Trends Observed in Relationship between Temperature (Band 10) and TIR Band Differences (B10-B11)

NOTE: All calculations based on the equation $\Delta T = m (T_{10}) + b$

Land:

- Slopes relatively consistent between scatter plot regions and across images
    - Range = 0.18; between 0.318 and 0.138
    - Also, largest slope is from scatter plot made over New Orleans
        - New Orleans is much more urban land cover than the land used for any of the other scatter plots and thus has a higher mean temperature
- Greater variability among offset values
    - Slightly more consistency between values within each scene, though even in individual locations there is pretty high variability
- The slope values from the new Alaska image (Alaska2, highlighted in blue) are generally slightly lower than the values calculated in the more southern locations.
    - The values from the Alaska2 image have a much smaller range than values found within any one of the other locations.
    - Variation between slopes in the Alaska2 does not appear to be due to land cover/elevation.
- Like the slope values, the offsets in the Alaska2 image are close to the range calculated for the more southern images but generally larger (less negative) than the southern images' offsets.

Location	Slope	Offset (Kelvin)	$T_E = -b/a$
Mississippi, Rural	0.272	-80.2	294.4
Mississippi, Rural	0.323	-94.9	293.9
Mississippi, Rural	0.239	-69.8	292.6
Mississippi, Rural	0.251	-73.1	291.1
Mississippi, Urban	0.318	-93.7	293.9
New Zealand	0.285	-81.1	284.5
New Zealand	0.138	-40.0	289.2
New Zealand	0.152	-43.8	287.5
New Zealand	0.259	-73.4	284.1
Florida	0.226	-66.2	292.7
Florida	0.230	-68.9	299.7
Florida	0.189	-56.0	297.0
Alaska2, Lowland	0.136	-40.1	295.8
Alaska2, Lowland	0.171	-50.9	297.7
Alaska2, Lowland	0.155	-46.0	295.9
Alaska2, Lowland Sand Dunes	0.158	-48.1	304.6
Alaska2, Mountains	0.115	-33.6	291.4
Alaska2, Mountains	0.152	-44.8	294.6

Dominica Island Transect: $y=0.023x-6.01$; $R^2=0.032$

NOTE – many clouds in transect, so probably not very accurate

Ocean:

- Large variation in slopes between images
    - Smaller variation within images (though Florida's range is still very large).
- Variation between offset is also large, even within the same image
- Relatively little variation in slope or offset values for the Alaska2 image (highlighted in blue) except for one outlier (highlighted in red).
    - Not a very strong trend seen in scatter diagram used for outlier so more difficult to discern best fit line.

Location	**Slope**	**Offset (Kelvin)**	**T_E = -b/a**
Mississippi	0.027	-7.35	274.2
Mississippi	-0.050	15.5	307.9
Florida	-0.131	39.4	299.9
Florida	0.546	-162.6	297.8
Florida	0.360	-106.4	295.8
Florida	-1.28	381.0	297.3
Dominica	-0.102	31.2	306.2
Dominica	-0.389	116.2	298.5
Dominica	0.117	-32.8	280.3
Dominica	0.066	-18.1	274.0
New Zealand	0.151	-43.8	288.9
New Zealand	0.382	-108.7	284.9
New Zealand	0.268	-76.0	283.8
Alaska2	0.215	-62.7	291.1
Alaska2	0.133	-39.2	293.9
Alaska2, Inlet	0.179	-52.6	293.0
Alaska2, Inlet	0.149	-43.9	294.0
Alaska2, Iceflow	0.361	-103.1	285.9

Dominica Ocean Transect1: $y = 0.034x - 8.47$; R^2=0.019

Dominica Ocean Transect2: $y = 0.239x - 69.3$; R^2=0.271

NOTE –despite low R^2 values, transects avoid clouds almost entirely and have slopes and offsets within the range seen from my calculations based on image scatter plots (though these ranges are large)

Clouds:

- With the exception of one outlier (highlighted in red), very little variation in slope and offset between the Florida clouds (both high and low altitude)
- Greater variation in range of slopes and offsets in the other three images (more on par with the ranges seen in the on-land trend lines)

Location	**Slope**	**Offset (Kelvin)**	**T_E = -b/a**
Florida, High Altitude	0.139	-38.6	277.1
Florida, High Altitude	0.145	-39.9	274.7
Florida, High Altitude	0.144	-43.8	303.1
Florida, Low Altitude	0.124	-35.6	285.4

Florida, Low Altitude	0.163	-45.9	281.1
Florida, Low Altitude	0.130	-39.7	305.4
Florida, Low Altitude	0.183	-53.6	293.5
Florida, Low Altitude	0.334	-98.9	296.0
Florida, Low Altitude	0.160	-48.0	299.4
Dominica, Low Altitude	0.433	-126.2	291.4
Dominica, Low Altitude	0.302	-81.3	269.4
Dominica, Low Altitude	0.158	-46.0	291.1
Dominica, Low Altitude	0.346	-100.8	291.2
Dominica, Low Altitude	0.505	-135.9	269.0
Mississippi, Low Altitude	0.333	-95.9	288.1
Mississippi, Low Altitude	0.366	-105.7	288.5
New Zealand, Low Altitude	0.179	-50.3	281.2
New Zealand, Low Altitude	0.255	-71.1	279.0

Dominica High Alt Cloud Transect: $y = 0.321x - 87.4$; $R^2=0.48$

Dominica Low Alt Cloud Transect: $y = 0.187x - 53.0$; $R^2=0.215$

Dominica Cirrus Cloud Transect: $y = 0.1011x - 27.5$; $R^2=0.124$

NOTE – like the ocean transects, the slope and offset values calculated from the cloud transects are consistent with those that I calculated using the scatter plots, despite their relatively low R^2 values

Alaska:

- NOTE: This is the original image used for Landsat 8 assessment. The locations labeled Alaska2 in the above tables are from an image downloaded in July, of a coastal region further north and taken on June 24.
- The slopes and offsets in the Alaska image are relatively consistent within lowland and within mountainous terrain and there are relatively distinct differences between the lowland and mountain values.
    - Slopes over lowland are generally small and negative. Offsets are generally positive.
        - There are two outliers (highlighted in red) with slightly positive slopes and negative offsets.
    - Slopes over the Alaska mountains are small and positive. Offsets are negative

Location	**Slope**	**Offset (Kelvin)**	**T_E = -b/a**
Lowland	-0.084	23.0	273.0
Lowland	-0.169	46.4	274.5
Lowland	-0.146	39.6	271.4
Lowland, North of Mnt McKinley	0.067	-19.9	296.0
Lowland, North of Mnt McKinley	-0.079	20.290	255.9
Lowland, North of Mnt McKinley	0.025	-8.32	327.5
Mountains	0.110	-31.1	282.2
Mountains	0.093	-26.1	280.7
Mountains	0.061	-17.1	282.1
Mountains	0.125	-34.9	278.8
Mountains	0.097	-27.6	285.2