Land Surface Temperature (LST) is defined as the temperature at interface between the Earth's surface and its atmosphere. LST is playing a Key role in land surface processes, not only, because of having climatic importance, but also due to its control of the sensible and latent heat flux exchange. LST have wide application in many fields visa; evapotranspiration, climate change, hydrological cycle, vegetation monitoring, urban climate and environmental studies. We can calculate LST from this equation:

$$LST = \frac{BT}{1 + \frac{W \times BT}{\rho} \ln LSE}$$

Where:

BT: effective at satellite temperature in absolute temperature.

$$BT = \frac{K2}{\ln\left(\frac{K1}{L_\lambda} + 1\right)} - 273.15 (to\ convert\ from\ Kelvin\ to\ Celsius)$$

$K1$ & $K2$**:** stand for the band-specific thermal conversion constants from the metadata.

L_λ**:** is the Spectral Radiance at the sensor's aperture

$$L_\lambda = ML \times QCAL + A_L$$

ML: represents the band-specific multiplicative rescaling factor.

QCAL: is the band of image.

A_L**:** Band specific additive rescaling factor from the metadata

We can write this equation in this form

$$L_\lambda = RADIANCE \times band_n + 0.1$$

W: is the wavelength of emitted radiance (w = 10.8 μm for band10 & w=12 μm for band11).

$$\rho = \frac{hC}{S} = 14380$$

h: Planck's constant $(6.626 \times 10^{-34}\ JS)$

S: Boltzmann Constant $(1.38 \times 10^{-23}\ J/K)$

C: Velocity of light $(2.998 \times 10^{8}\ m/s)$

LSE: the emissivity.

$$LSE = 0.004Pv + 0.986$$

Pv**:** Proportion of vegetation

$$Pv = \left[\frac{NDVI - NDVI_{min}}{NDVI_{max} - NDVI_{min}}\right]^2$$

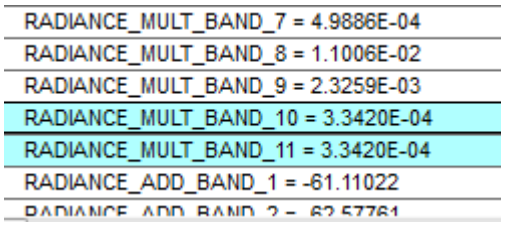
NDVI: Normalised Difference Vegetation Index

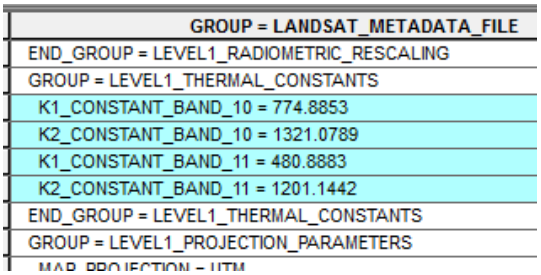
$$NDVI = \frac{band5 - band4}{band5 + band4}$$

$band5$: Near infrared (NIR) band
$band4$: Red band

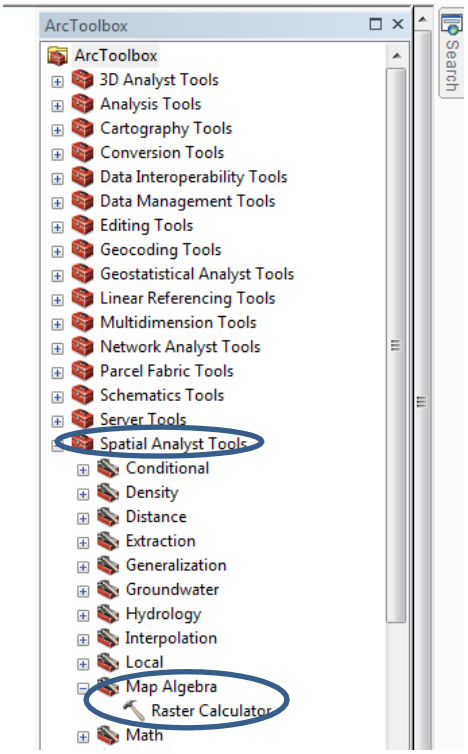
- **To calculate LST, follow these steps:**

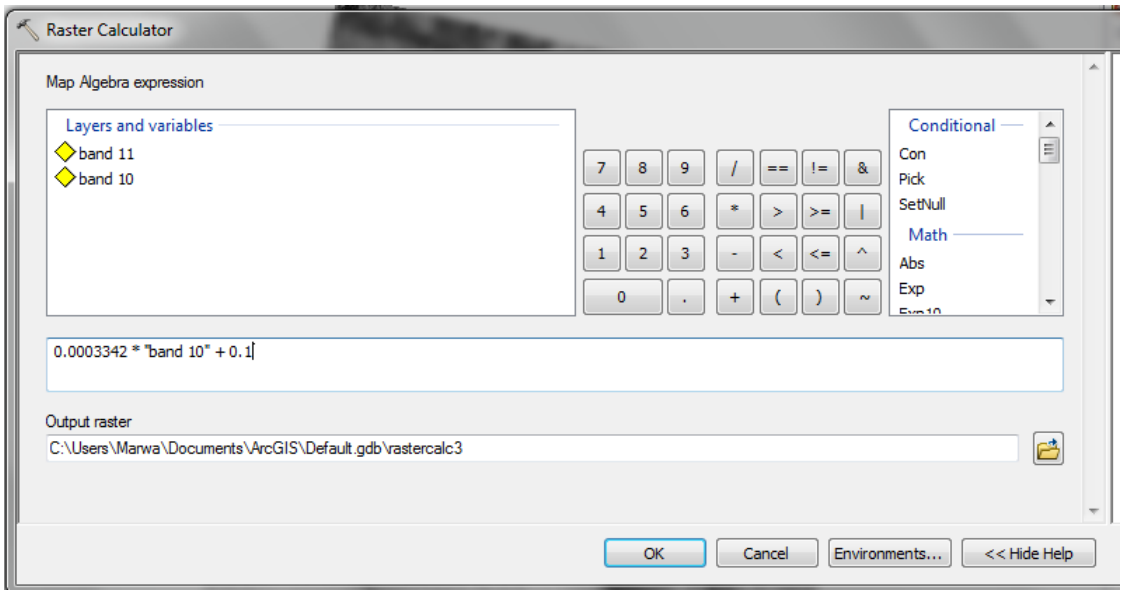
1. Open Arcmap, then add Band 10 - Thermal Infrared (TIRS) & Band 11 - Thermal Infrared (TIRS) 2 from add data 
2. The RADIANCE , K1 &K2 values can be found from the text file





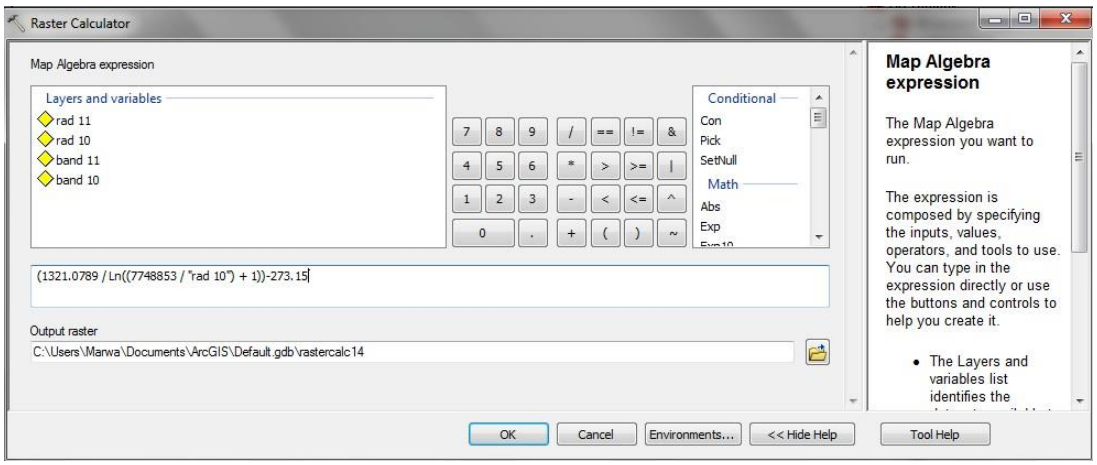
3. Calculate $L_\lambda$from the toolbar select Arc toolbox, and then follow these steps

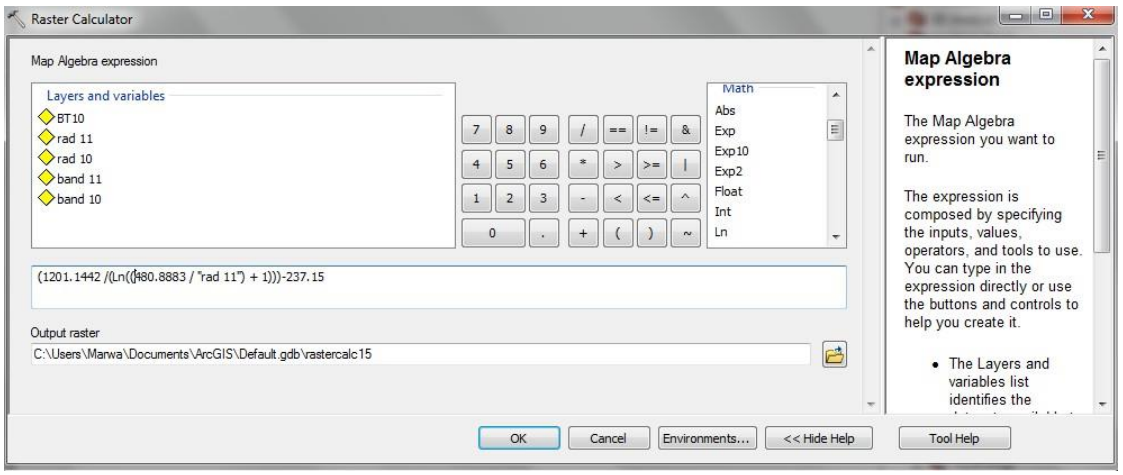




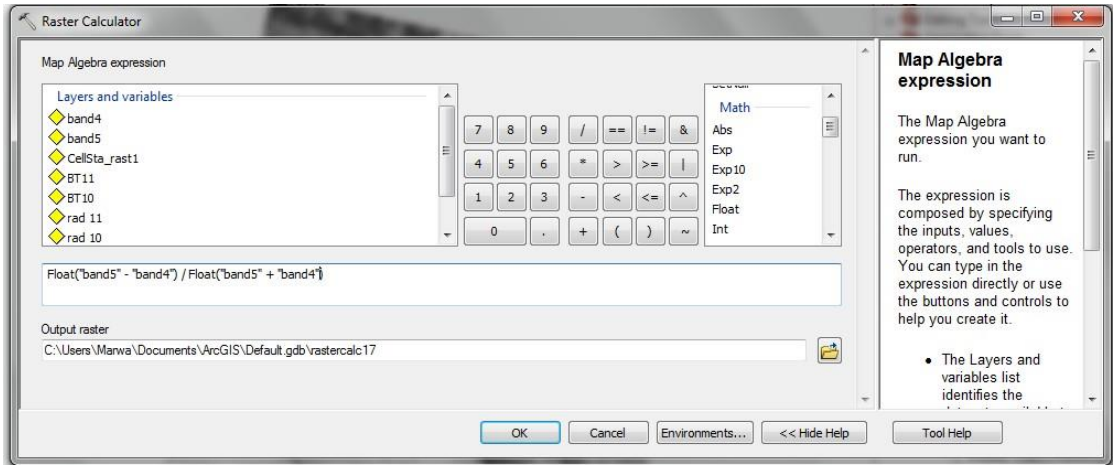
4. Press ok and repeat the steps for band11

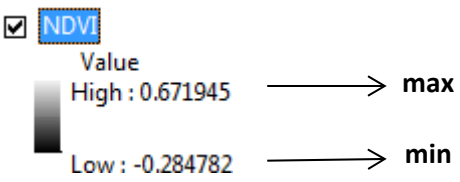
5. Calculate BT for band 10 & band 11 from raster calculator



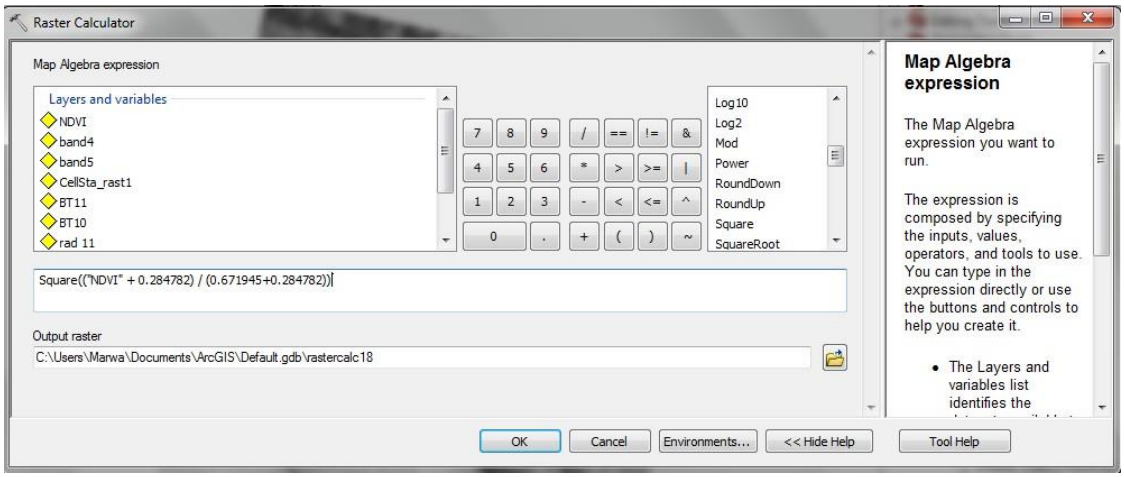


6. Calculate the NDVI; add band4& band5 from add data  , then raster calculator

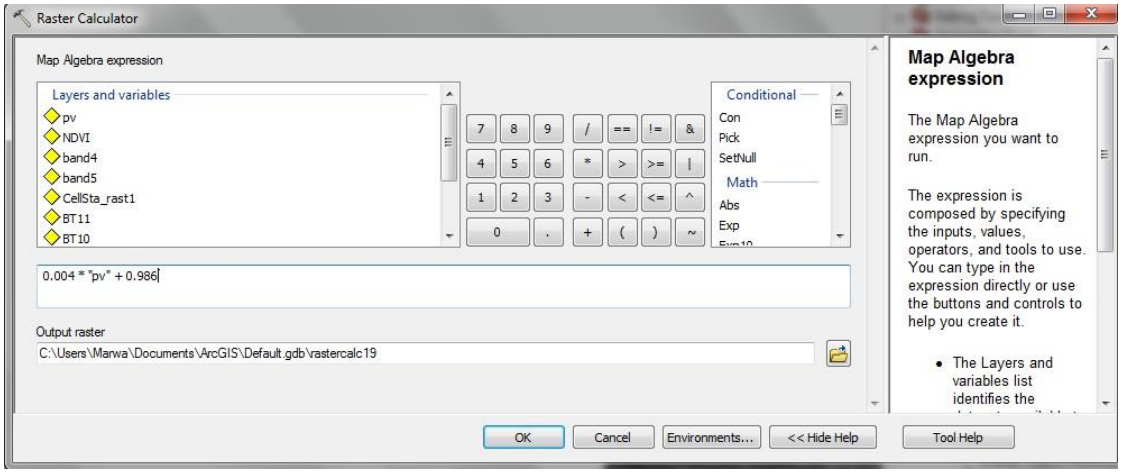




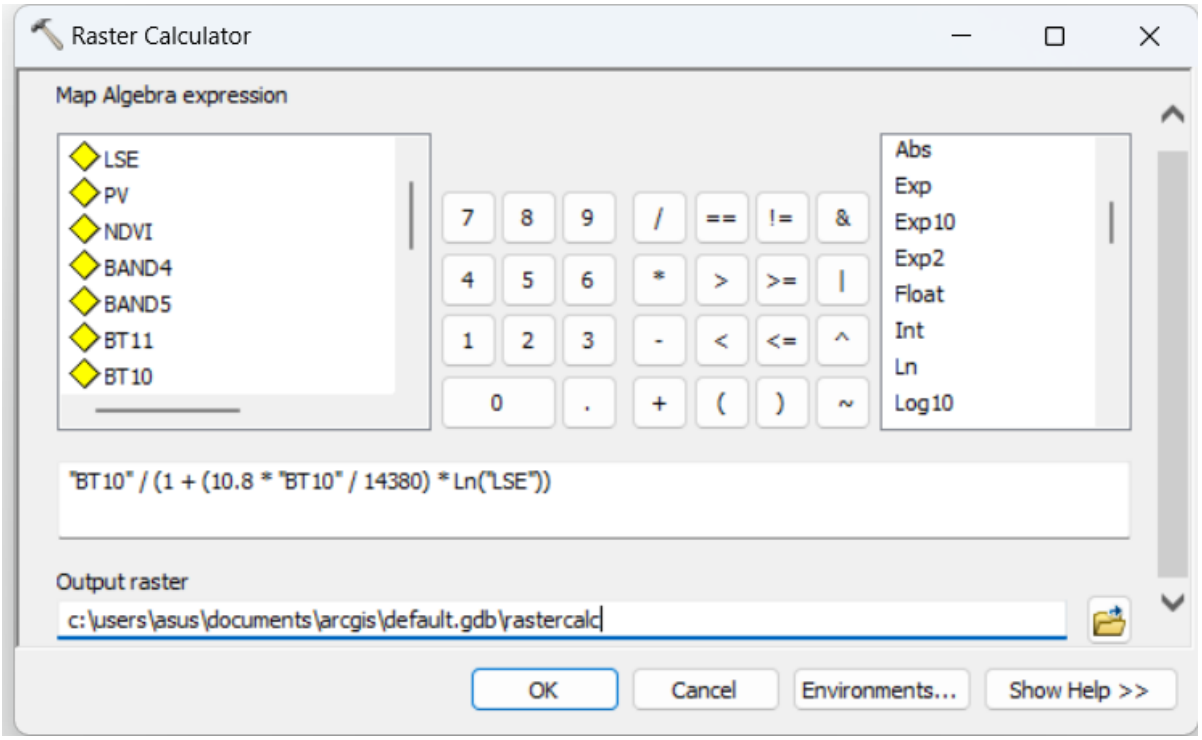
7. Calculate $\boldsymbol{Pv}$ from raster calculator



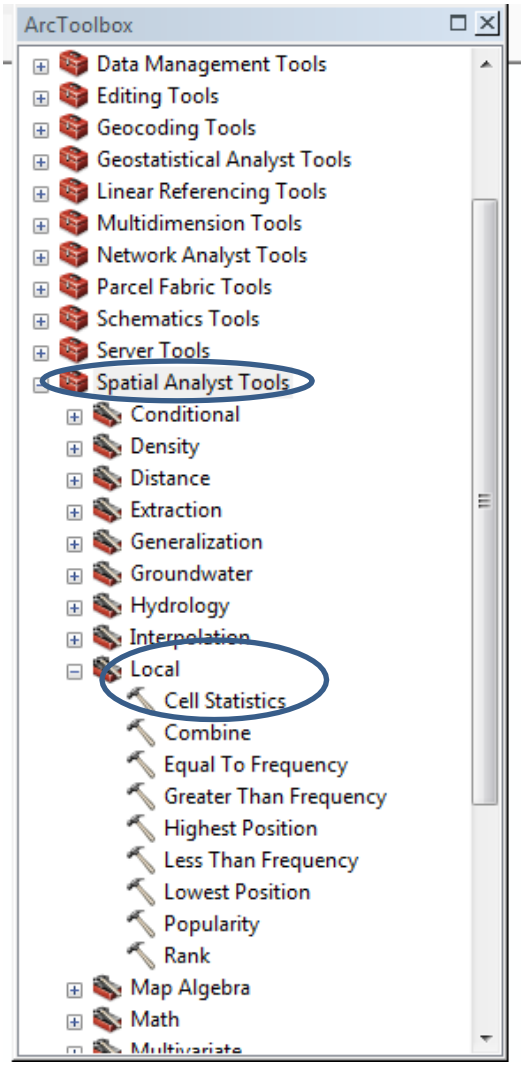
8. Calculate LSE from raster calculator

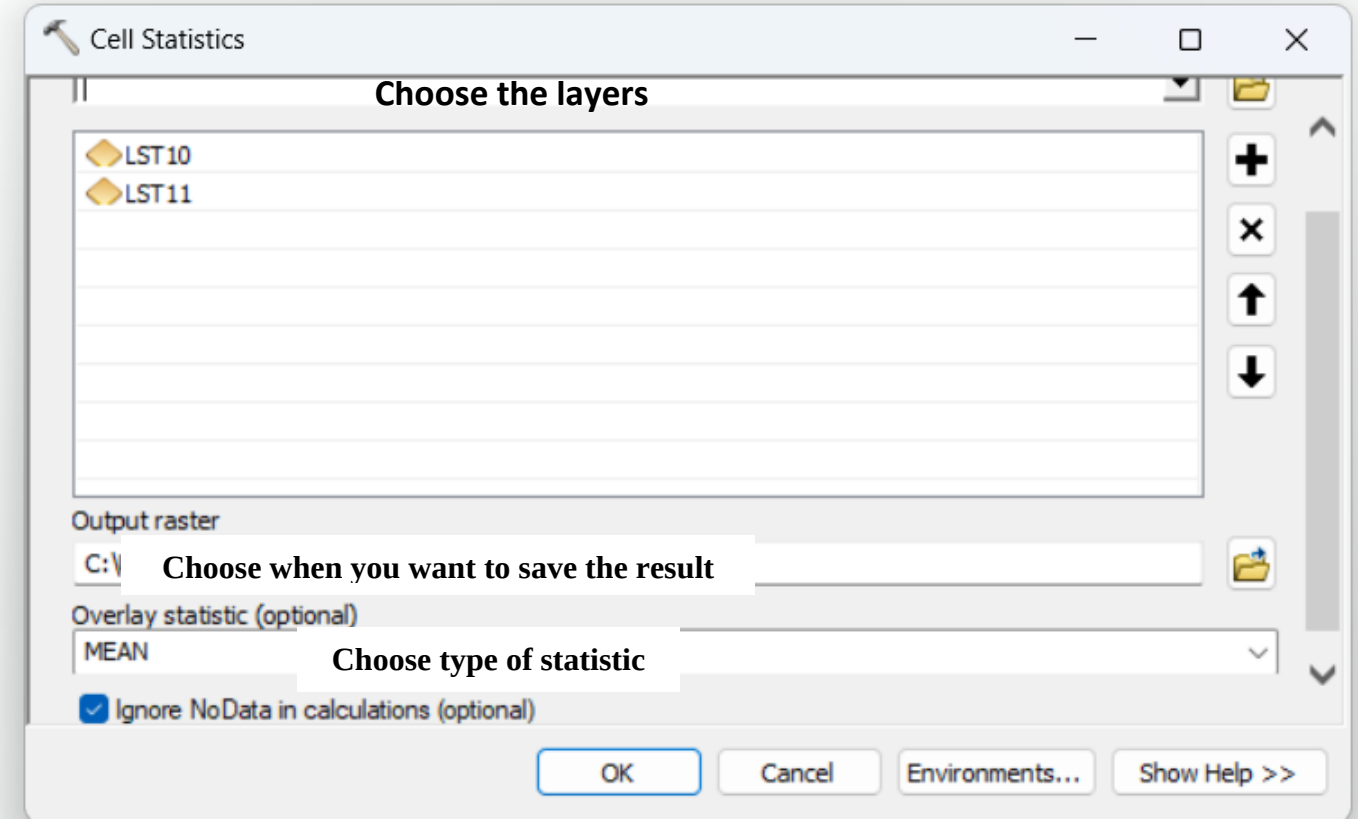


9. Calculate LST for band 10 & band11 from raster calculator



10. Now calculate the average of LST from the toolbar select Arc toolbox,and then follow these steps




Cell Statistics
Choose the layers
LST10
LST11
Output raster
C:\
Choose when you want to save the result
Overlay statistic (optional)
MEAN
Choose type of statistic
Ignore NoData in calculations (optional)
OK
Cancel
Environments...
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