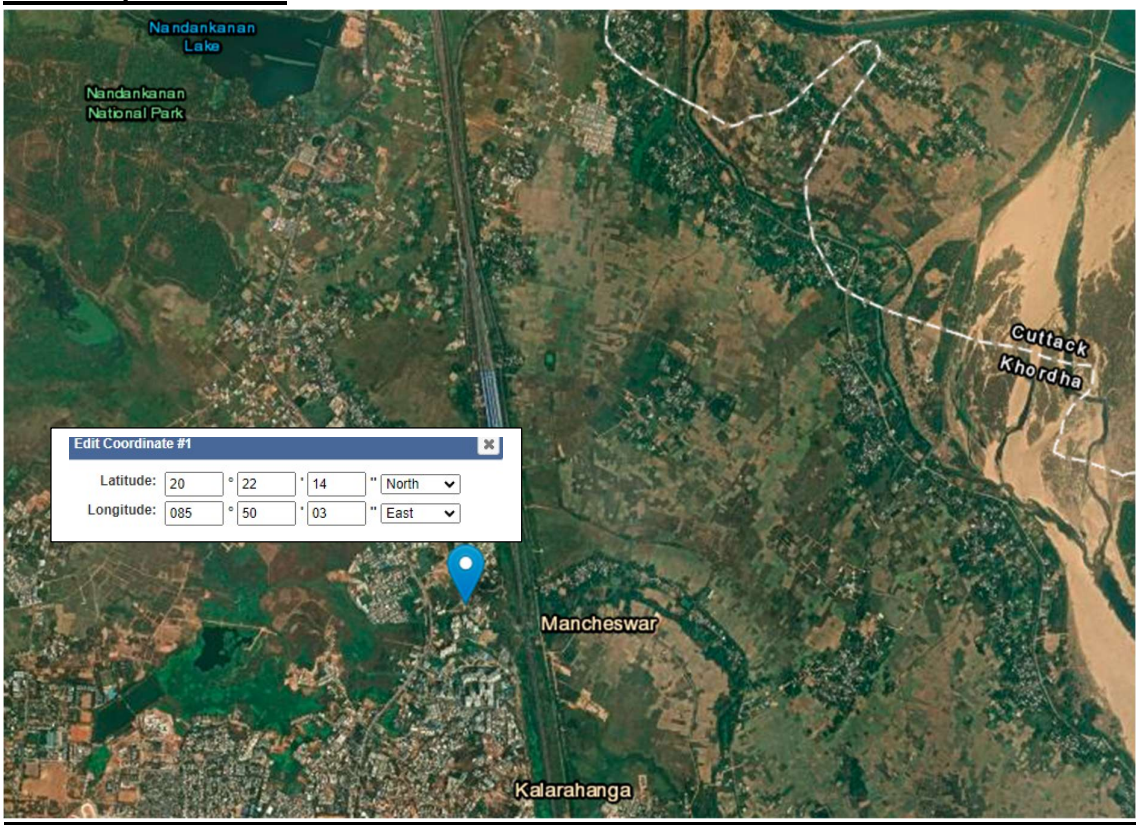
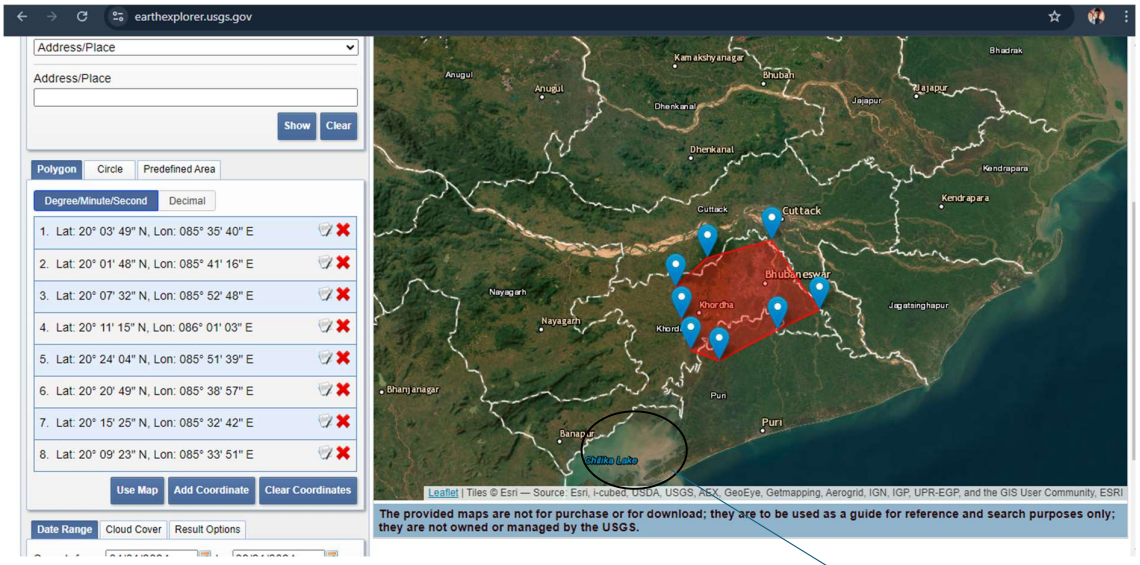
SRIMAYA MOHAPATRA ,244104010

LAB 2 ASSIGNMENT

CE 593 ADVANCED REMOTE SENSING

Earth Explorer USGS





Chilika Lake

USGS EarthExplorer - To search and download satellite imagery and other geospatial data

Geographic Location:

- **Country**: India
- **State**: Odisha
- **Region**: The area highlighted is in the eastern part of Odisha, around the cities of Bhubaneswar and Cuttack.

Polygon Details:

The polygon drawn on the map marks a specific area of interest, mainly to download satellite imagery or other geospatial data. The coordinates listed on the left side define the boundaries of this polygon.

Metadata of the Downloaded File

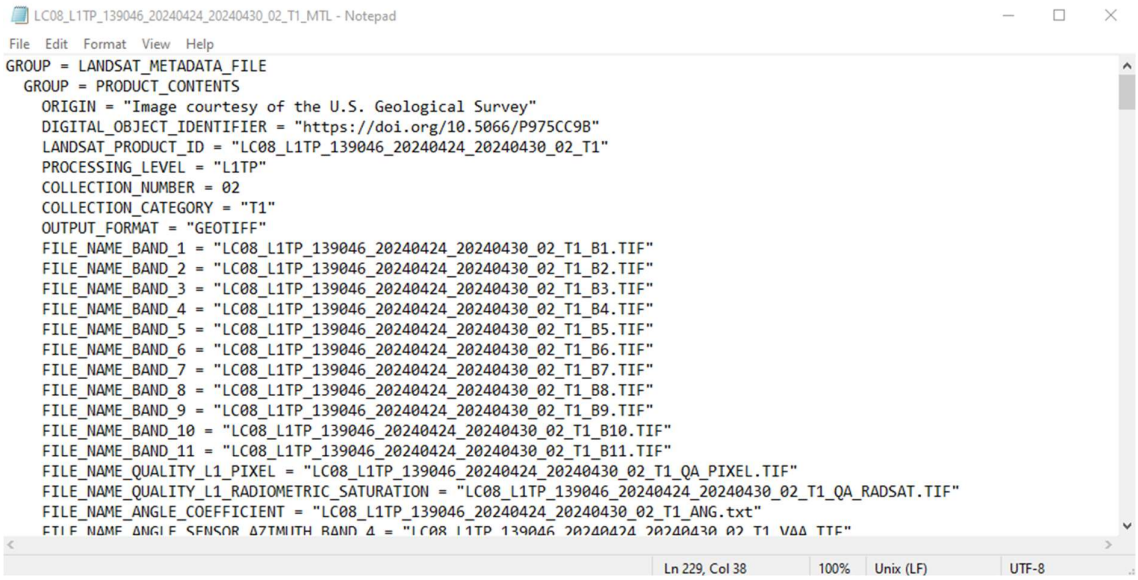
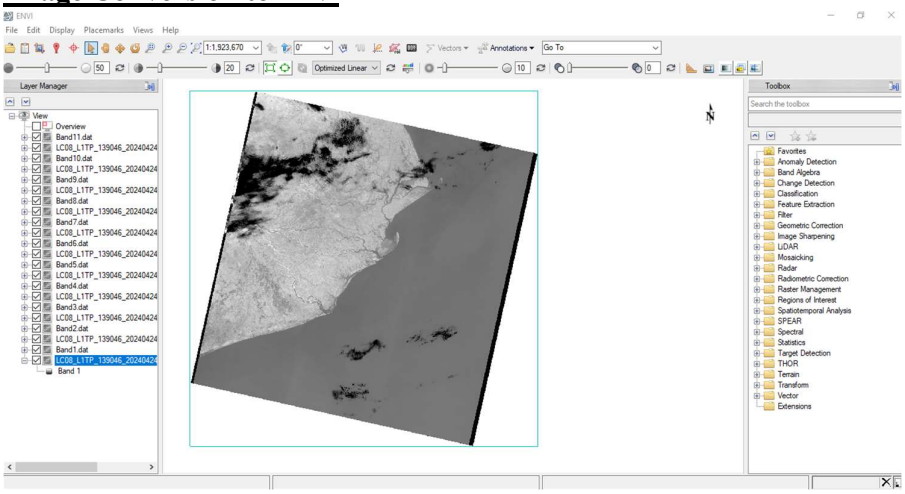
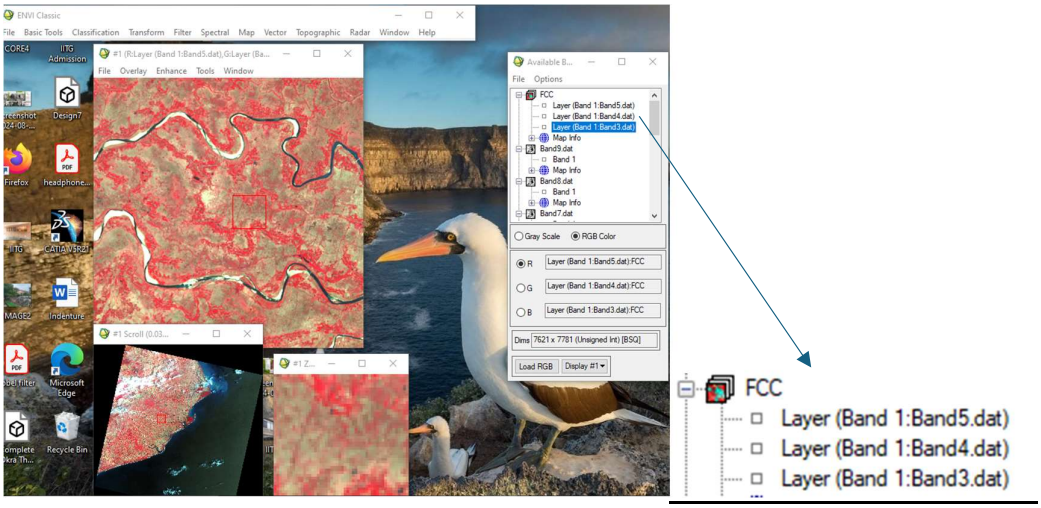


Image Conversion to Envi



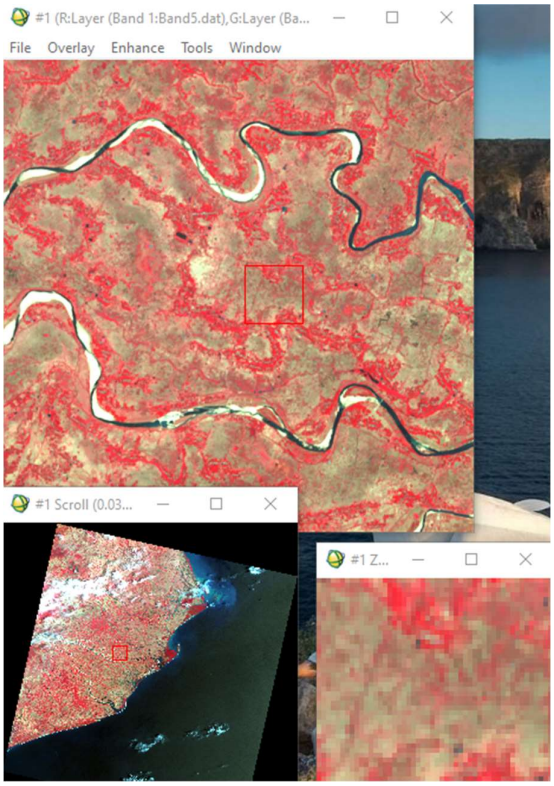
Layer Stacking for FCC Band

11 bands are loaded, and FCC image stacked into single file



- For (FCC) image - bands 5, 4, and 3:
  - Red (R): Band 5 (NIR)
  - Green (G): Band 4 (Red)
  - Blue (B): Band 3 (Green)
- Stack the bands in the order of R-G-B

FCC IMAGE RESULT AND INFORMATION



1. General Information

- Product ID: LC08_L1TP_139046_20240424_20240430_02_T1
- Date Acquired: 2024-04-24
- Processing Level: L1TP (Precision Terrain)
- Output Format: GeoTIFF

2. Image Attributes

- Spacecraft ID: LANDSAT_8
- Cloud Cover: 6.06%
- Cloud Cover over Land: 11.07%
- Sun Azimuth: 104.04°
- Sun Elevation: 66.33°

3. Projection Attributes

- Map Projection: UTM
- Datum/Ellipsoid: WGS84
- UTM Zone: 45
- Grid Cell Size:
    - Panchromatic: 15 meters
    - Reflective/Thermal: 30 meters

4. Geometric Attributes

- Upper Left Corner (Lat, Lon): (21.27384, 85.49441)
- Upper Right Corner (Lat, Lon): (21.27913, 87.69792)
- Lower Left Corner (Lat, Lon): (19.16546, 85.51457)
- Lower Right Corner (Lat, Lon): (19.17018, 87.68858

Band Math Calculation

Digital Number to Reflectance

$$\boldsymbol{P_\lambda = (M_\rho + Q(cal) + A_\rho) / \sin(\theta_{se})}$$

P_λ = Reflectance

M_ρ=Band – specific rescaling factor from the metadata (Reflectance)

A_ρ=Band - specific additive rescaling factor from the metadata

$Q(cal)$ – Quantized and calibrated standard product pixel value (DN)

θ_{se}- Local sun elevation angle, provided in the metadata

Parameter	Band 3	Band 4	Band 5
M_ρ	2.0000E-05	2.0000E-05	2.0000E-05
A_ρ	-0.100000	-0.100000	-0.100000
θ_{se}	66.32614072	66.32614072	66.32614072

```
((0.00002*B3)-0.1)/0.915845
((0.00002*B4)-0.1)/0.915845
((0.00002*B5)-0.1)/0.915845
```

Digital Number to Radiance

$$P_\lambda = (M_\rho + Q(cal) + A_\rho$$

P_λ = Radiance

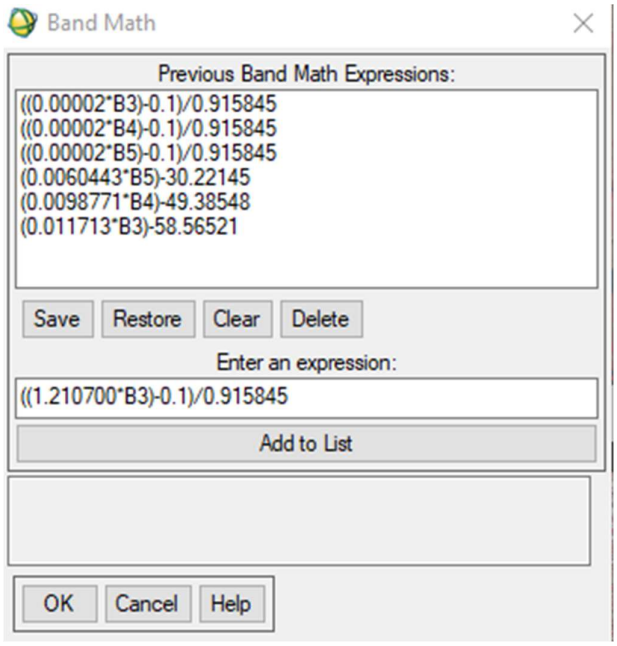
M_ρ=Band – specific rescaling factor from the metadata (Radiance)

A_ρ=Band - specific additive rescaling factor from the metadata

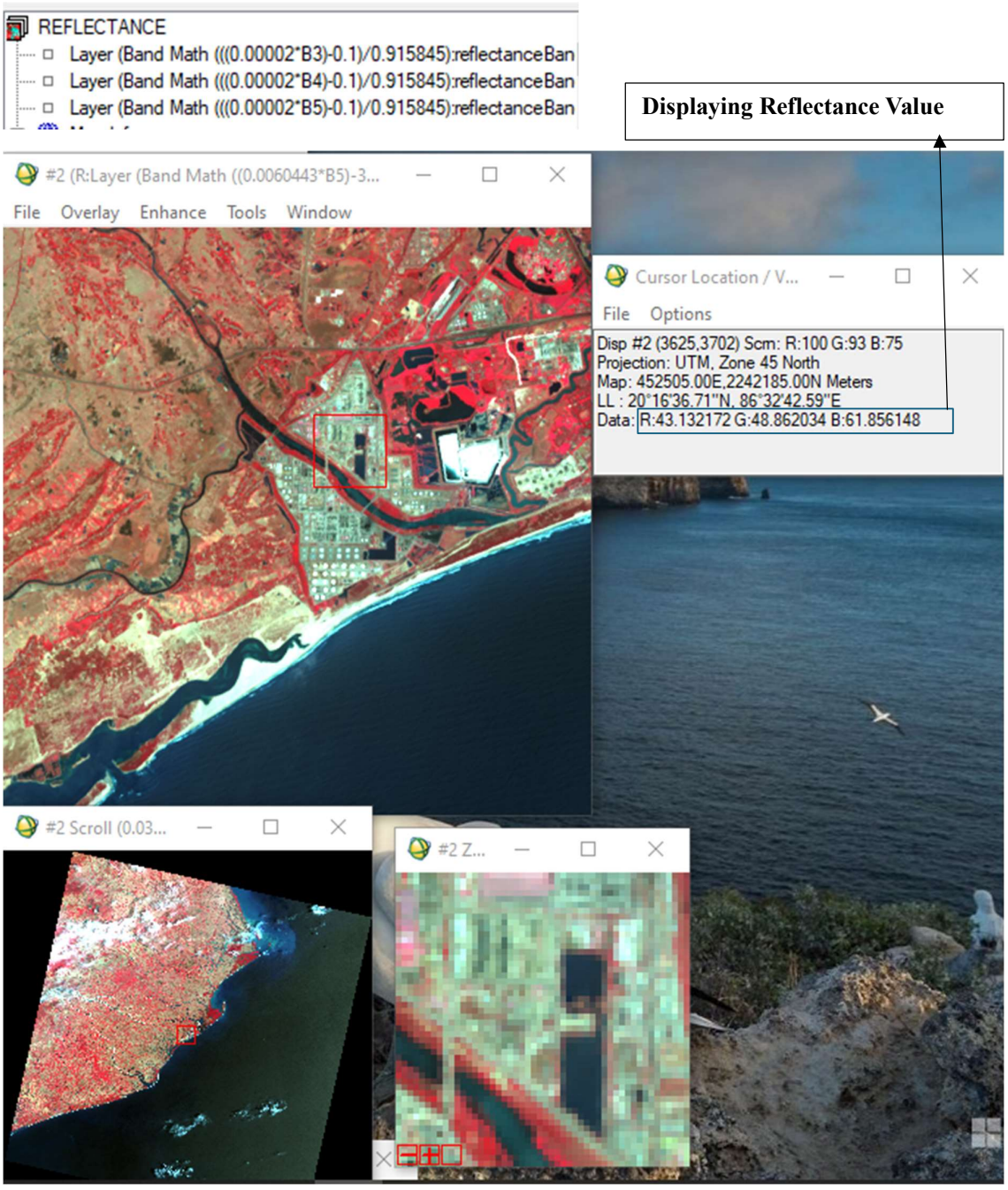
$Q(cal)$ – Quantized and calibrated standard product pixel value (DN)

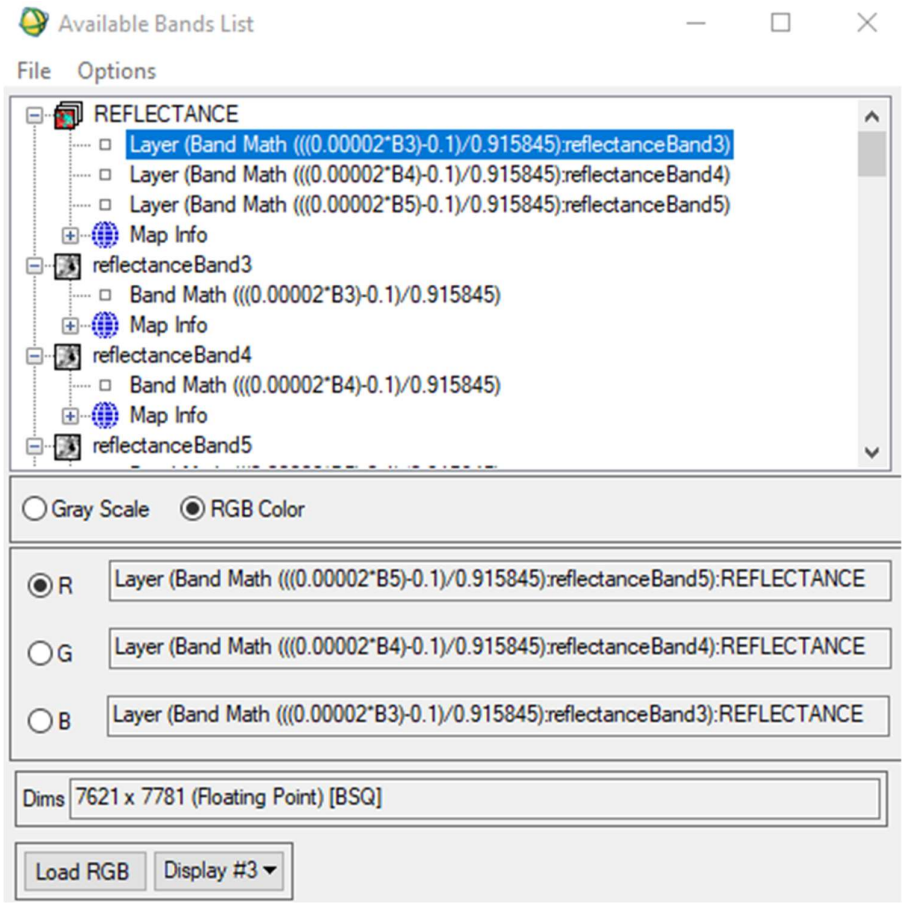
Parameter	Band 3	Band 4	Band 5
M_ρ	1.1713E-02	9.8771E-03	6.0443E-03
A_ρ	-0.100000	-0.100000	-0.100000

```
(0.0060443*B5)-30.22145
(0.0098771*B4)-49.38548
(0.011713*B3)-58.56521
```

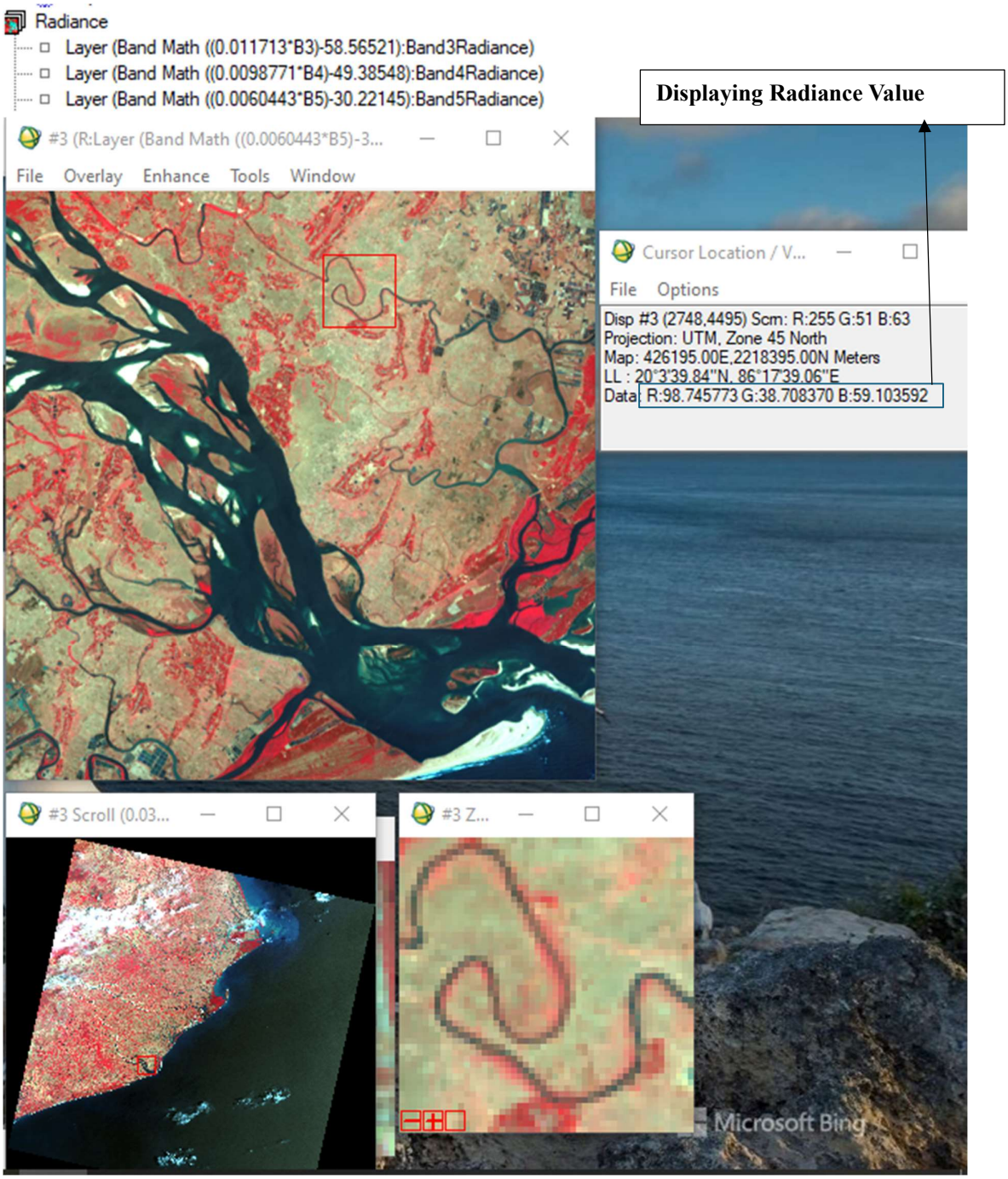


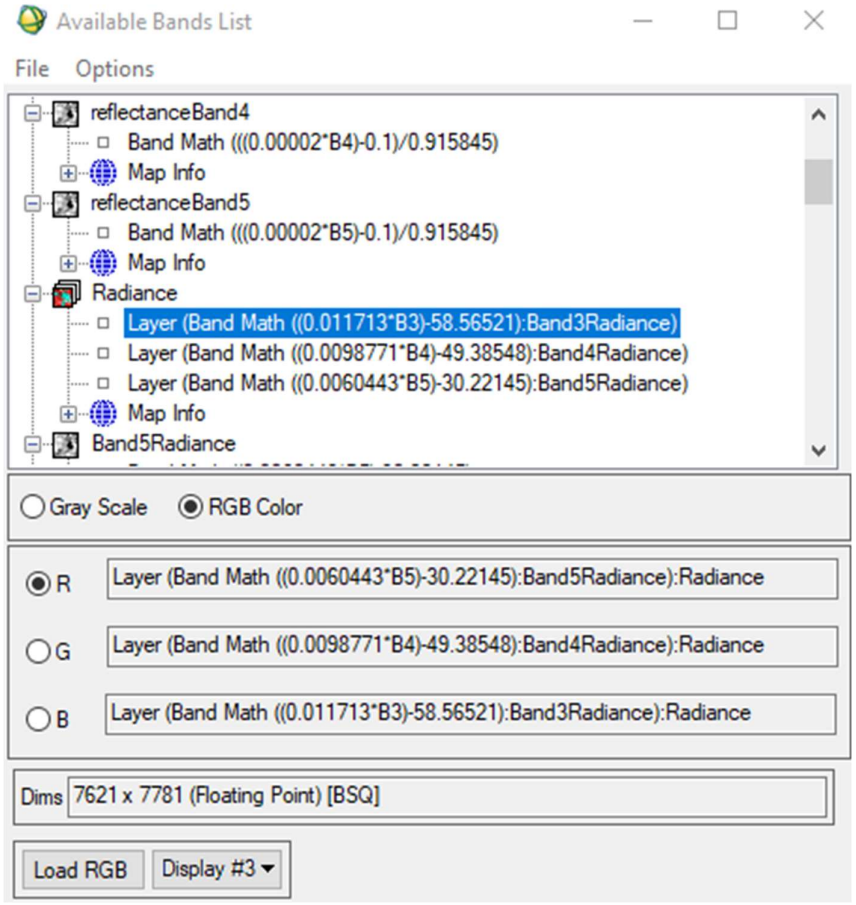
Reflectance Value




Available Bands List
File
Options
REFLECTANCE
Layer (Band Math (((0.00002*B3)-0.1)/0.915845):reflectanceBand3)
Layer (Band Math (((0.00002*B4)-0.1)/0.915845):reflectanceBand4)
Layer (Band Math (((0.00002*B5)-0.1)/0.915845):reflectanceBand5)
Map Info
reflectanceBand3
Band Math (((0.00002*B3)-0.1)/0.915845)
Map Info
reflectanceBand4
Band Math (((0.00002*B4)-0.1)/0.915845)
Map Info
reflectanceBand5
Gray Scale
RGB Color
R
Layer (Band Math (((0.00002*B5)-0.1)/0.915845):reflectanceBand5):REFLECTANCE
G
Layer (Band Math (((0.00002*B4)-0.1)/0.915845):reflectanceBand4):REFLECTANCE
B
Layer (Band Math (((0.00002*B3)-0.1)/0.915845):reflectanceBand3):REFLECTANCE
Dims
7621 x 7781 (Floating Point) [BSQ]
Load RGB
Display #3

Radiance Value




Available Bands List
File
Options
reflectanceBand4
Band Math (((0.00002*B4)-0.1)/0.915845)
Map Info
reflectanceBand5
Band Math (((0.00002*B5)-0.1)/0.915845)
Map Info
Radiance
Layer (Band Math ((0.011713*B3)-58.56521):Band3Radiance)
Layer (Band Math ((0.0098771*B4)-49.38548):Band4Radiance)
Layer (Band Math ((0.0060443*B5)-30.22145):Band5Radiance)
Map Info
Band5Radiance
Gray Scale
RGB Color
R
Layer (Band Math ((0.0060443*B5)-30.22145):Band5Radiance):Radiance
G
Layer (Band Math ((0.0098771*B4)-49.38548):Band4Radiance):Radiance
B
Layer (Band Math ((0.011713*B3)-58.56521):Band3Radiance):Radiance
Dims
7621 x 7781 (Floating Point) [BSQ]
Load RGB
Display #3