**Calculation of Land Surface Temperature**

* **Conversion to digital number to spectral radiance**

**Lλ = ML \* Qcal + AL**

Where:

Lλ = TOA spectral radiance (Watts/ (m2 \* sr \* μ m)

ML = Radiance multiplicative Band (No.)

AL = Radiance Add Band (No.)

Qcal = Quantized and calibrated standard product pixel values (DN)

* **Conversion of spectral radiance to brightness temperature**
* Spectral radiance data can be converted to top of atmosphere brightness temperature using the thermal constant Values in Meta data file

**TB = K2 / ln (k1 / Lλ + 1) - 272.15**

Where:

* TB = Top of atmosphere brightness temperature (°C)
* Lλ = TOA spectral radiance (Watts/ (m2 \* sr \* μ m))
* K1 = K1 Constant Band (No.)
* K2 = K2 Constant Band (No.)
* Pop up window will appear > give input : ( 1321.07/

* **Calculate NDVI**
* The Normalized Differential Vegetation Index (NDVI) is a standardized vegetation index which Calculated using Near Infra-red (Band 5) and Red (Band 4) bands.

**NDVI = (NIR – RED) / (NIR + RED)**

Where:

* RED= DN values from the RED band
* NIR= DN values from Near-Infrared band
* **Proportionate vegetation & land surface emissivity**
* Land surface emissivity (LSE) is the average emissivity of an element of the surface of the Earth calculated from NDVI values.

**PV = [(NDVI – NDVI min) / (NDVI max + NDVI min)] square**

Where:

* PV = Proportion of Vegetation
* NDVI = DN values from NDVI Image
* NDVI min = Minimum DN values from NDVI Image
* NDVI max = Maximum DN values from NDVI Image
* ***Land surface emissivity :***

**E = 0.004 \* PV + 0.986**

Where:

* E = Land Surface Emissivity
* PV = Proportion of Vegetation
* **Conversion from At- satellite temperature to land surface temperature**
* Convert the At satellite brightness temperature to brightness temperature to LANDSAT surface temperature using following equation

**T = TB / [1+ (λ\*TB/C2)\*ln (e)]**

Where,

λ = wavelength of emitted radiance

c2= hc/s = 1.4388\*10E-02 m K = 14388 µm K

h = Plank’s constant = 6.626\*10E-34 J/K

s = Boltzmann constant = 1.38 \* 10E-23 J/K

c = velocity of light = 2.998 \*10E8 m/s