

GEOG-741 Assignment-4

Land Surface temperature

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# Executive Summary

The main aim behind this activity was to process thermal bands captured by Landsat 8 OLI and analyze both level 1 and level 2 data. This included conversion from raw digital numbers to at sensor radiance and then conversion to brightness temperature in absence of atmospheric corrections. Then surface temperature and the differences between them were calculated. Same two pixels from initial assignments were used. One of them was vegetation while the other one was water. Figure below shows the selection of pixels from study area.

Chart, surface chart

Description automatically generated

Figure Selected pixels from Imagery

# Task 1: Brightness temperature

Brightness temperature for Landsat band 10 was calculated using the level-1 product. The band 10 digital numbers were first converted to radiances and then brightness temperature using the procedures mentioned in lab4. The planks radiance function was used to convert the radiances to brightness temperature. The pixels selected were from vegetation and water respectively. The brightness temperature for both pixels as shown below in Figure 2.

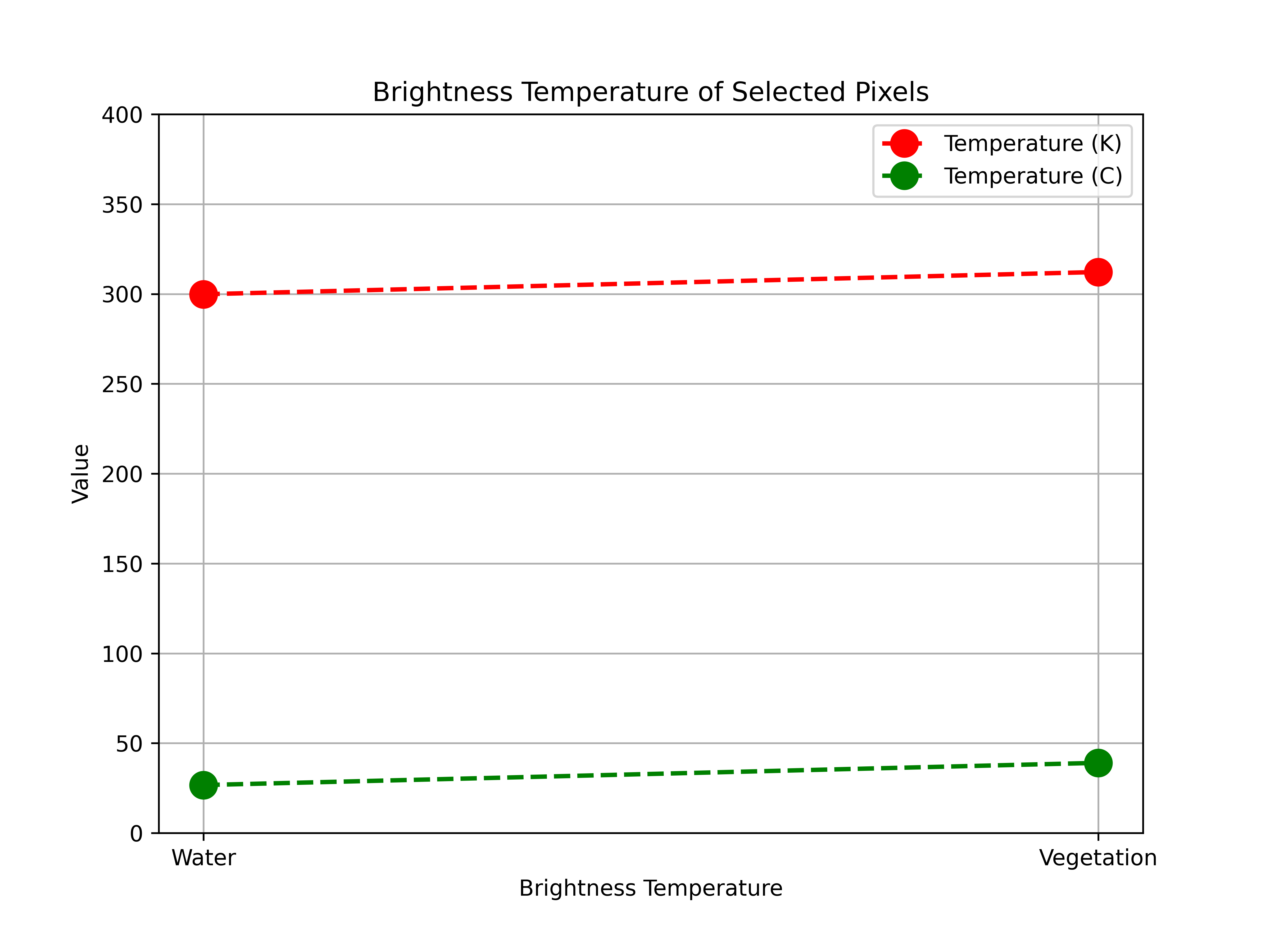


Figure Brightness Temperature for Selected Pixels

# Task 2: Surface Temperature

The surface temperature for selected pixels was derived from level 2 data. The data was corrected by multiplicative and additive factor which was provided in the MTL file as mentioned in the lab 4 document. Surface reflectance values are show in following figures.

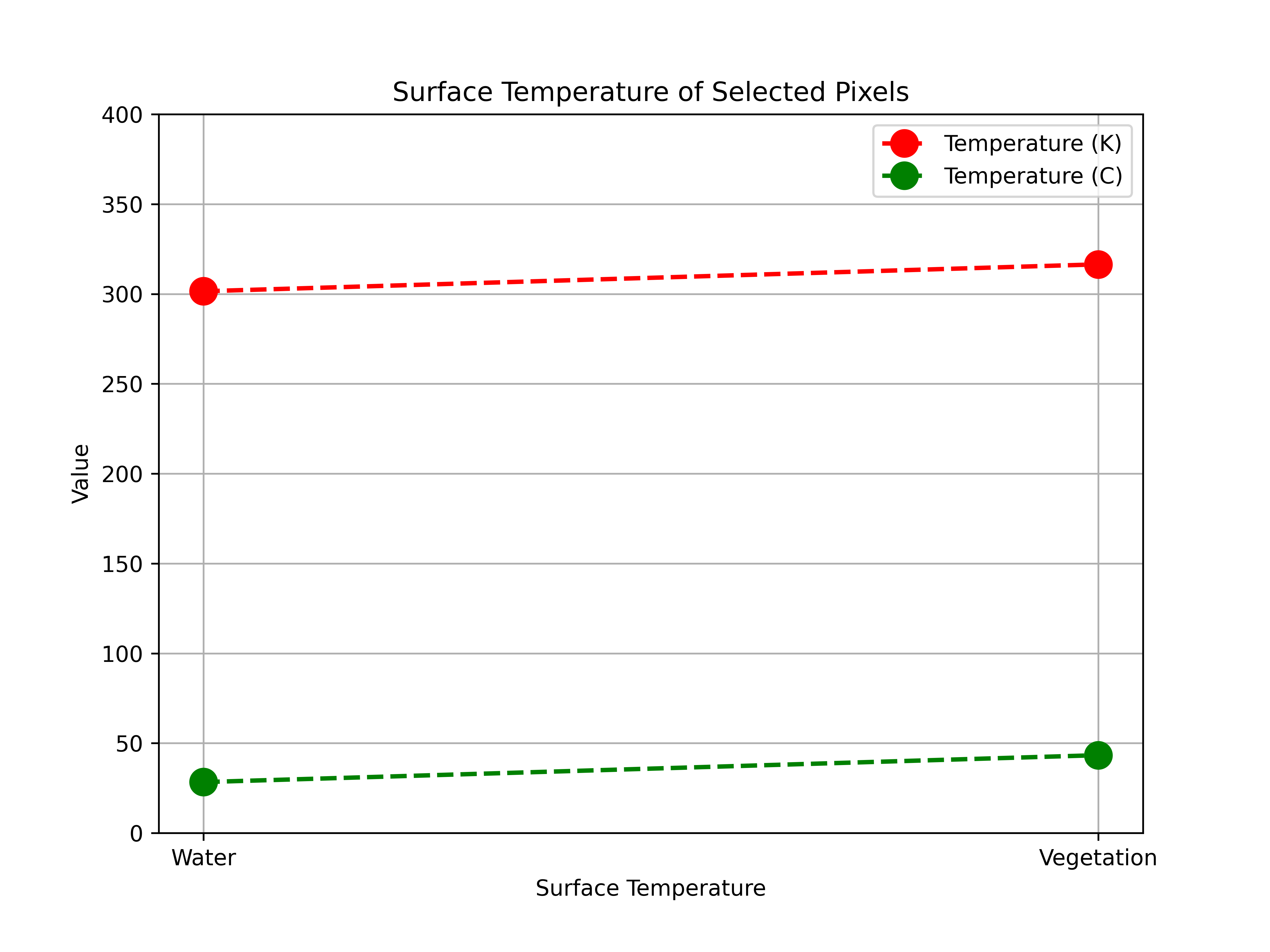


Figure Surface Reflectance for selected pixels

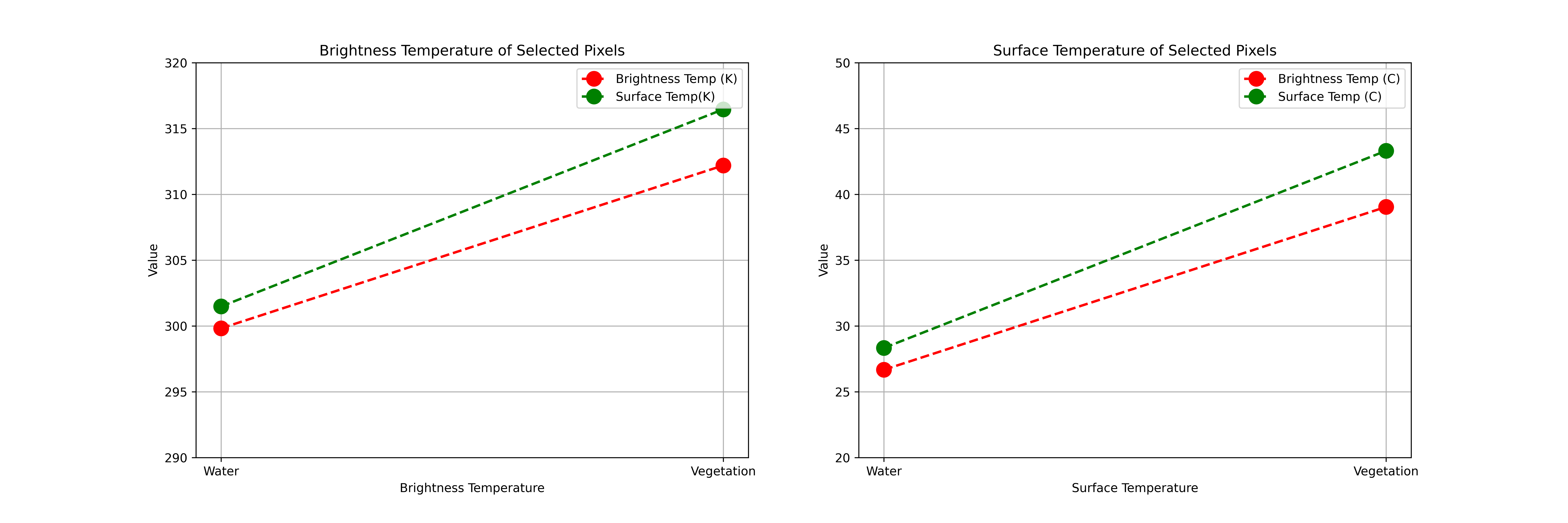


Figure Comparison of Surface and Brightness temperature in Celsius and Kelvin

# Task 3: Explain the differences

For both the pixels i.e., water and vegetation the brightness temperature is lesser than surface temperature. As discussed in lecture 8 that atmospheric effects may make the surface appear cooler which means the emitted radiation might be absorbed by the particles or it may be make it appear warmer which means the atmosphere may have emitted extra radiations. In this case the surface temperature appears to be more than the brightness temperature which means the surface temperature is more than the brightness temperature which means it made it appear cooler. Concludingly, in this case the radiation emitted by atmosphere are outweighed by radiation absorbed by atmosphere.

# Task 4: Radiance of Target Surface

Assumption: Emissivity= 1

Using the simplified equation from lab 4 document the radiances for target surface and the cold plane will be the following.

Target Surface= 9.5971 W/m2-sr-um

Cold focal plane= 0.00038412 W/m2-sr-um