CE 778

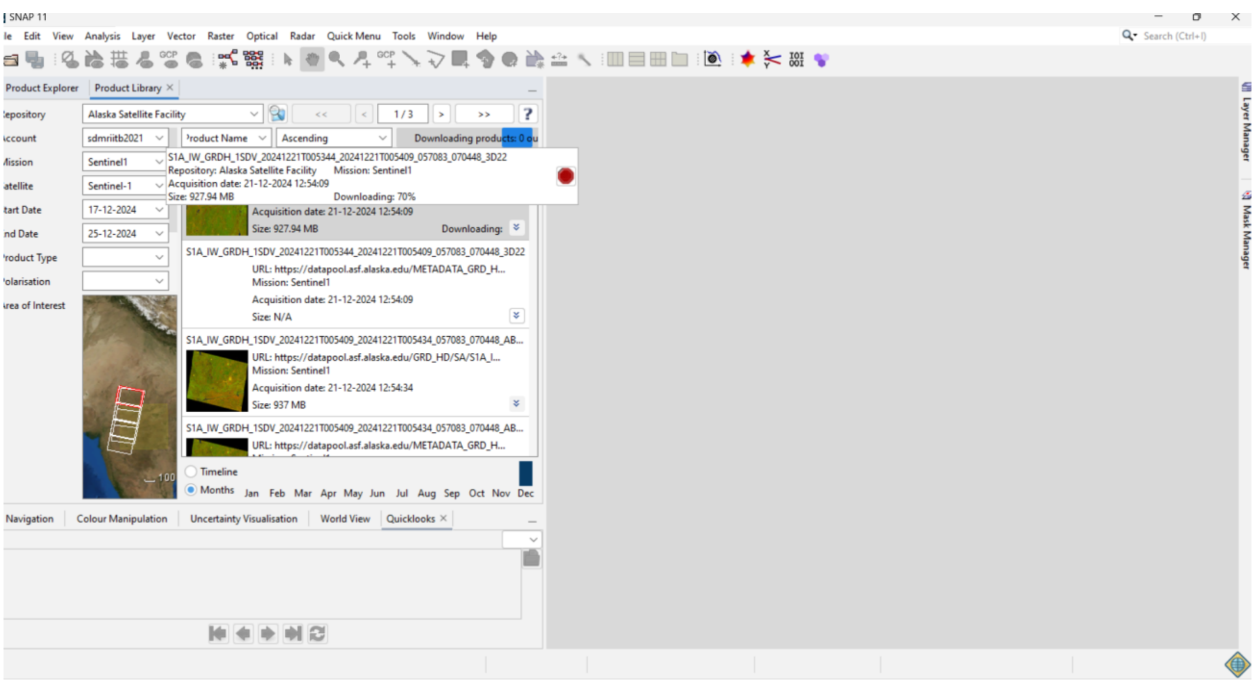
TUTORIAL EXERCISE NUMBER: 3

NAME: SAHIL, GUNWANTH ROLL NUMBER: 210040131, 210040031

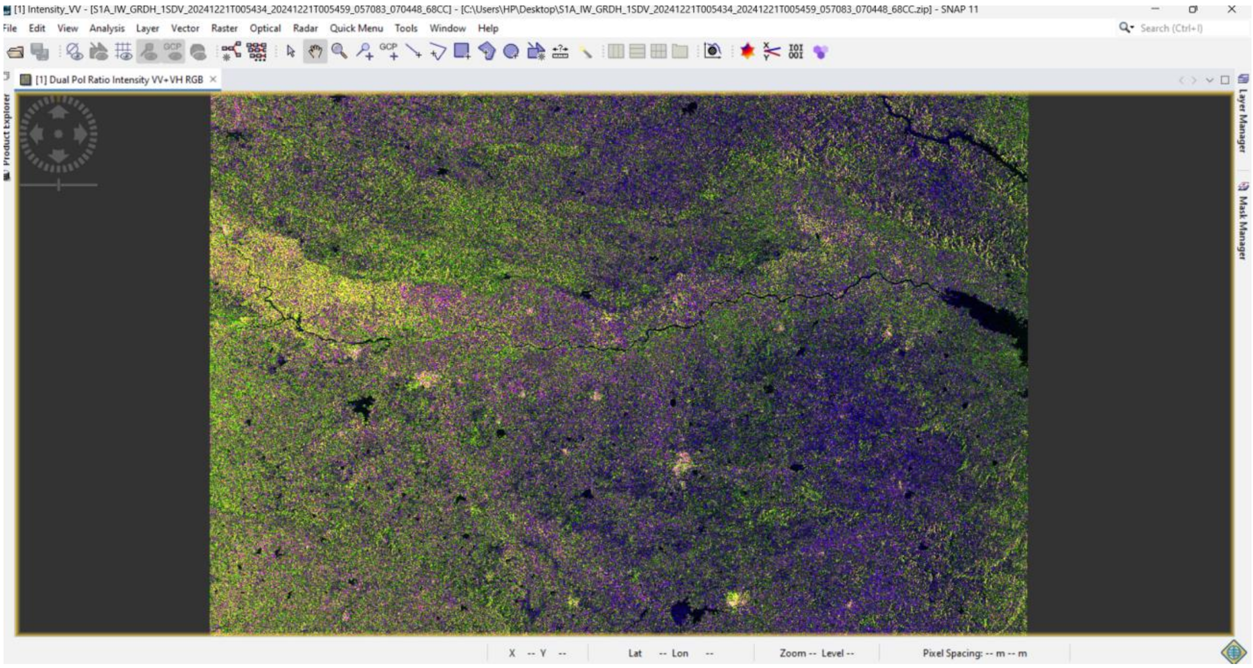
DEPARTMENT: CIVIL PROGRAM : B.Tech

DATA SOURCE: ASF Sentinel- 1 DATE OF ACCQUISITION: 06-02-25

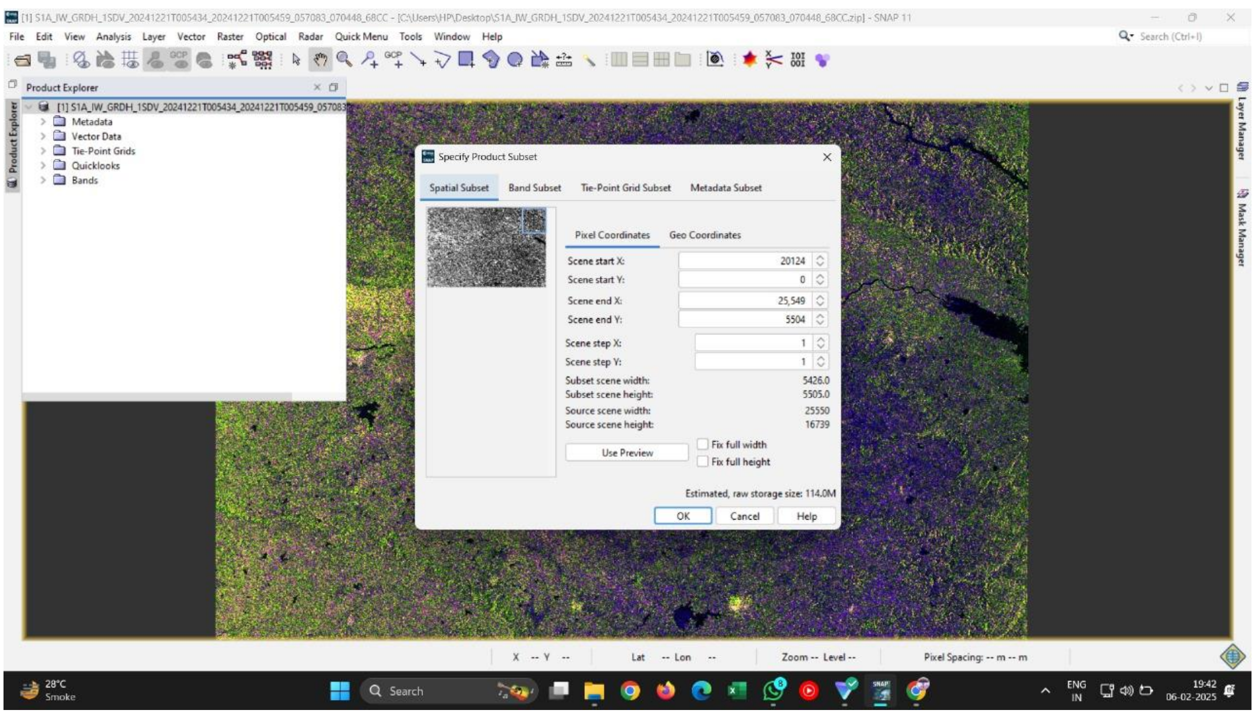
1) DATA ACCUISITION
   Since downloading and uploading on SNAP takes a long time so using product library interface in SNAP as shown in figure where using ASF repository of Sentinel-1 imagery satellite in SLC format for Date: 15 Dec 2024 to 21 Dec 2024 (2024 Year advised by TAs) was directly downloaded and open in product explorer tab as shown:



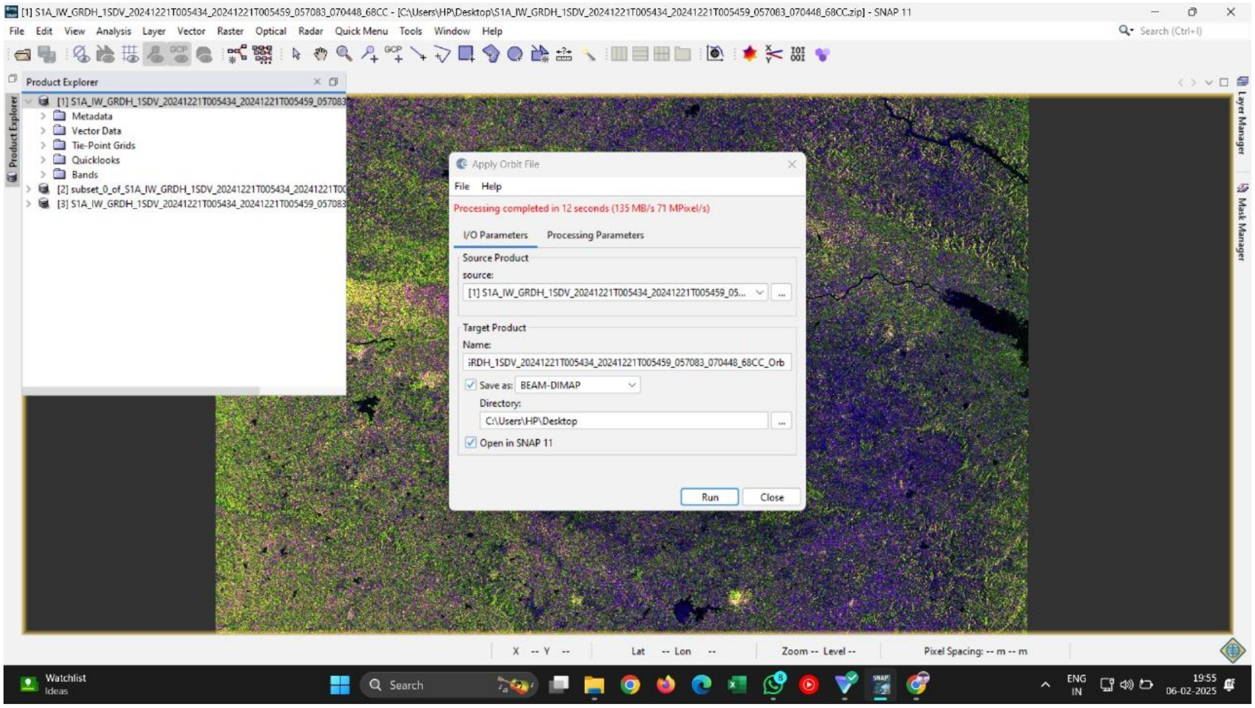
After which this was opened in rgb format using rgb channel window on right clicking safe extension file.



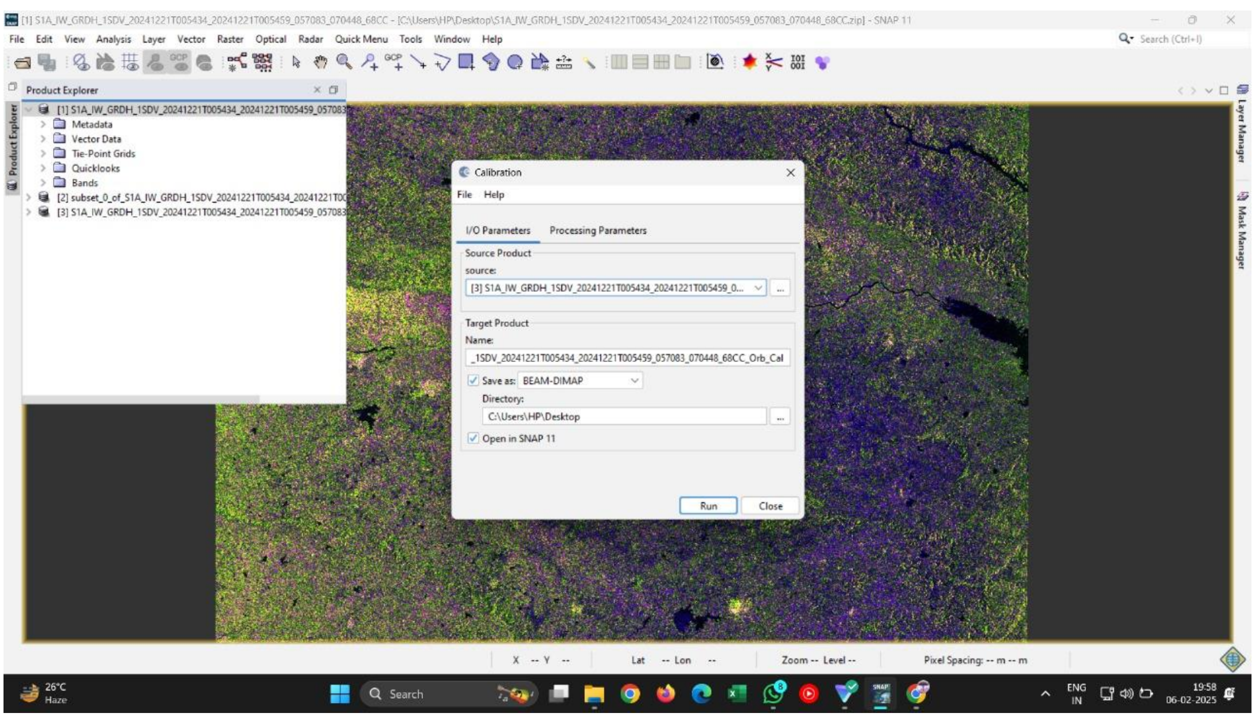
2)Since this image was too large so we used subset functionality present in Raster -> Subset… Where further image processing was done on small subset of original slc image.



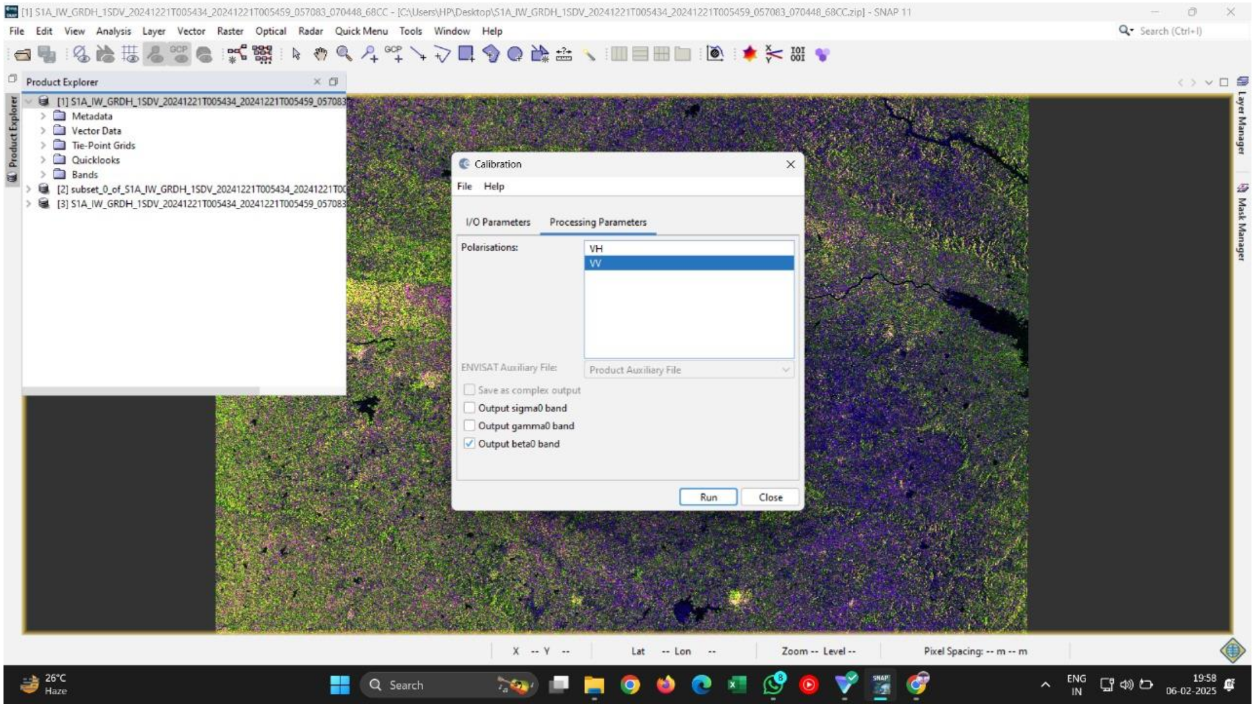
3)After choosing subset then we created an orbit file for this so to get exact satellite position and velocity information which metadata may not provide accurate, and this is required for further steps, and this was done as follows:



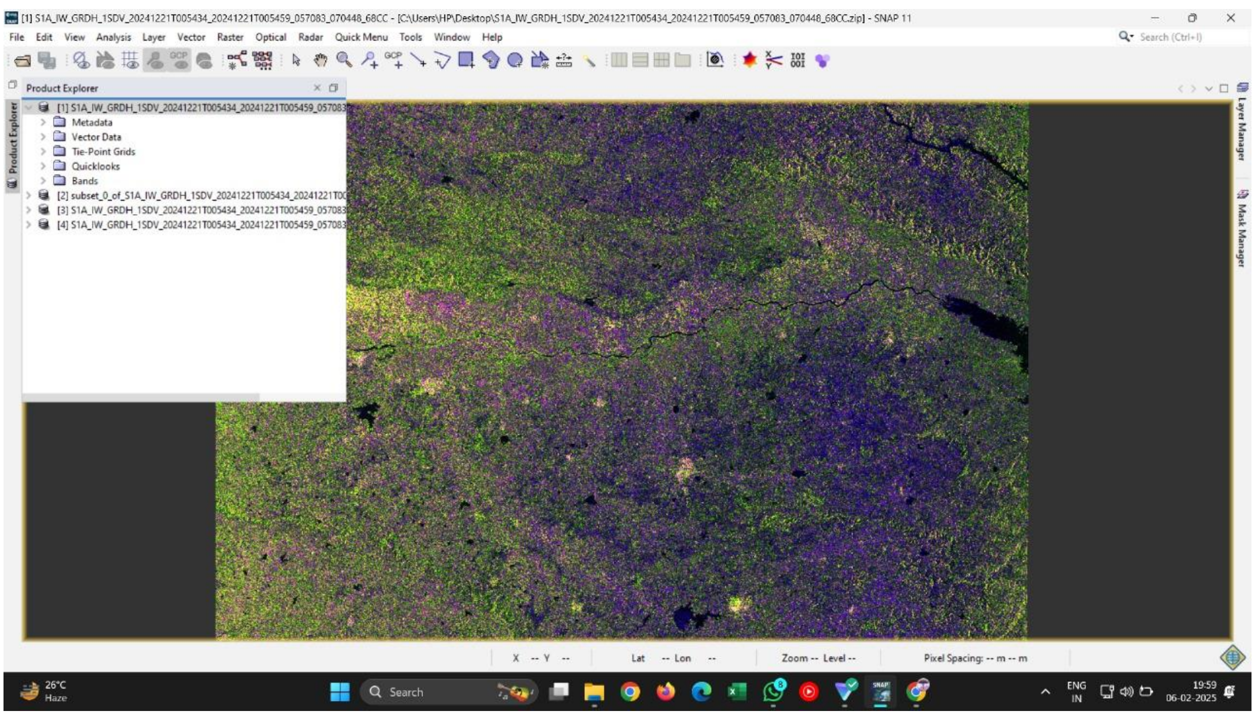
4)Next crucial step of calibration was done to perform necessary radiometric corrections and remove significant bias so that it correctly represents actual backscatter values from that position and thus can be worked for next steps as shown:



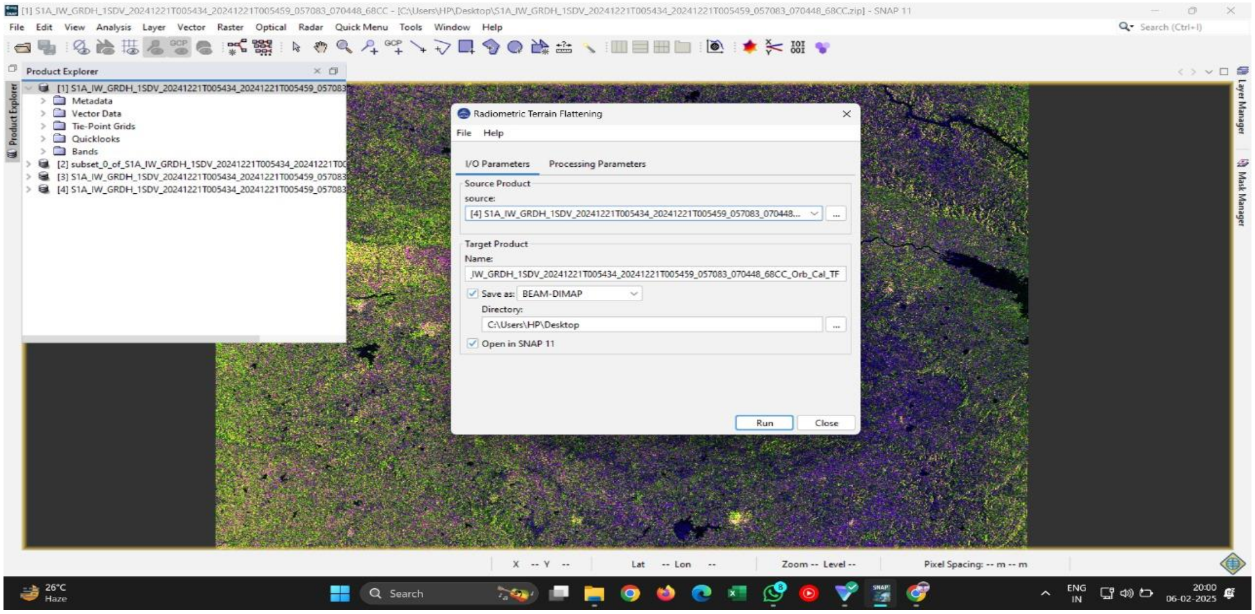
Also required preprocessing parameters was provided like beta0 band was sufficient than other bands as shown:



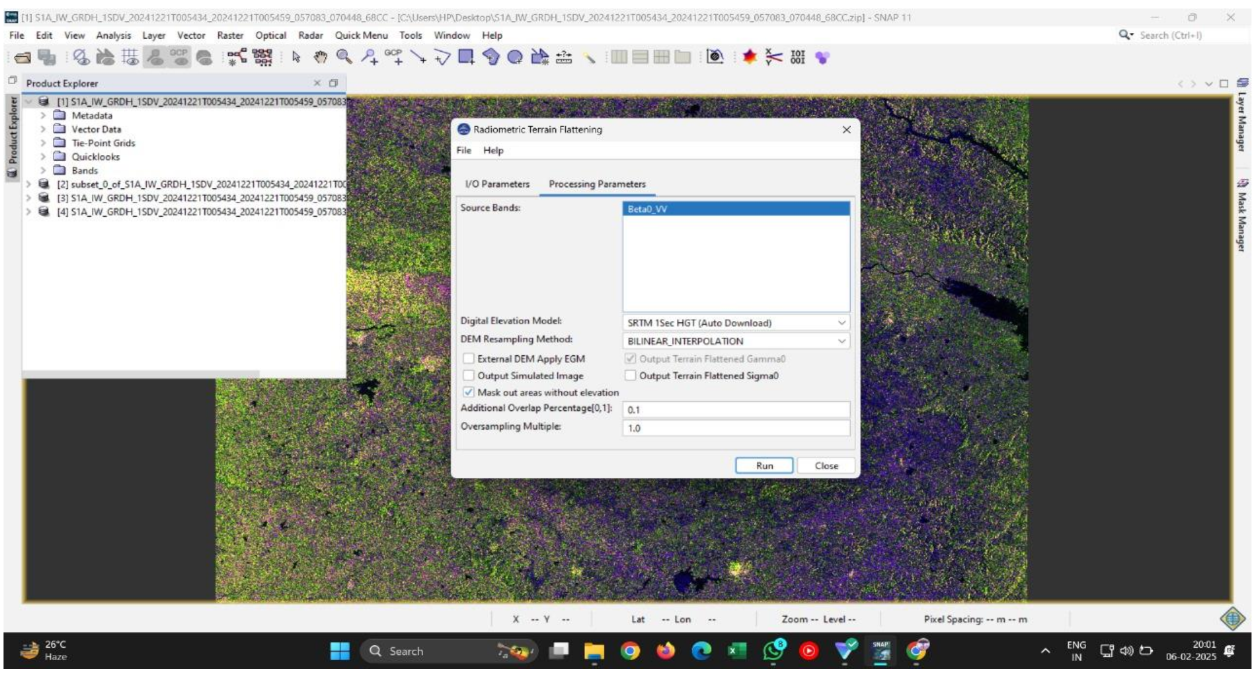
After calibration:



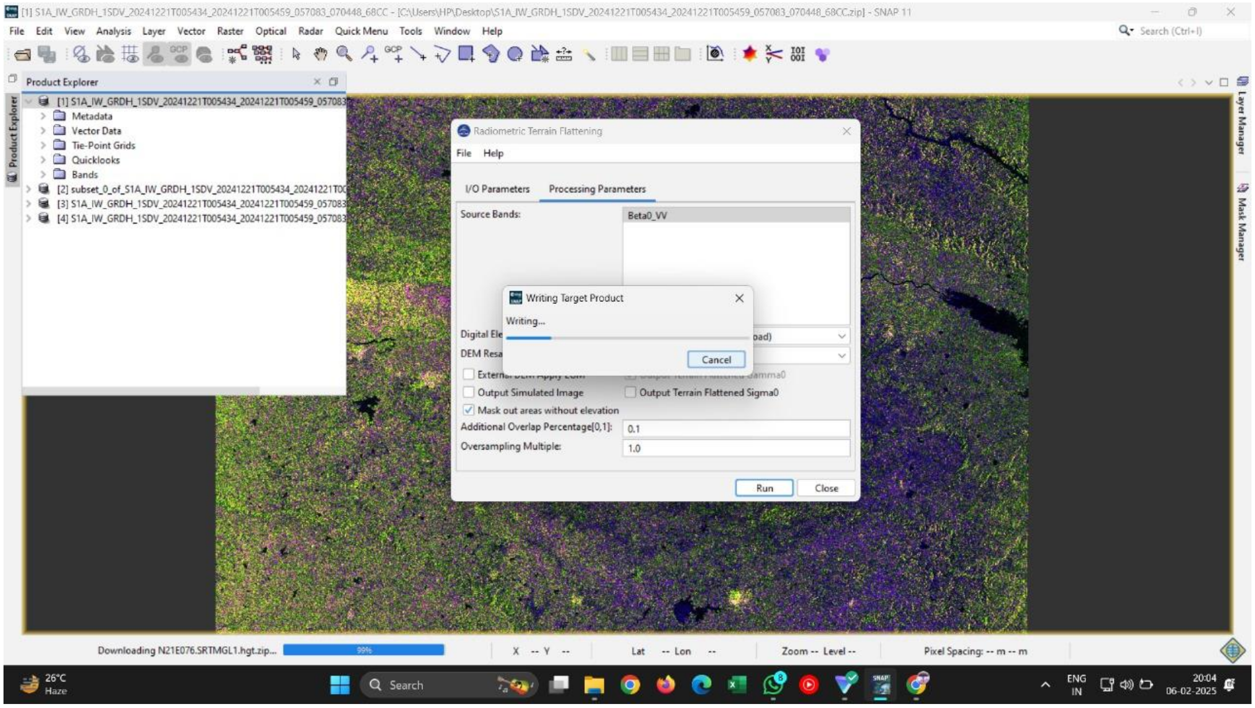
5)Now to do land cover classification, it is essential to do this following step of terrain flattening since terrain so obviously not flat which can bring variability in brightness and other parameters thus to remove this bias, we perform this step by selecting orb_cal extension result file as shown: (takes very long time as compared to previous steps)



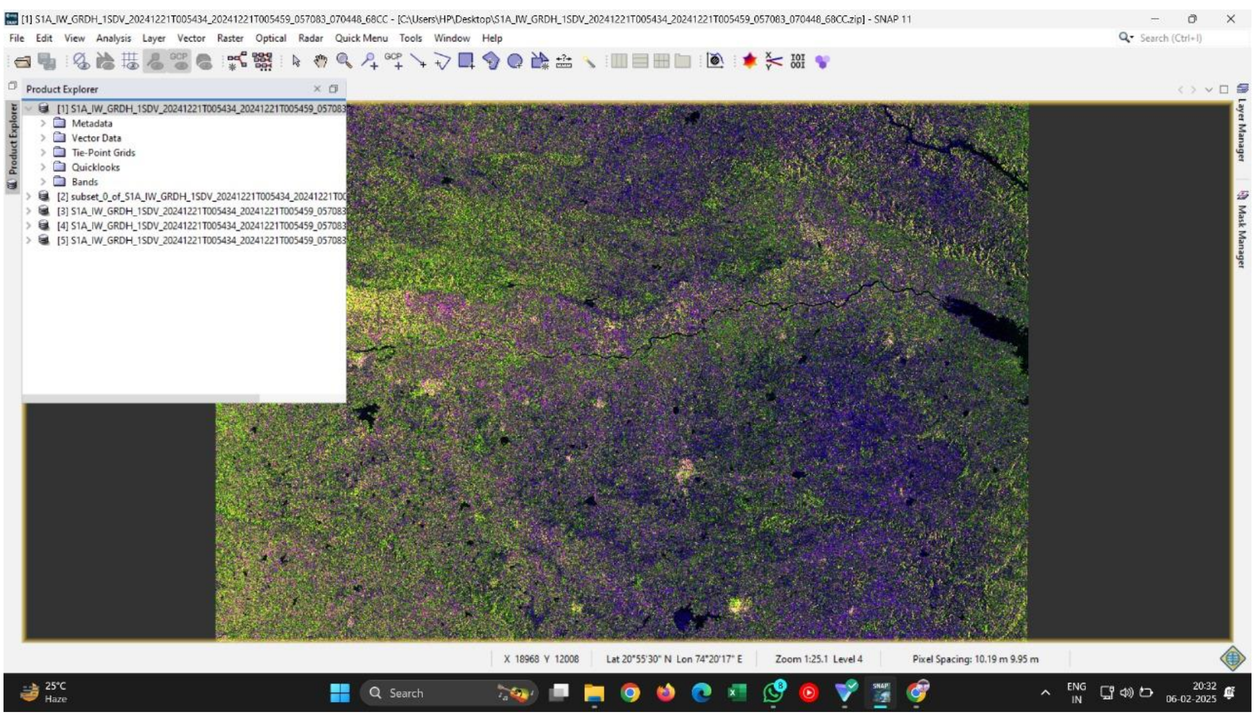
Checking digital elevation and sampling method in preprocessing parameters as shown:



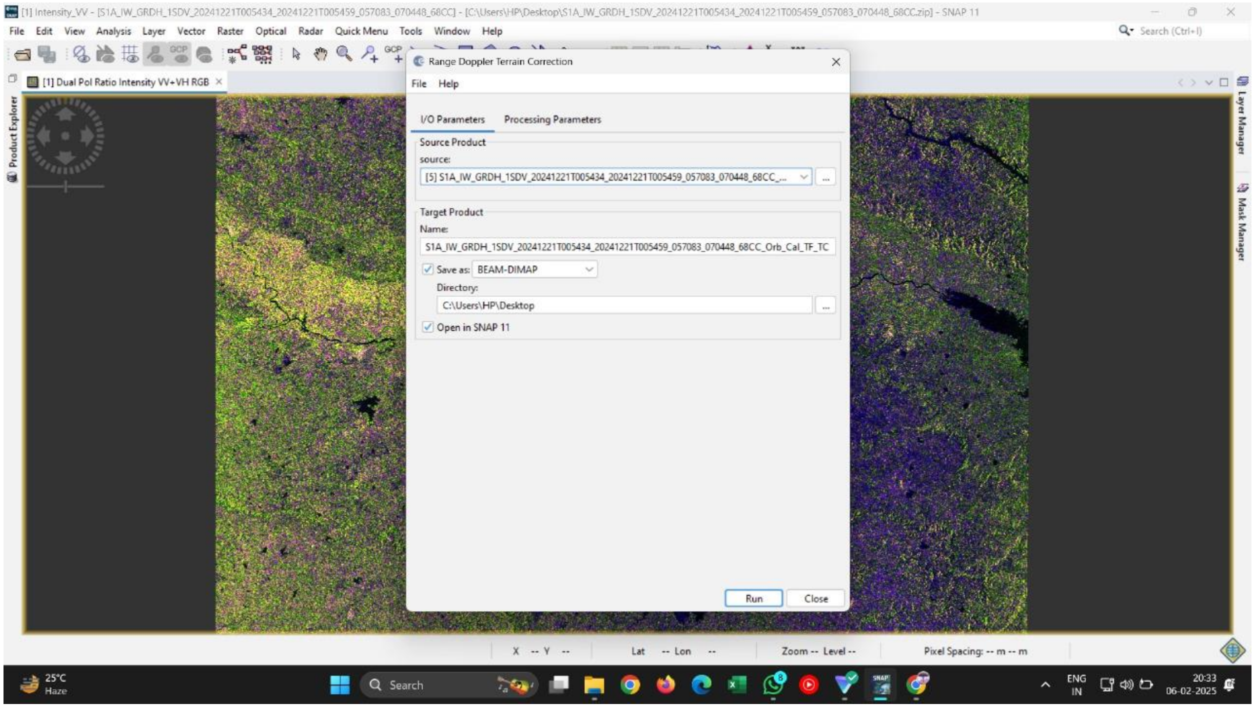
Running process of radiometric terrain flattening (rtf) :



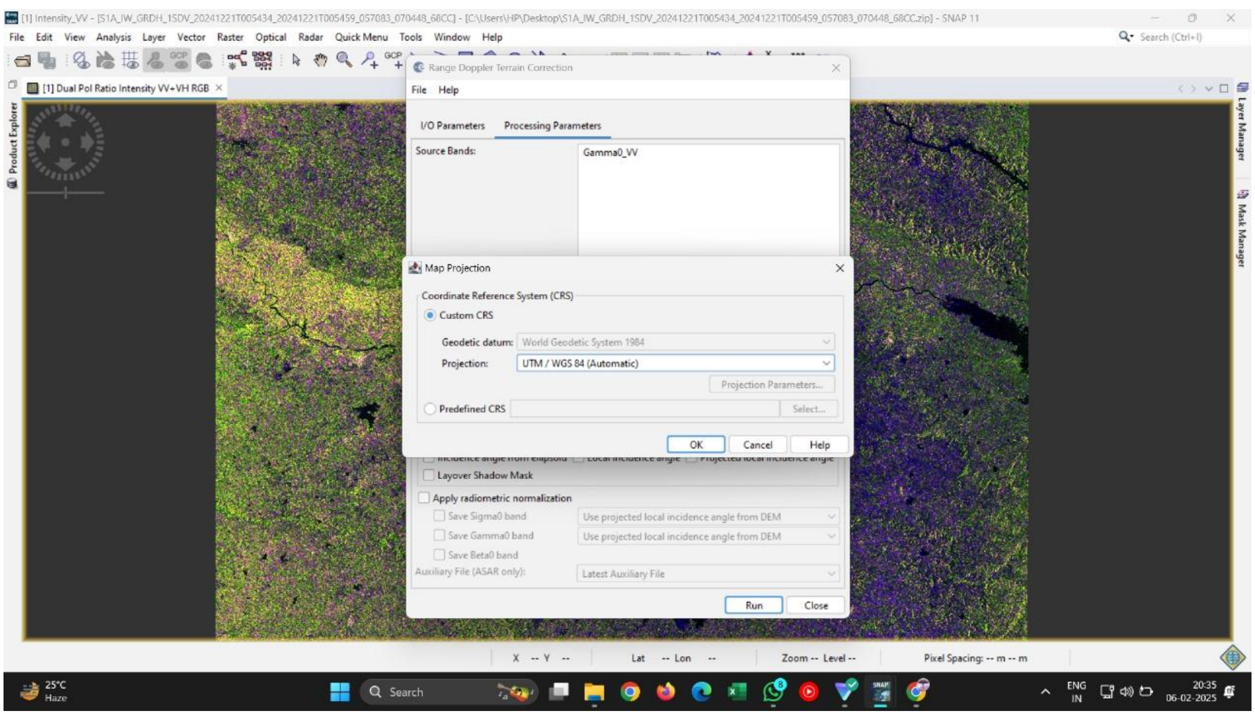
After rtf step:



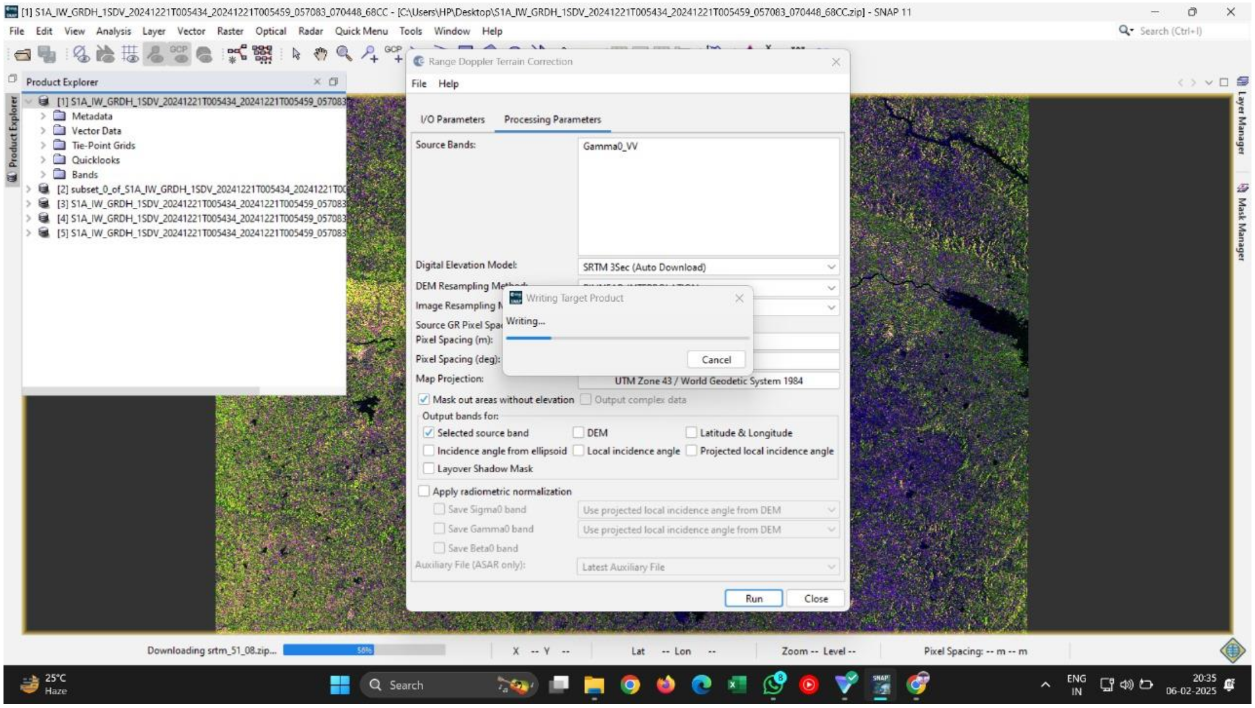
6)Now next preprocessing performed was range Dopler terrain (rdt) correction where topographical variations of a scene and the tilt of the satellite sensor, distances can be distorted, and this step compensate these distortions as shown:



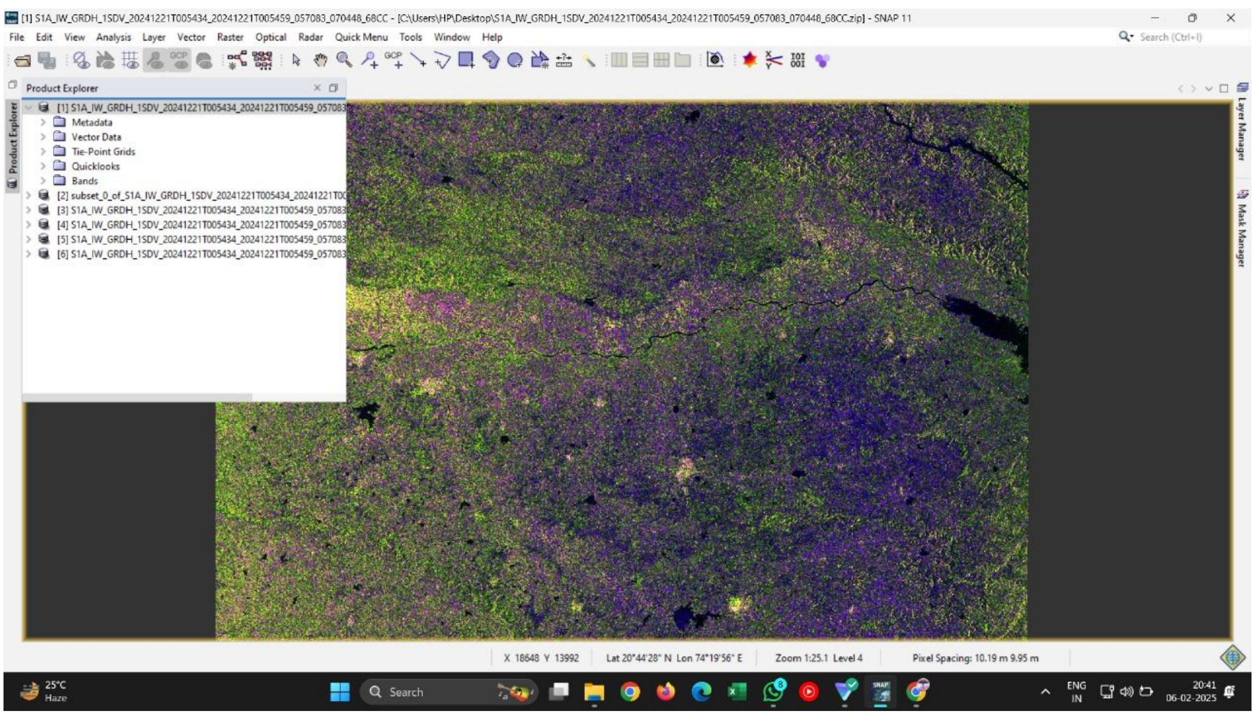
Following processing parameters to select projection as UTM/WGS 84 as shown :



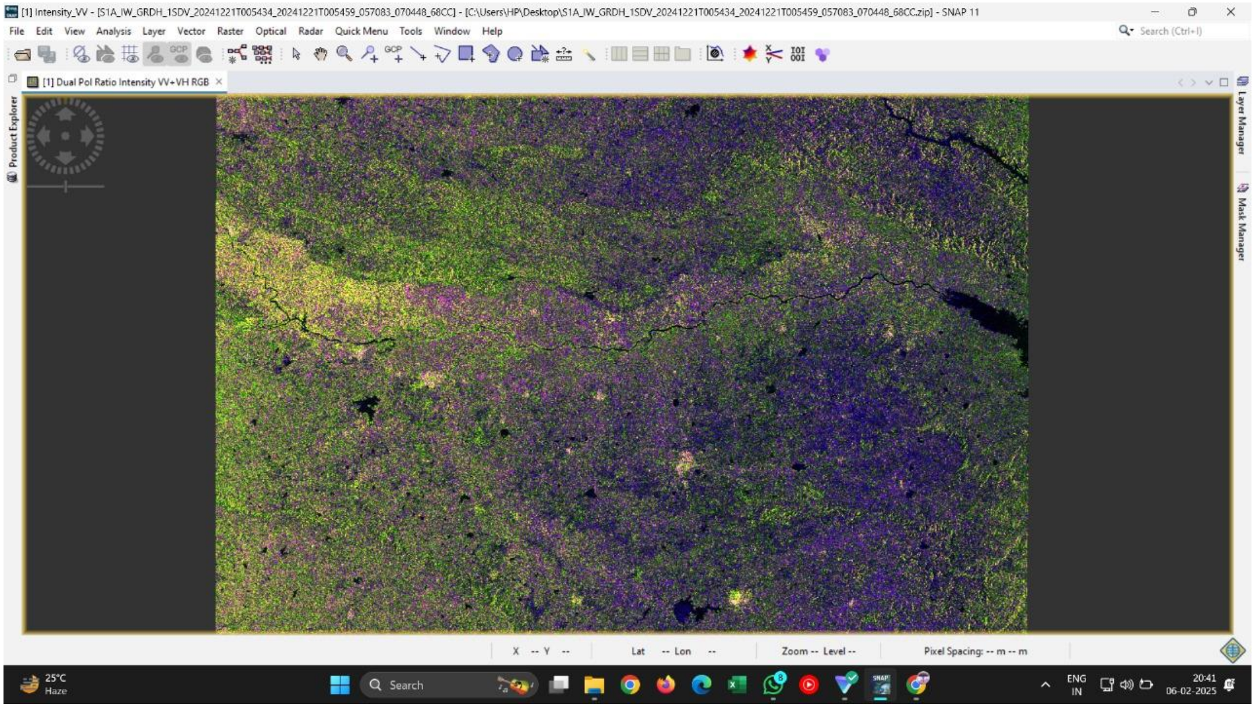
Running this rdt step:



After completion of rdt step:



Final preprocessing image:



After completing all preprocessing steps (subset creation, orbit correction, calibration, terrain flattening, and Doppler correction), the final preprocessed image was generated, ready for further analysis. The preprocessed image is now suitable for land cover classification and further scientific analyses. Preprocessing steps, especially calibration, RTF, and RDT, played a crucial role in removing biases, correcting distortions, and ensuring the imagery accurately represents the real-world surface conditions.

The variations in color indicate a diverse landscape, with greenish areas representing vegetation or agricultural fields, while darker regions may correspond to water bodies such as rivers or lakes. The presence of distinct patterns suggests both natural and human-caused structures, with potential urban or built-up areas highlighted by brighter or distinct hues. The image also reflects the spatial heterogeneity of the region, highlighting variations in surface reflectance and backscatter intensity, which could be indicative of differing land use or terrain elevations.