MODIS TERRA Collection V Sea Surface Temperture

SST Matchup database Calibration and Validation activities

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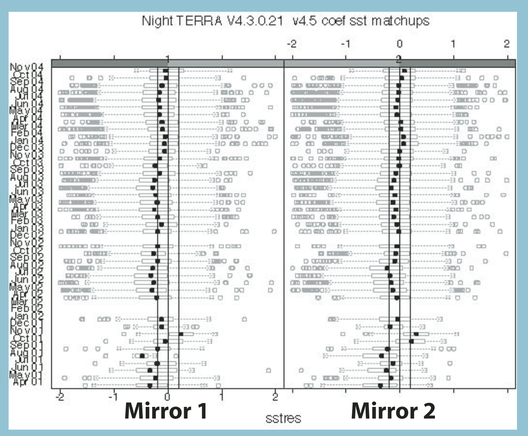
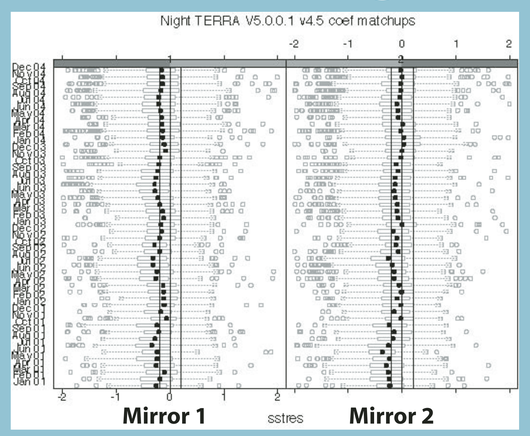
TERRA Collection IV
L1b LUT 4.3.0.21
v4.5 algorithm coefficients

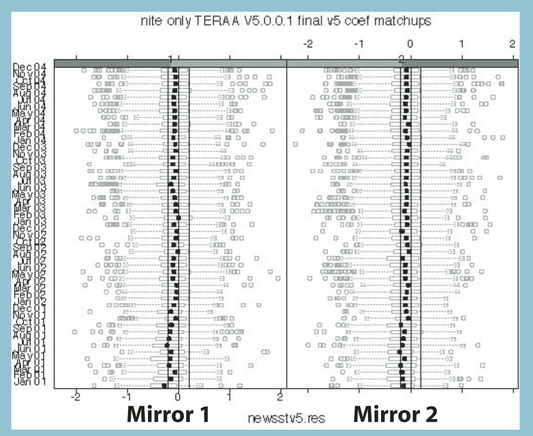
Testing
L1b LUT 5.0.0.1
v4.5 algorithm coefficients

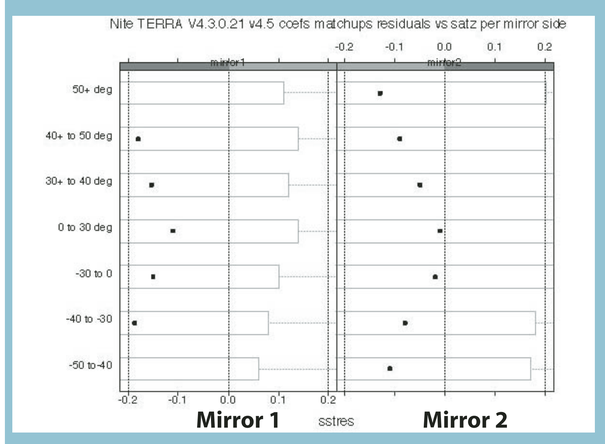
TERRA Collection V
L1b LUT 5.0.0.1
v5 monthly algorithm coefficients

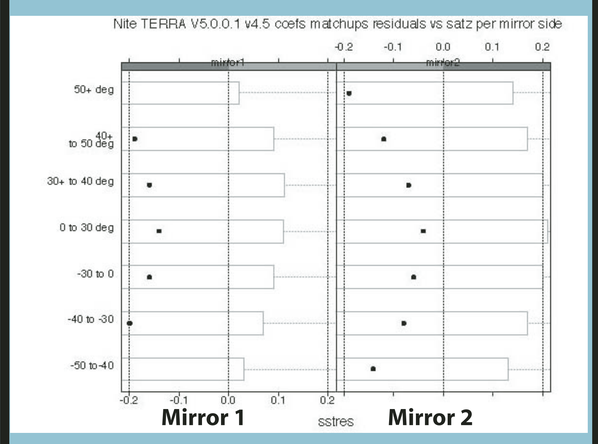
SST 11-12 um algorithm

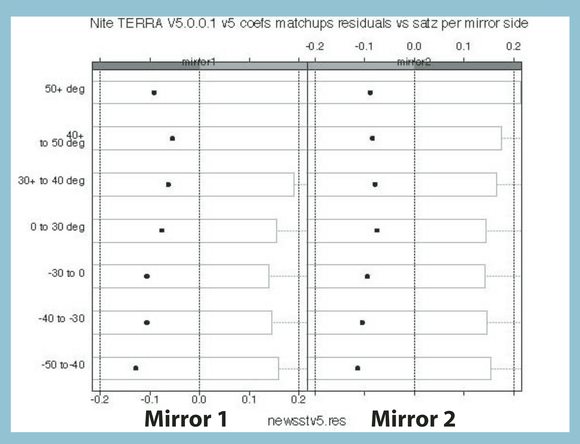


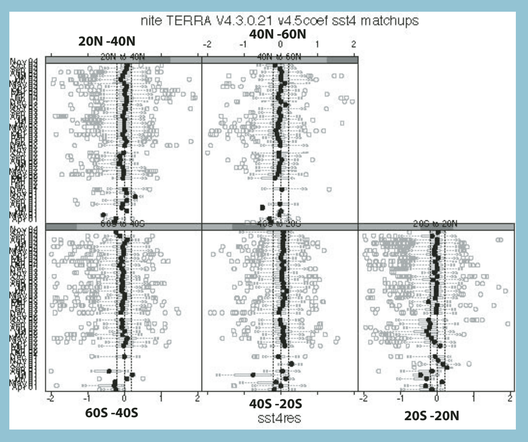


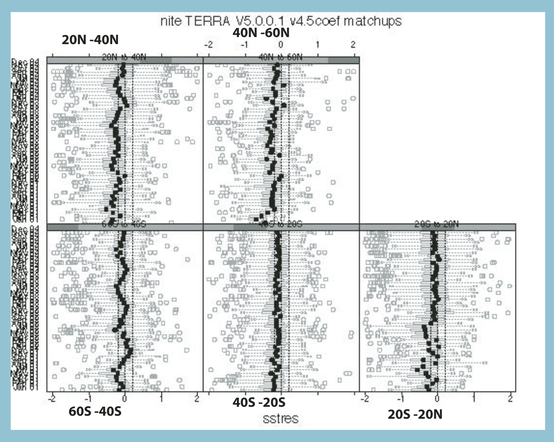


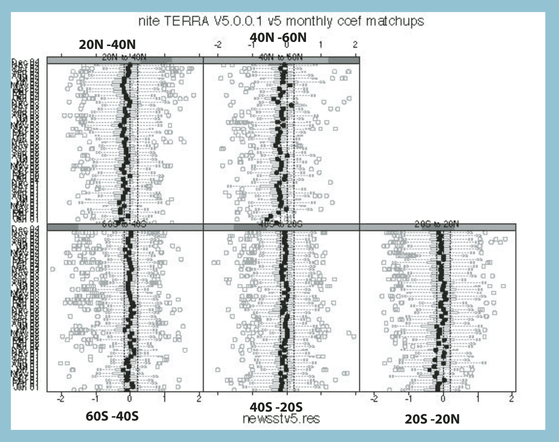




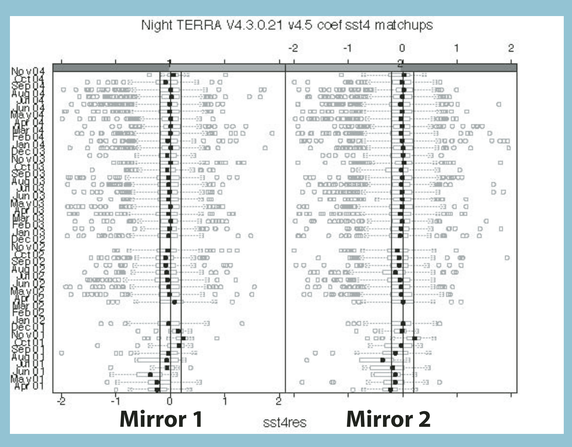


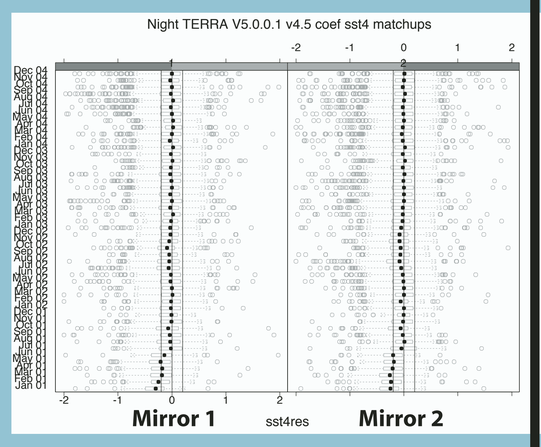


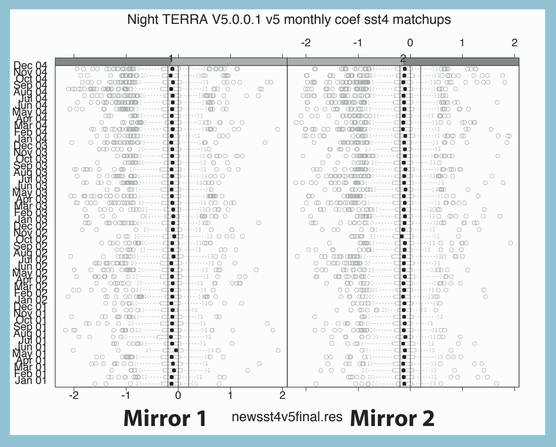


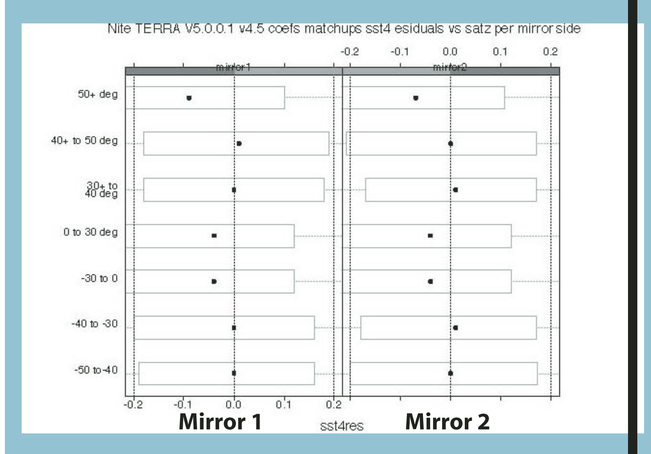


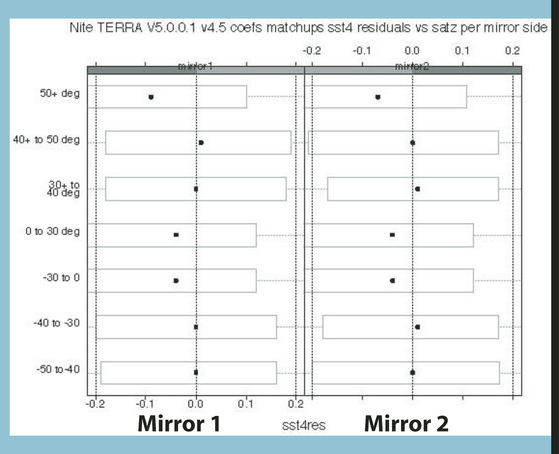
SST4 4um algorithm

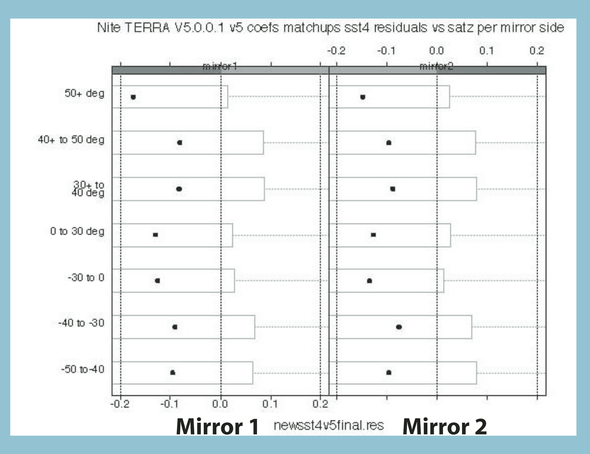


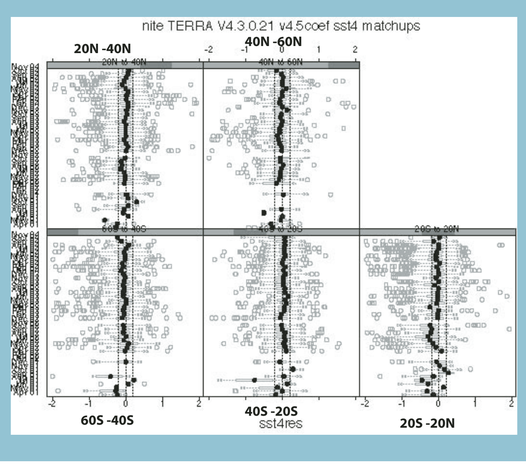


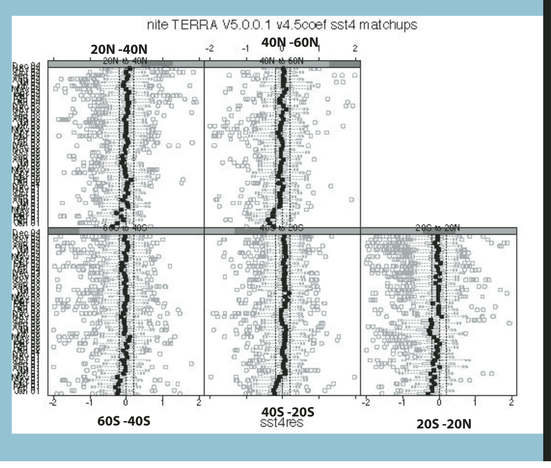


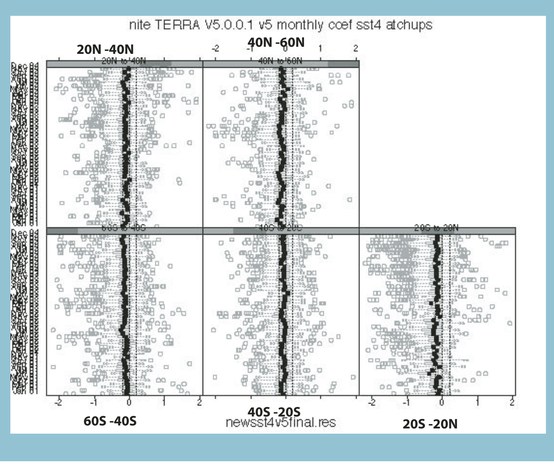












Collection IV MODIS TERRA SST
Validation of collection IV based on SST Matchup database
L1b LUT 4.3.0.21
L2 Single set of algorithm coefficients; SST v4.5 coefficients last updated Nov. 2002
Findings:
Instrument calibration degradation with time; significant change in rate around Oct. 2003
Time dependent change in mirror side behavior
Small instrument RVS or 4th term algorithm coefficient artifact
Repeating seasonality in SST residuals

Testing and evaluation of MCST L1b V5
Evaluate impact of L1b changes on L2 SST
Reprocessed matchup database L1a extractions based on:
L1b LUT v5.0.0.1; released to Miami SCF December 23,2004
L2 Single set of algorithm coefficients; SST v4.5 coefficients
Findings:
Improved instrument calibration for period 2002-2004; 2001 appears unchanged
Relative mirror side behavior appears unchanged from collection IV; time dependent bias still present
Small improvement in instrument RVS; residual bias likely due to 4th term algorithm coefficient
Annually repeating seasonality in SST residuals unchanged relative to collection IV

Collection V MODIS TERRA SST
Based on analysis of the v5.0.0.1 MDB the following changes will be incorporated in Collection V TERRA SST reprocessing:
SST algorithm coefficients estimated on a monthly basis
Algorithm coefficients were estimated using satellite: in situ buoy matchups from only mirror side 2.
Time dependent mirror side bias correction factors applied
Algorithm C1 bias coefficient determined from MAERI
Findings:
Drift in calibration eliminated in period 2002-2004; 2001 residuals –0.1C colder than other years
RVS/4th term coefficient artifact completely eliminated
Seasonality dramatically minimized
Latitudinal differences improved but sampling biases remain as a result of differences in the continental air-mass influences between hemispheres.

The 4um SST4 product for Collection IV and V remains as one of the best satellite SST data products available.

TERRA Collection V
Night time Validation Statistics

SST 11-12um Night time
Satellite-buoy residuals

Year	2001	2002	2003	2004
median	-0.147	-0.088	-0.082	-0.080
RMS	0.43	0.426	0.431	0.439
N	4388	6077	8417	11502

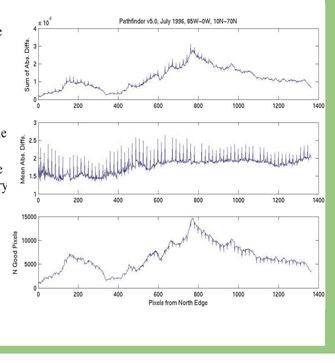
SST4 4um Night time
Satellite-buoy residuals

Year	2001	2002	2003	2004
median	-0.119	0.118	-0.114	-0.119
RMS	0.351	0.349	0.354	0.366
N	4239	5894	8023	10874

Collection V
Oceans SMI Map resolution change

Legacy SMI map issue, impact on locating gradients in global images with resolutions of 512 multiples

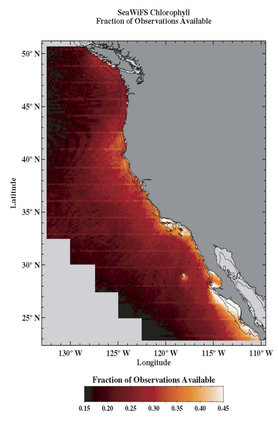
- For each daily SeaWiFS, MODIS or Pathfinder image subtracting the image from itself shifted by one pixel meridionally.
- Sum absolute count differences along latitudinal lines and then over the whole image.
- Spikes every 18 lines are the result of having to drop every 18th row in the bin file during projection onto a power of two map grid
- Problem common to Pathfinder AVHRR, SeaWiFF and MODIS SMI maps



SeaWiFS SMI Example

Example from Andy Thomas for SeaWifs image.

SMI daily map product has temporal/spatial aliasing in actual coverage. When you investigate the number of valid chlorophyll retrievals at any given location over time, there is an 18 pixel zonally oriented spatial aliasing to the pattern.



L3 Mapping Update

8192 pixels by 4096 lines

Noise seen in the upper plot results from '18' line jump in maps using 8192 pixel by 4096 format. Problem removed by changing to 8640 pix by 4320 lines, 4.63km resolution

8640 pixels by 4320 lines: