SP3 and Manually Calculated Temperature and Radiance Comparisons

Comparisons between the two techniques for calculating temperature and radiance were made by subtracting the SP3-calculated temperature and radiance from the manually calculated temperature and radiance, respectively. (In Band Math: B1-B2; B1 = manually calculated, B2 = SP3 calculated.)

Radiance Comparison Statistics:

Band 10

Dominica

	Mean	St Dev	Range
Manual-SP3	-9.5E-08	2.4E-07	1E-06

Florida

	Mean	St Dev	Range
Manual-SP3	-9.3E-08	2.6E-07	1E-06

Mississippi

	Mean	St Dev	Range
Manual-SP3	-7.3E-08	2.4E-07	1E-06

Alaska

	Mean	St Dev	Range
Manual-SP3	-3.9E-07	1.9E-07	1E-06

Band 11

Dominica

	Mean	St Dev	Range
Manual-SP3	-2.6E-07	2.8E-07	9.5E-07

Florida

	Mean	St Dev	Range
Manual-SP3	-7.8E-08	2.3E-07	9.5E-07

Mississippi

	Mean	St Dev	Range
Manual-SP3	-1.3E-07	2.5E-07	9.5E-07

Alaska

	Mean	St Dev	Range
Manual-SP3	-3.8E-07	1.9E-07	9.5E-07

Temperature Comparison Statistics:

Band 10

Dominica

	Mean	St Dev	Range
Manual-SP3	-1.21808	0.16561	1.4657

Florida

	Mean	St Dev	Range
Manual-SP3	-1.4175	0.23068	3.0111

Mississippi

	Mean	St Dev	Range
Manual-SP3	-1.34796	0.1273	1.4574

Alaska

	Mean	St Dev	Range
Manual-SP3	-0.5115	0.12632	1.8184

Band 11

Dominica

	Mean	St Dev	Range
Manual-SP3	5.573856	0.43407	3.23297

Florida

	Mean	St Dev	Range
Manual-SP3	6.210288	0.53652	6.96124

Mississippi

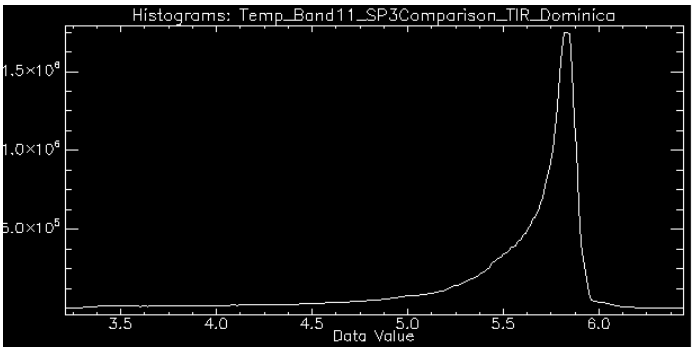
	Mean	St Dev	Range
Manual-SP3	5.950152	0.30589	3.35159

Alaska

	Mean	St Dev	Range
Manual-SP3	3.94521	0.32417	4.74219

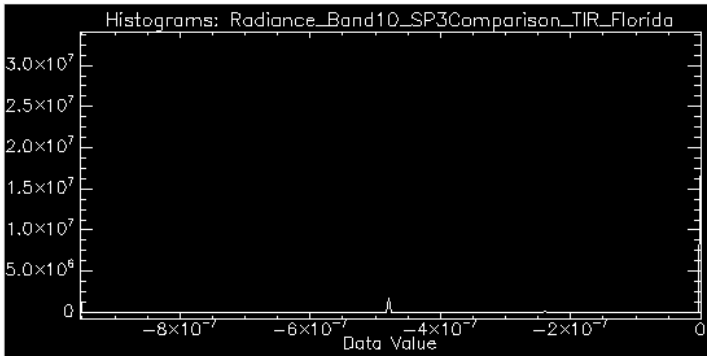
Observed General Trends:

- There was always greater variance in the comparisons of temperature than the comparisons of radiance.
    - Temperature Band 10 comparisons were negative (Manual Calculation > SP3), with a relatively consistent range from -2.5 and 0.
        - Though the right tail of the Florida data extended into positive numbers.



Dominica Band 11 Temperature Histogram – example of a temperature histogram (though Band 10 temperature histograms are right-skewed)

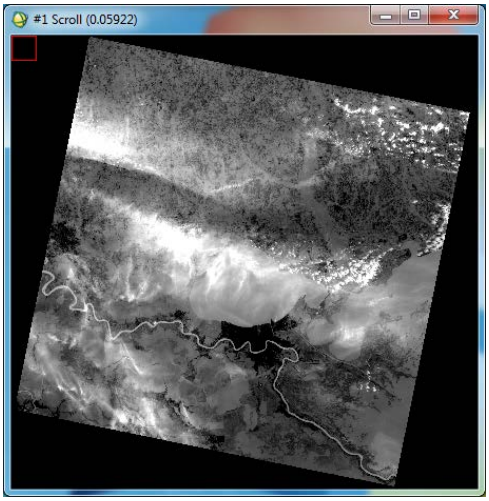
    - Temperature Band 11 comparisons were positive (Manual Calculations < SP3), with a relatively consistent range from 0 to 8.
    - For both Band 10 and Band 11 radiance comparisons, in all but the Alaska image, the majority of the pixels 0 (Manual Calculation = SP3).
        - However, for the image of Alaska, only 18% of Band 10 pixels and 19% of Band 11 pixels were zero.
    - For non-zero pixels in radiance comparisons for both bands, differences between the bands were always negative (Manual Calculation < SP3), always different by less than -1x10^{-7}, and always one of three values.

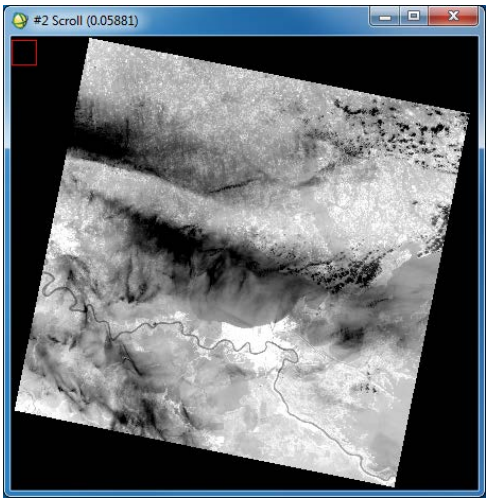


Florida Band 10 Radiance Histogram – example of a radiance histogram (NOTE: peaks at each end of the histogram as well as in the middle)

- Variation between the two methods appeared to depend on type of ground cover for both temperature and radiance, but the ground cover classes produced different trends in variation for temperature and radiance.
    - Temperature Trends:
        - Trends were consistent between Band 10 and Band 11.
        - Least variation between methods was consistently found over clouds.
        - Slightly but consistently more variation between methods over land than ocean.
            - The difference was not nearly as pronounced as the variation between cloud and all other land covers.

- In the image of Mississippi further land and water distinctions were possible.
    - More variation over land than river (similar variation between river and ocean).
    - Variation over land was not distinguishable from variation over bayou.
    - Less variation over rural land than over urban land.

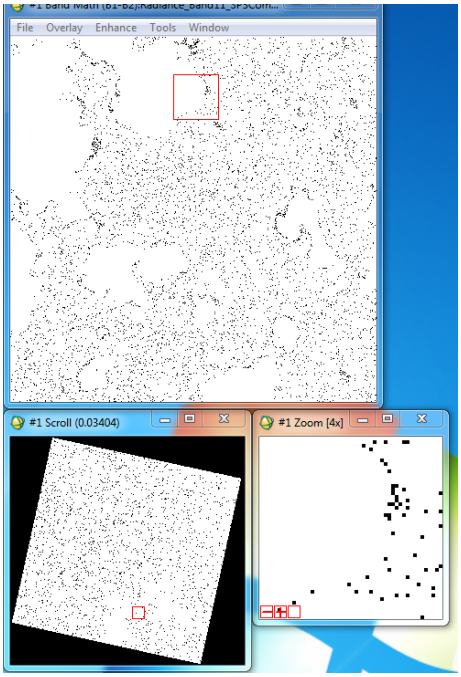




Mississippi Band 10, Band 11 (respectively) Temperature Images – Even in MS Word, river and ocean are clearly distinguishable from land. Clouds and New Orleans are brightest and darkest points in both images. NOTE: White is least variation in Band 10 (negative differences) and most variation in Band 11 (positive differences).

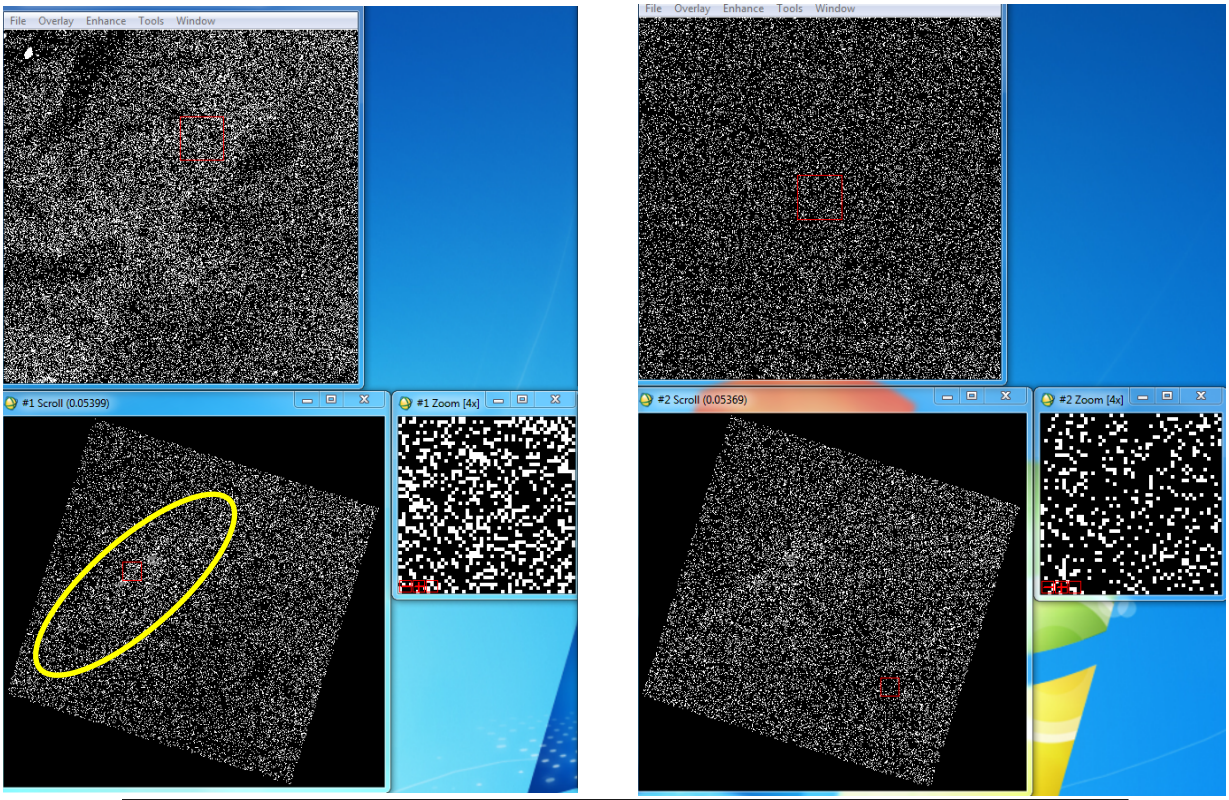
        - Alaska lacked most of the land features present in the other images but other trends were detectable. The methods varied least over the shaded, snow-covered mountain slopes, then over the bright, high-altitude snow, and then most over exposed rock and soil (both within the mountain range and in the lower-lying valleys).
    - Radiance Trends:
        - Trends were generally consistent between Band 10 and Band 11.
        - Greatest similarity between methods over land and sea (both regions predominantly zero with apparently randomly scattered pixels of low variation).

- Clouds generally distinct from land and sea. (Cloud pixels almost always had a value of -4.7×10^{-7} in their center and a rough rim around their border with a value of -9.5×10^{-7})
    - Clouds generally more distinct in Band 11.



Florida, Band 11 Radiance – distinct patches of clouds (large white patches), ringed by pixels with lower values (black clusters along cloud borders).
(NOTE: Because there are only three values of pixels in the image the clouds appear to have the same values as the white pixels that are more mixed in with the black pixels but most of those pixels actually have a value of 0.)

- Significantly more non-zero pixels in the image of Alaska. Difficult to detect/confirm patterns but variation appeared to decrease slightly along mountain range (but difficult to be sure just from looking, I wasn't sure how to quantitatively analyze).



Alaska, Band 10 Radiance – Comparison of mountain range (left image) and valley (right image) pixels, white pixels have value of 0. Though both zooms appear to have a relatively random distribution of non-zero pixels, they appear somewhat less dense across the mountain range. The light strip (circled in yellow in the left image, coincides with the mountain range.)