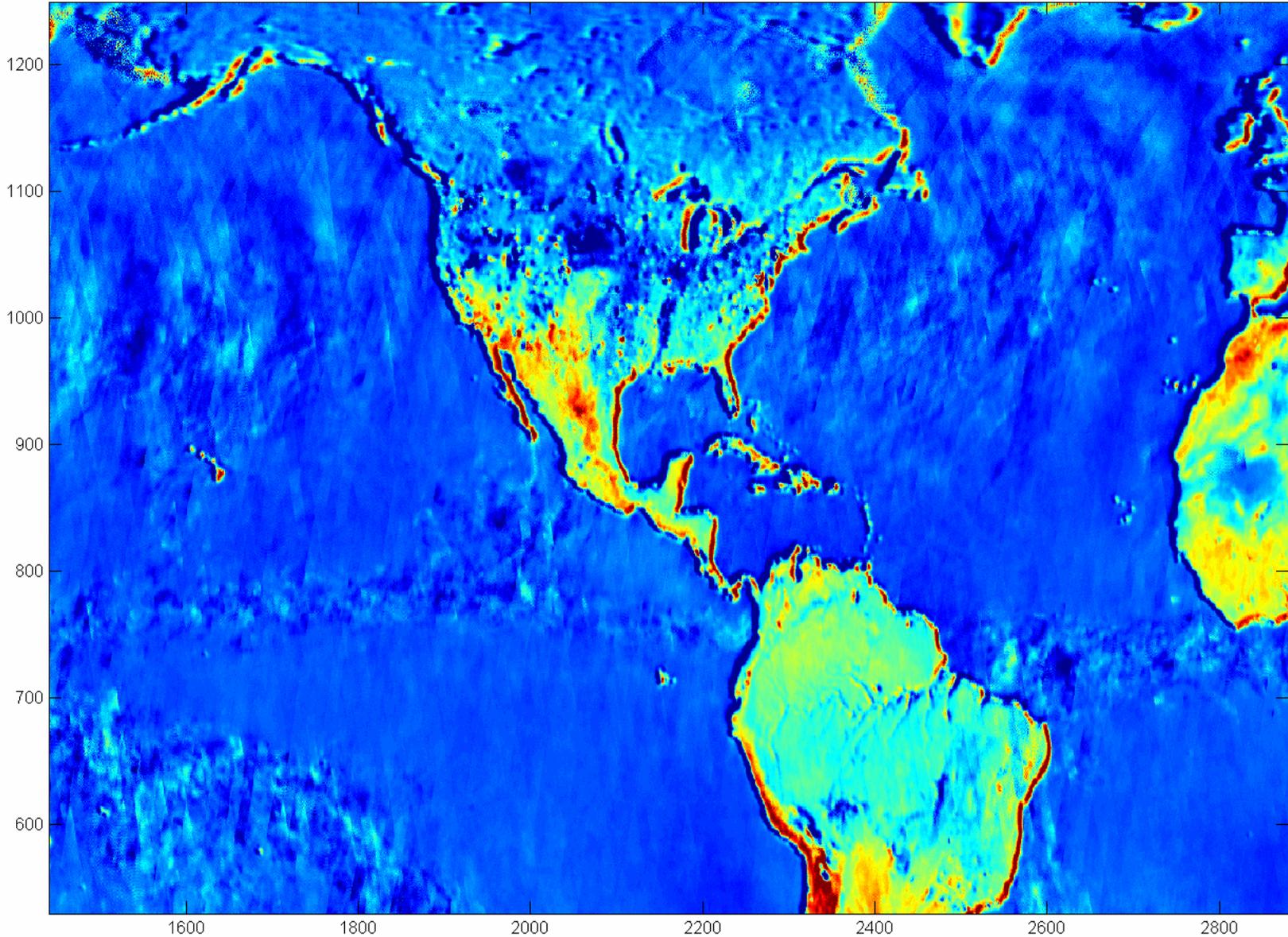


# 37H, ascending minus descending, after



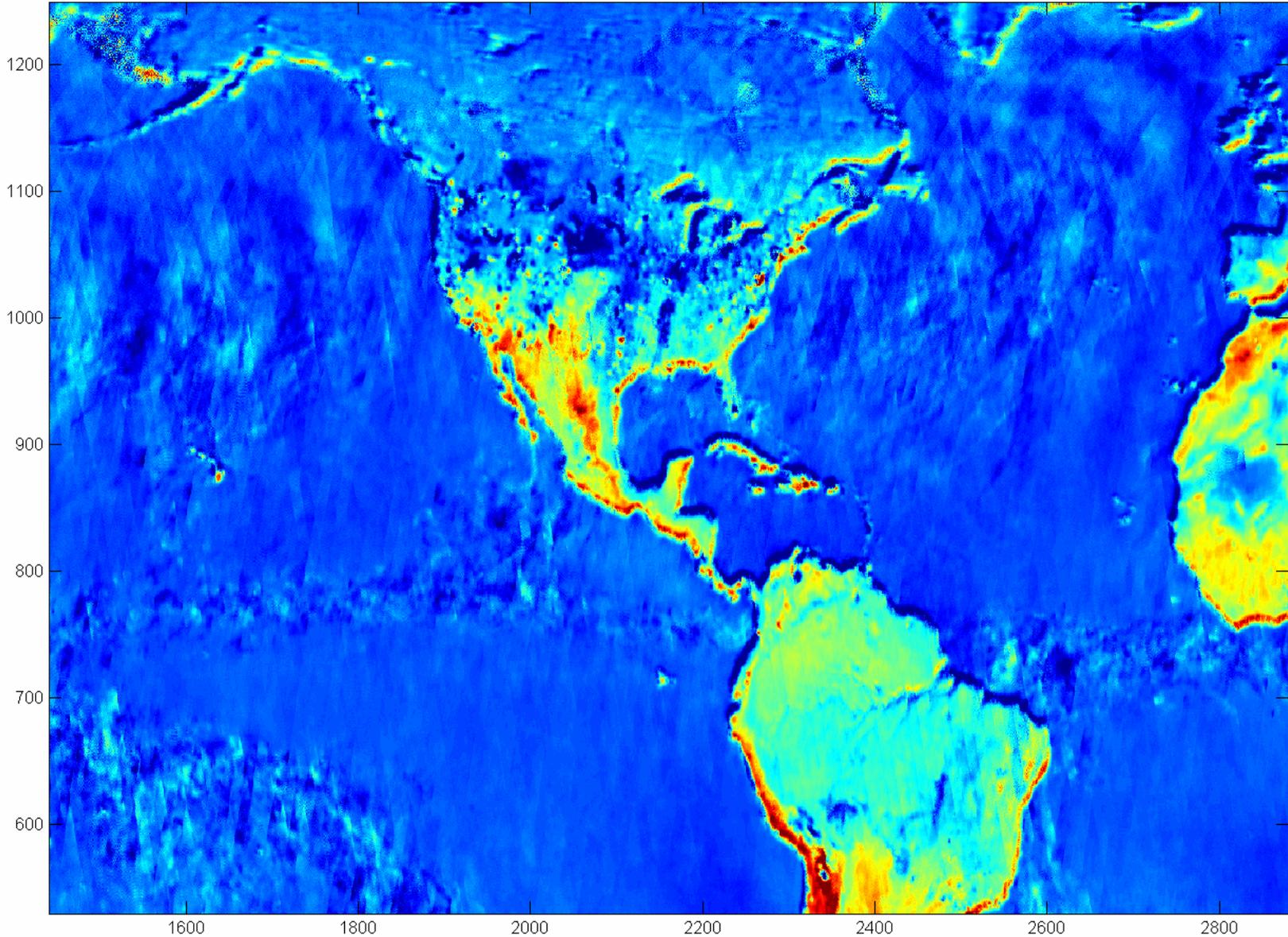


# 7H, ascending minus descending, before



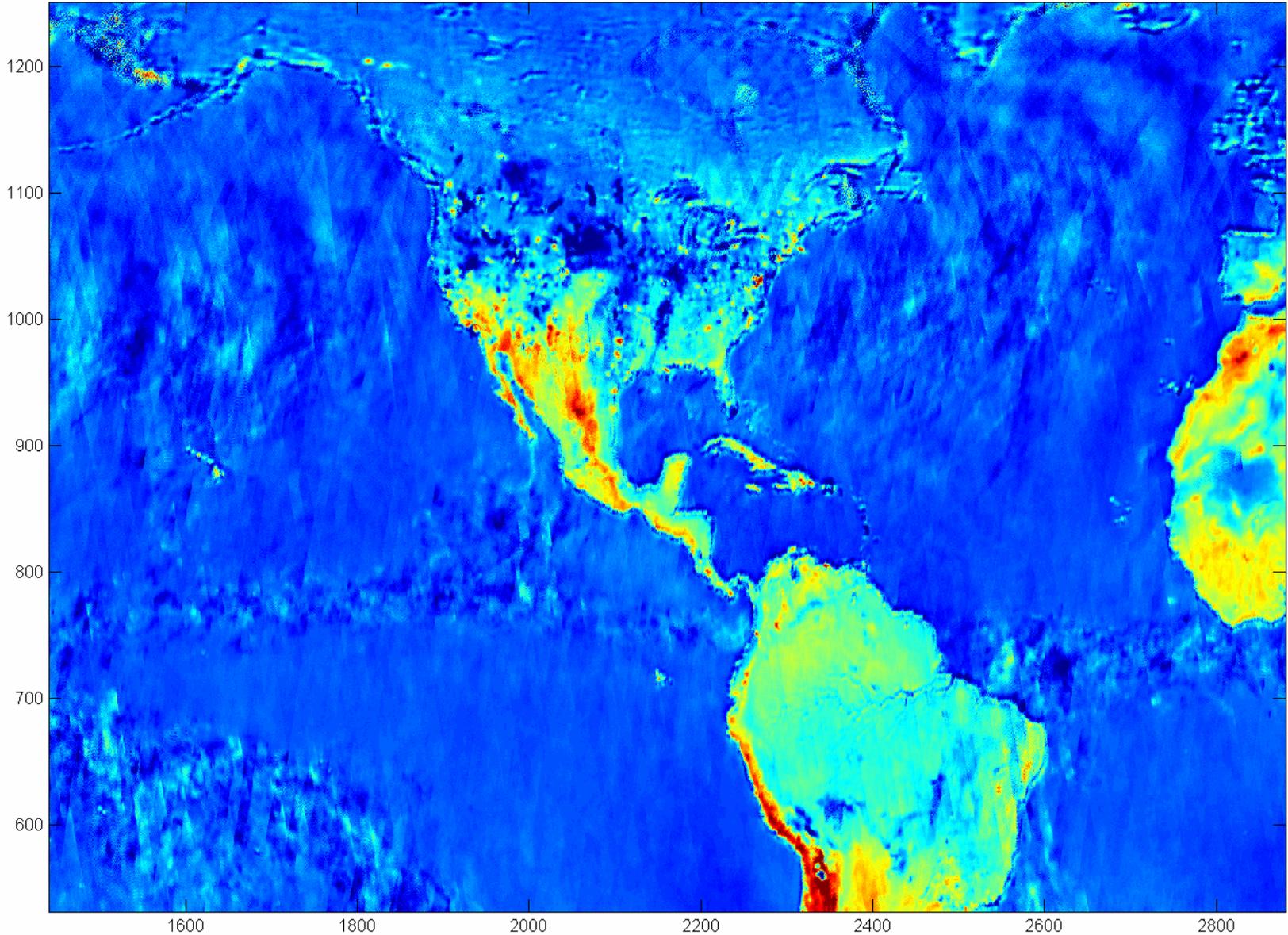


# 7H, ascending minus descending, after



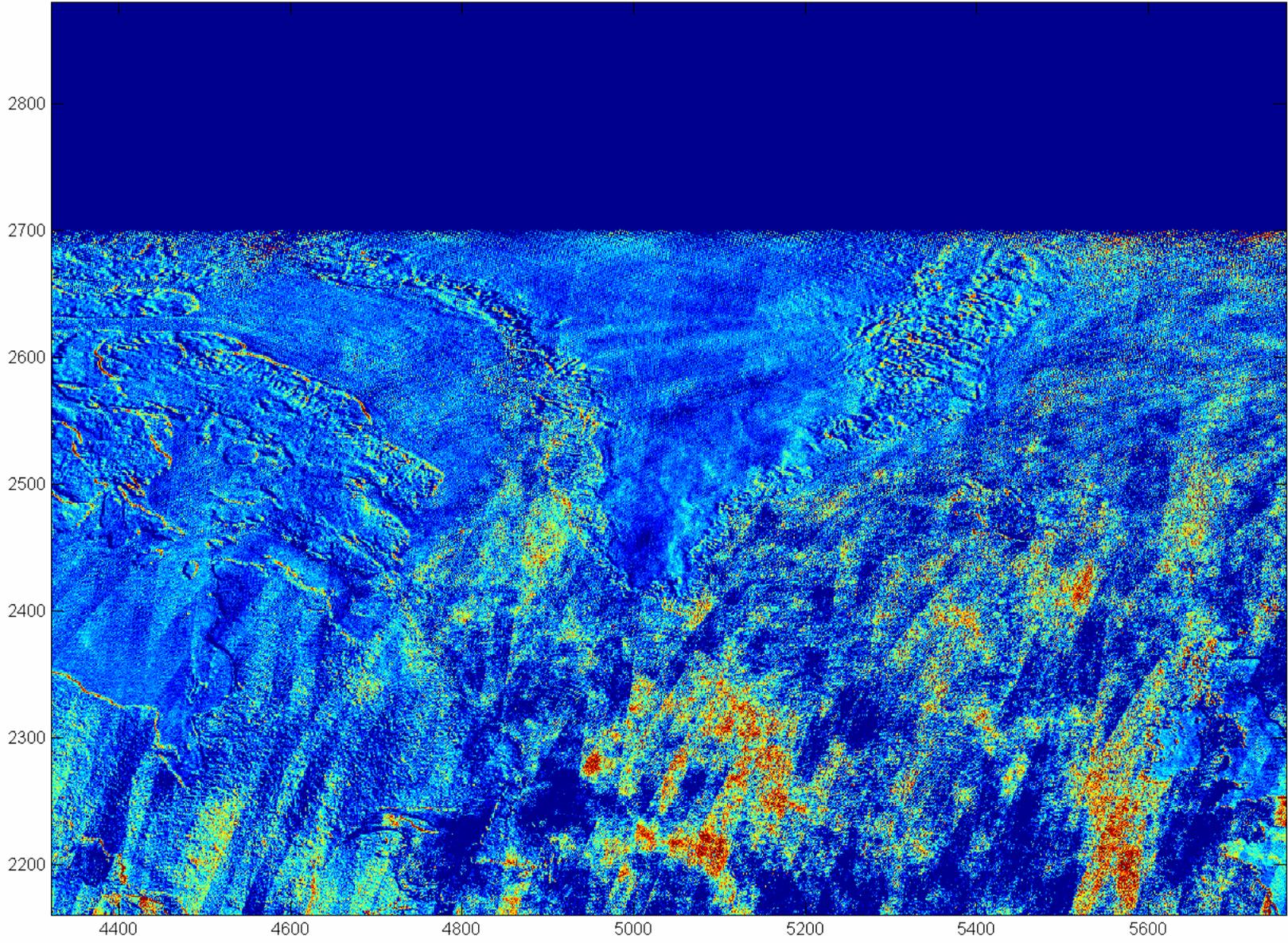


# 37H, ascending minus descending, resampled



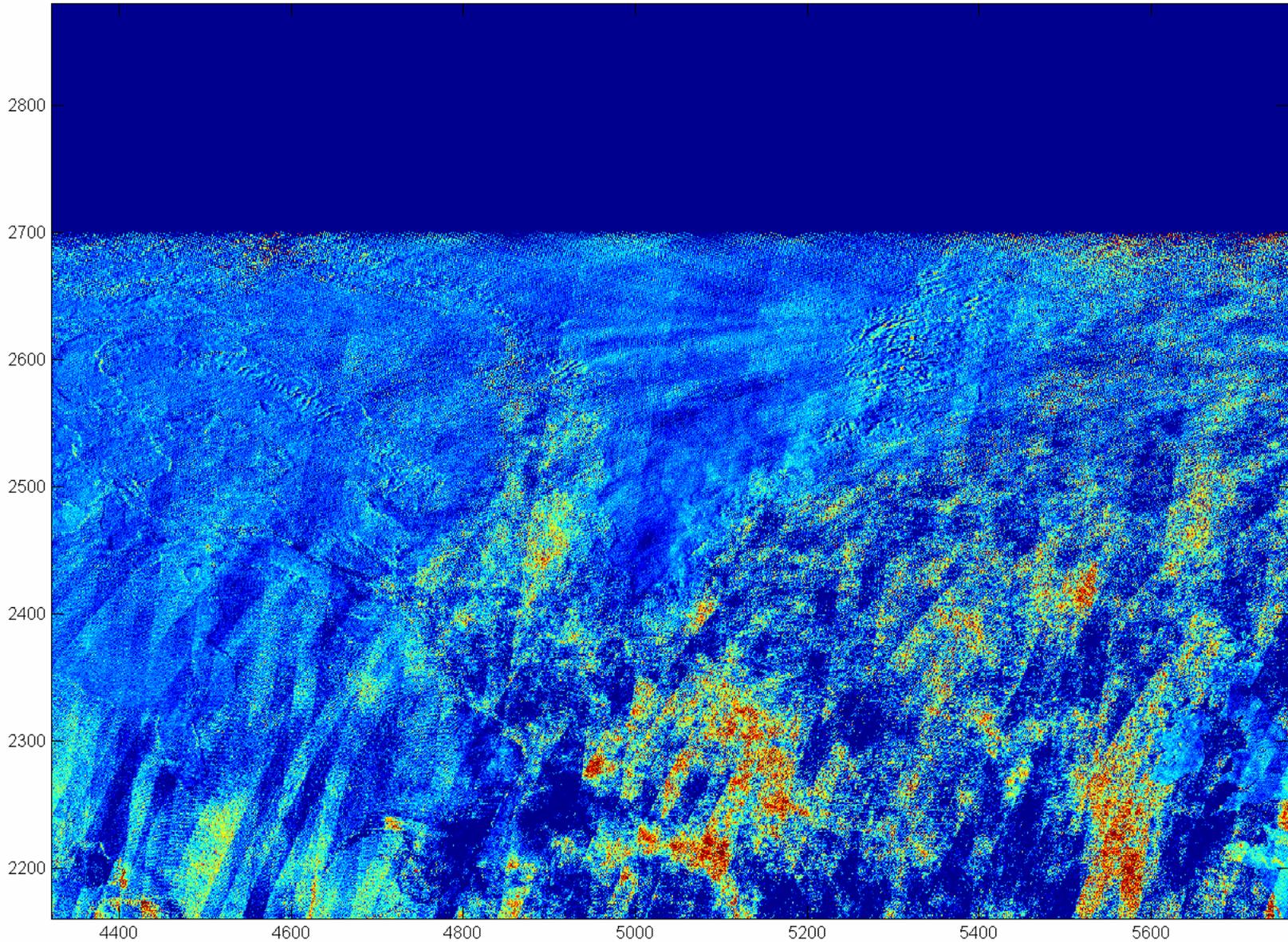


# 89A, left minus right, before





# 89A, left minus right, after

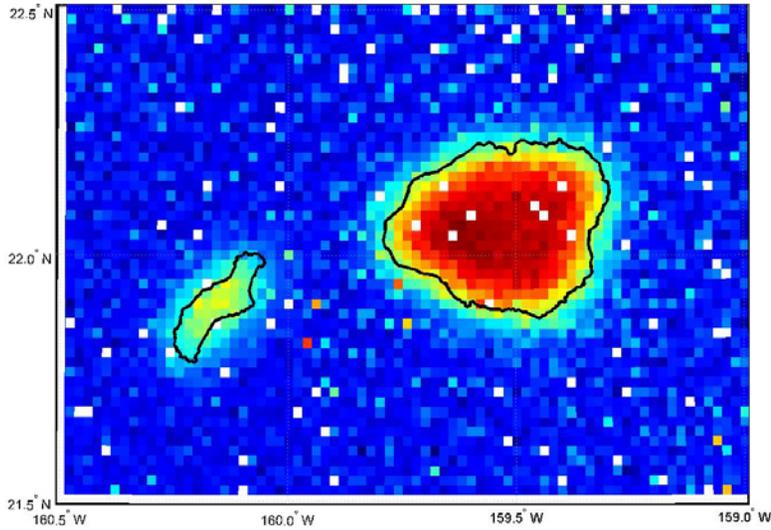




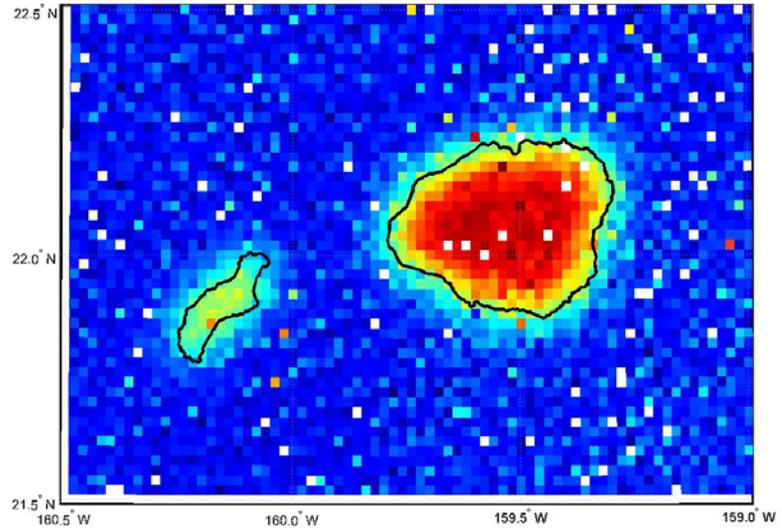
# 37 GHz Ascending/Descending, 2 Months



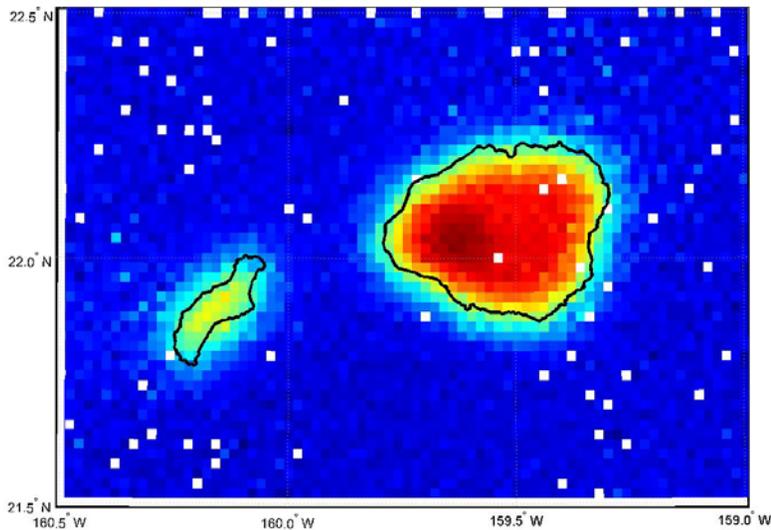
Ascending January Chan 9 combined times cone=47.57, azim=-0.17, roll=0.09



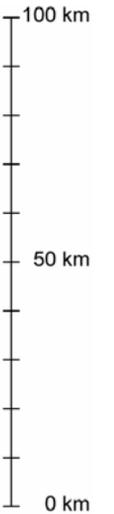
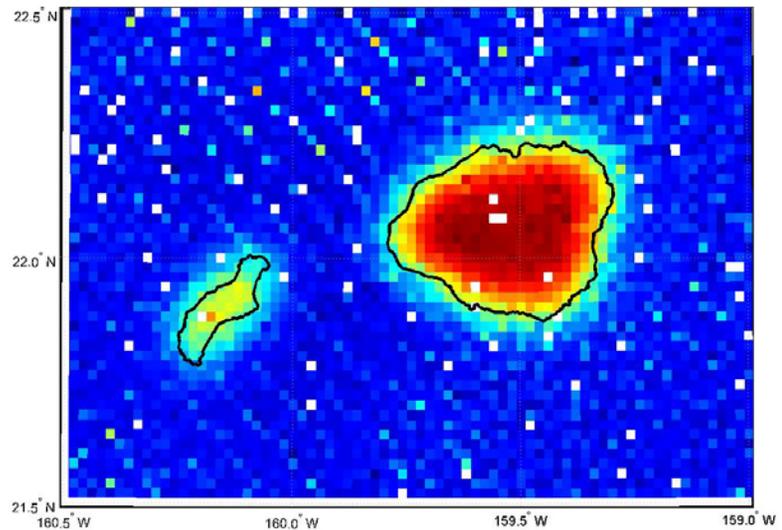
Descending January Chan 9 combined times cone=47.57, azim=-0.17, roll=0.09



Ascending July Chan 9 combined times cone=47.57, azim=-0.17, roll=0.09



Descending July Chan 9 combined times cone=47.57, azim=-0.17, roll=0.09

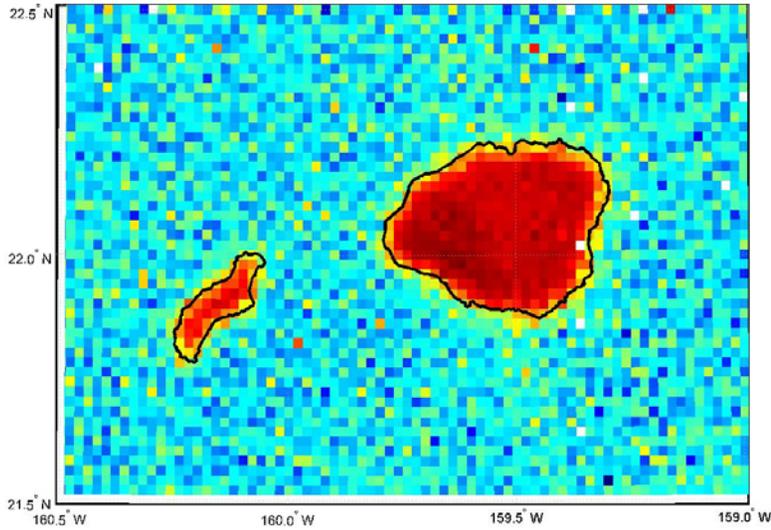




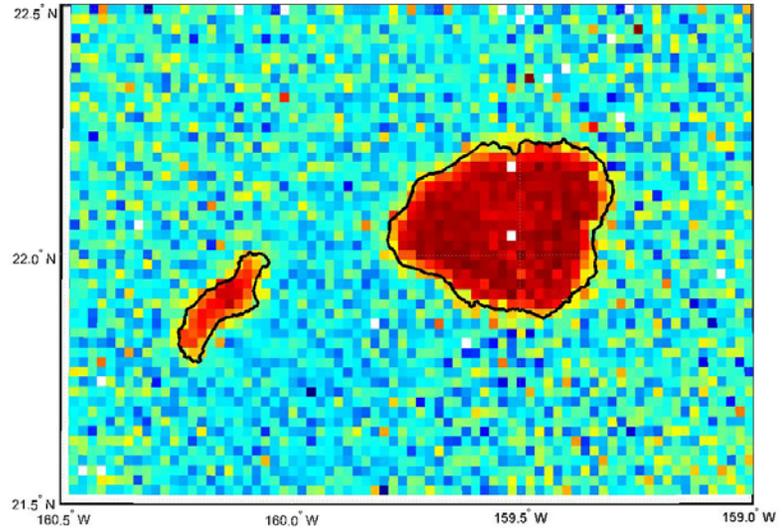
# 89 GHz Ascending/Descending, 2 Months



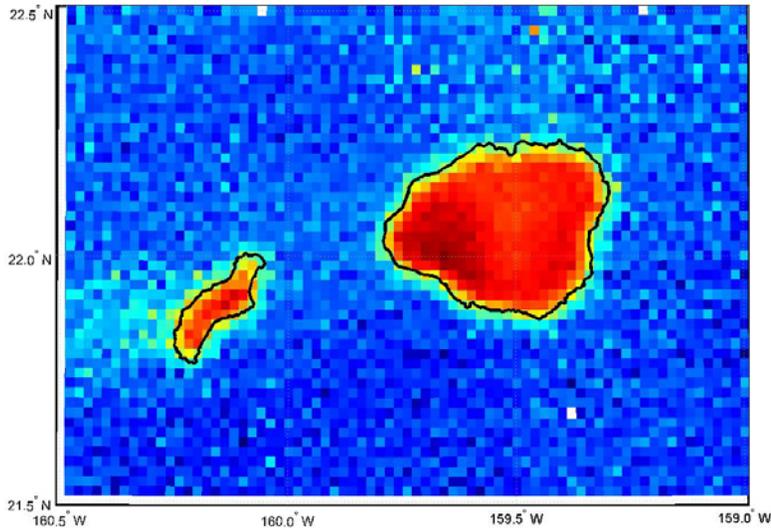
Ascending January Chan 14 combined times cone=47.57, azim=-0.37, roll=0.09



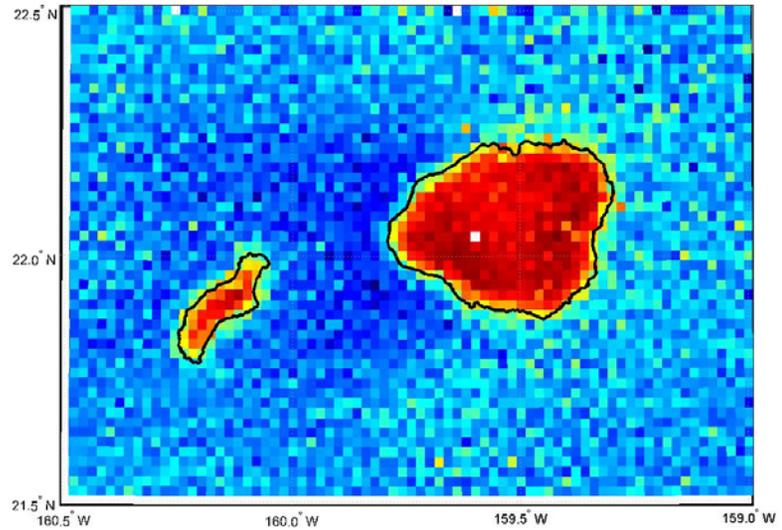
Descending January Chan 14 combined times cone=47.57, azim=-0.37, roll=0.09



Ascending July Chan 14 combined times cone=47.57, azim=-0.37, roll=0.09

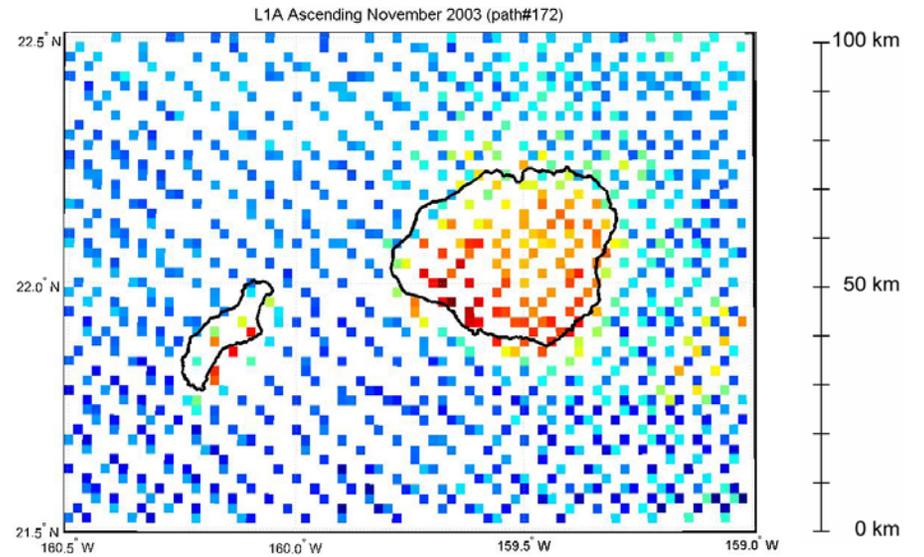
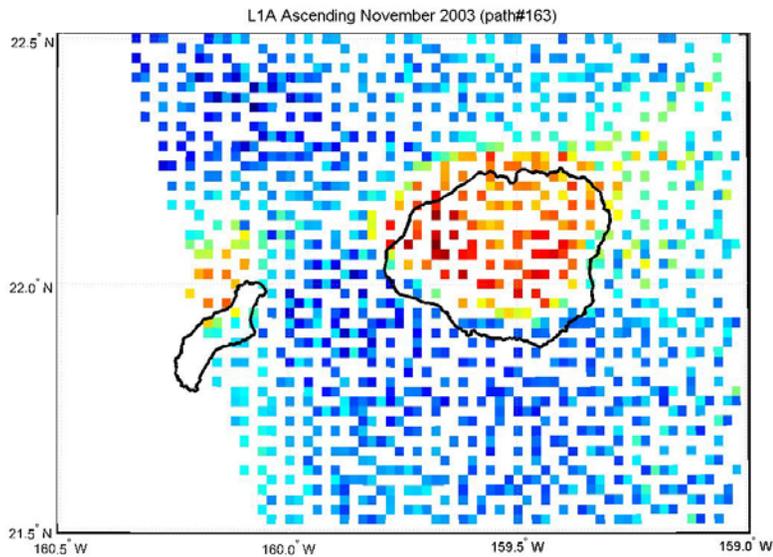
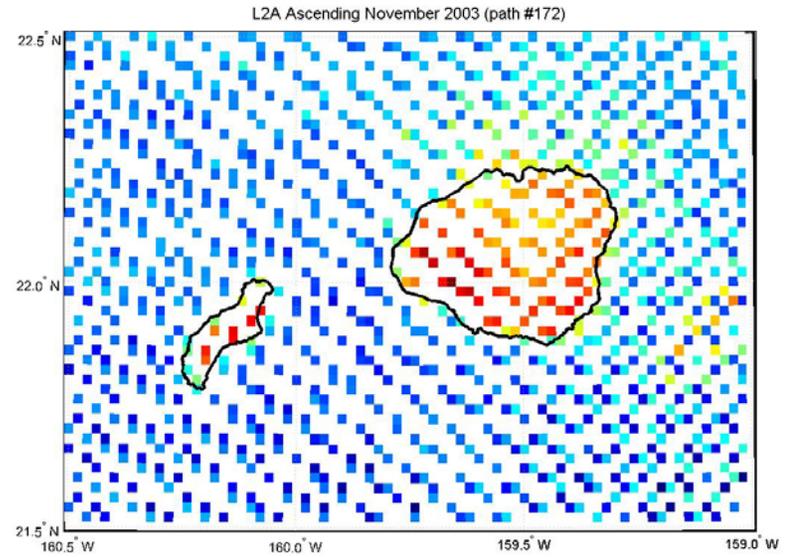
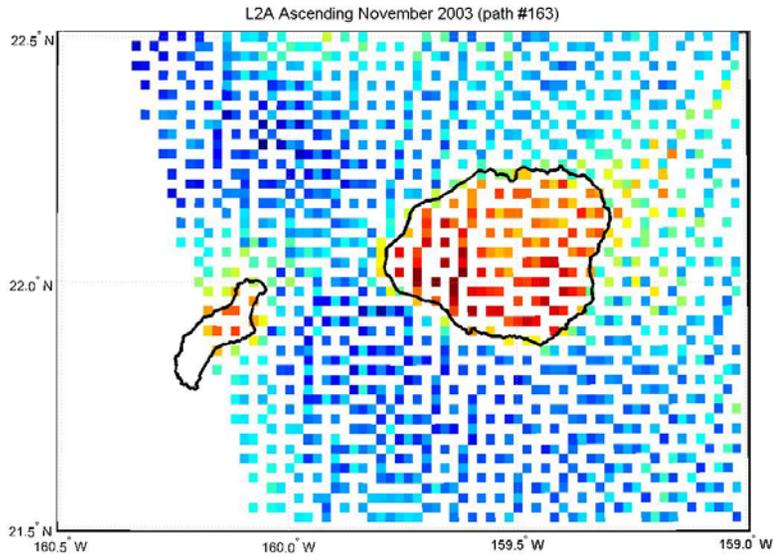


Descending July Chan 14 combined times cone=47.57, azim=-0.37, roll=0.09



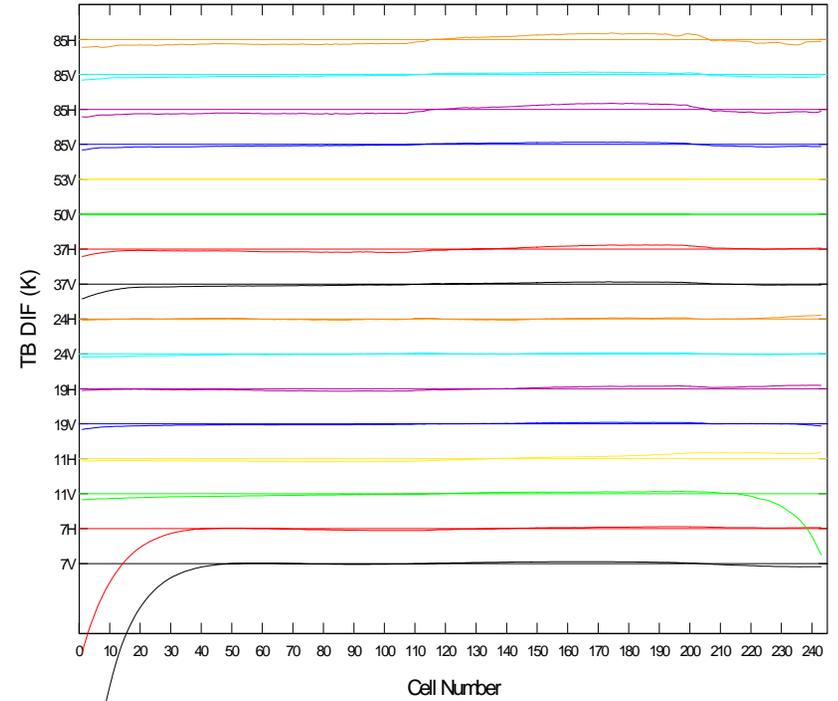
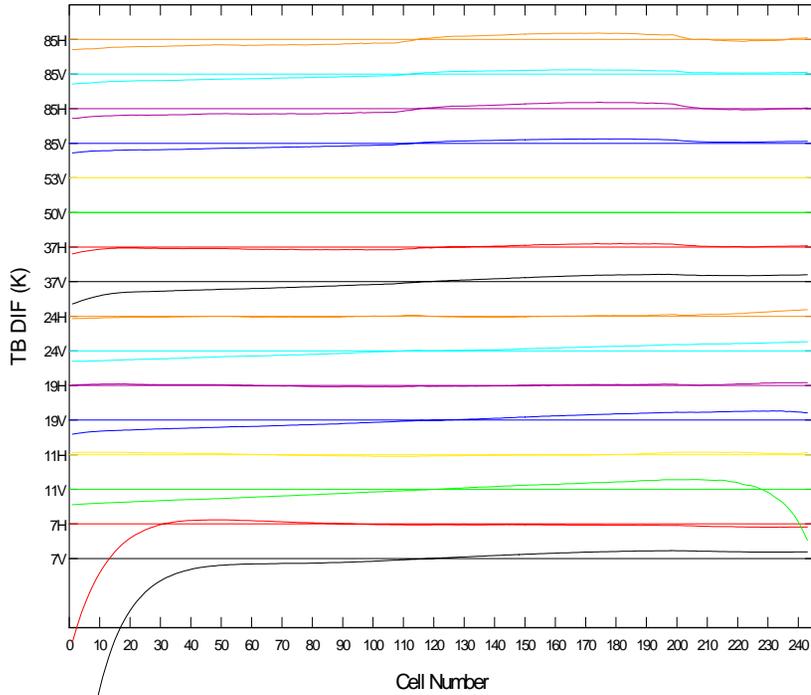


# Edge of Swath Sensitive to Roll Angle





# Correction for Roll Angle Reduces Along-Scan Error





## Comments on Along-Scan Adjustments

- Roll error translates into along-scan incidence angle variations
- New brightness temperatures will show along-scan variation
- Over land brightness temperature should be better
- Over ocean, algorithms should consider incidence angle variation



# Results of Examination



Optimal parameter values as determined by RSS geolocation analysis:

Channel	Azimuth angle (deg.)	Cone angle (deg.)	Roll angle (deg.)
7 GHz	-74.838	47.67	0.09
11 GHz	-74.948	47.64	0.09
19 GHz	-74.948	47.57	0.09
24 GHz	-74.948	47.57	0.09
37 GHz	-74.948	47.57	0.09
89 GHz A	-75.148	47.57	0.09
89 GHz B	-75.424	47.09	0.09

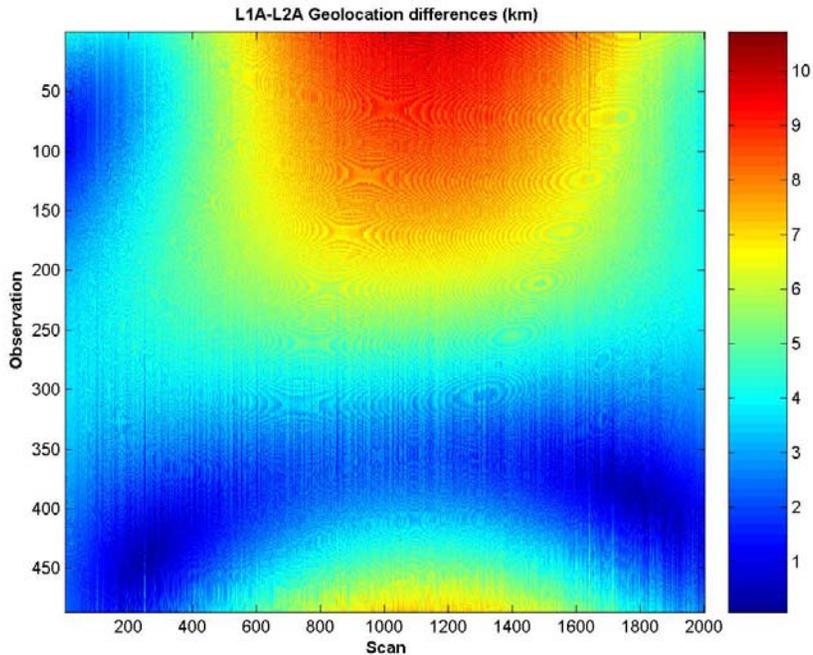
**Roll angle (+ 0.09) offset in addition to roll specified for each scan**



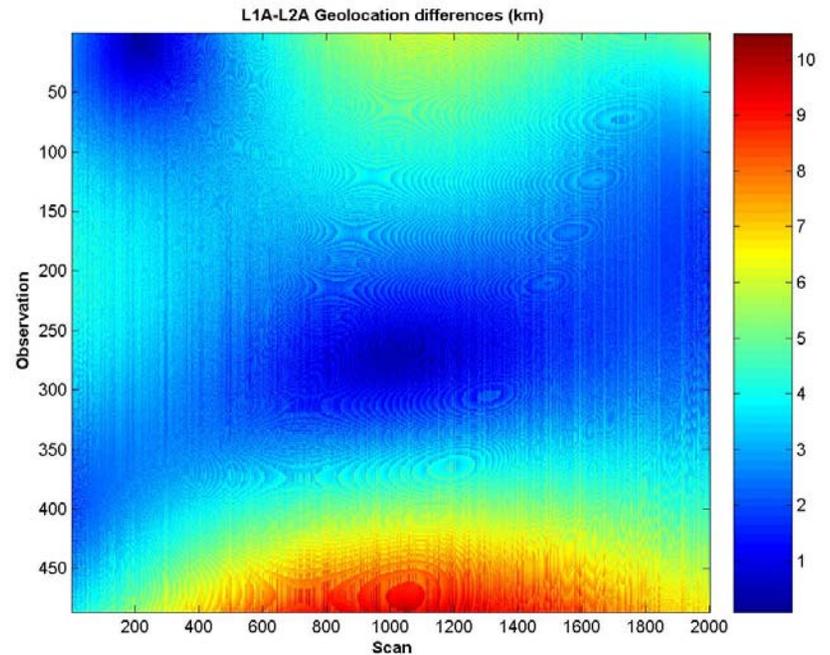
## Comparison RSS and JAXA Geolocation



- Relatively good agreement in the middle of the scan
- Increasingly different at swath edges



Ascending Swath, 2005-Mar-01



Ascending Swath, 2003-Nov-07



# Current Status



## Recent Updates

- RSS new geolocation implemented in AMSR-E L2A version B05
- New along-scan biases have been implemented
- New spillover and cross-pol coefficients implemented

## Things to do:

- Resample 7 and 11 GHz to location of 19-37 GHz locations
  - Remove Moon in cold calibration counts
  - Use WindSat to calibrate over land
  - Testing and verification
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- Look at hot-load Teff for 3 years
  - Merge AMSR-E into climate time series