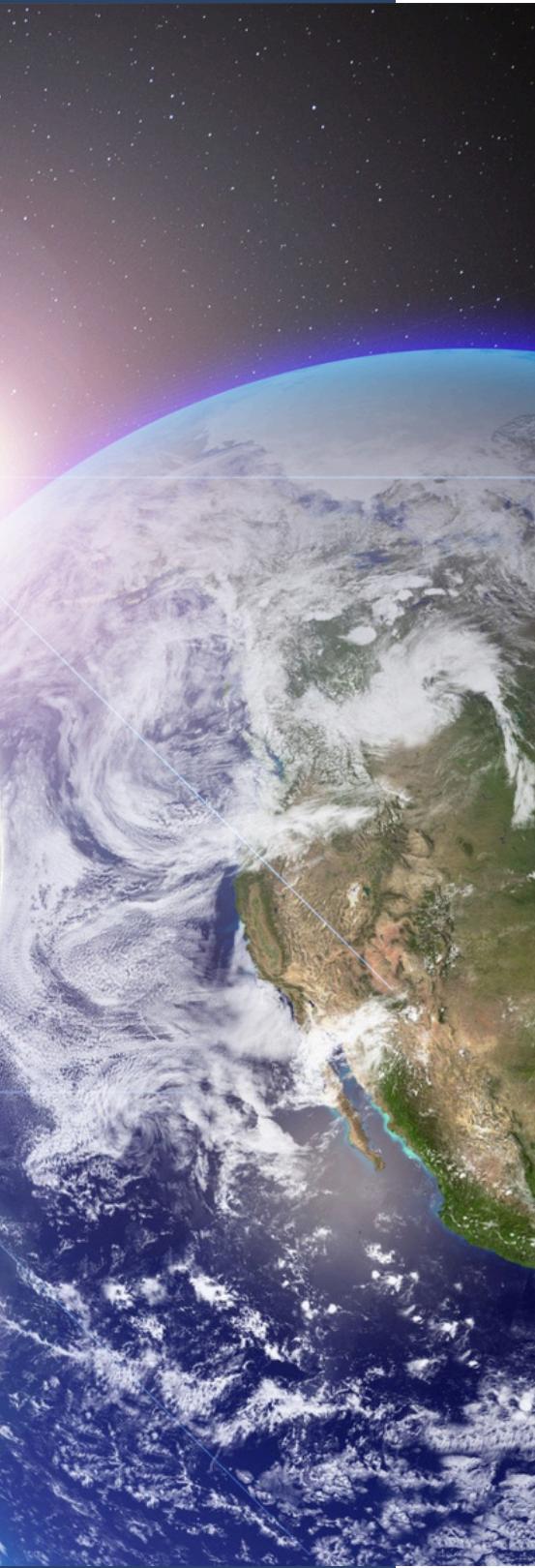


# Monitoring Vegetation Using Sentinel-1 Data: RVI Calculator

# Advantages of SAR data in vegetation monitoring

The most popular approach to monitoring vegetation involves analyzing optical data. However, this method has limitations - optical data cannot be used during high cloudiness or nighttime.

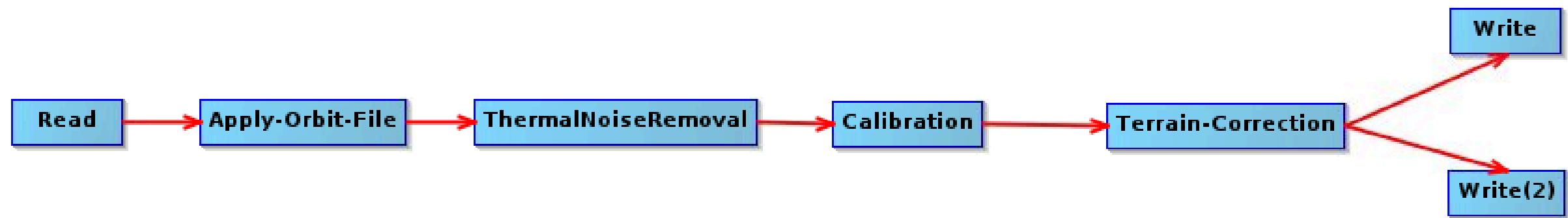
Fortunately, vegetation analysis is also possible using radar data, vegetation cover and height can be assessed by calculating the Radar Vegetation Index (RVI). Radar data overcomes issues related to cloud cover and time of day, as radar can capture data regardless of these factors.



**The project used Sentinel 1 data,  
with dual VV and VH polarization,  
from CREODIAS platform.**

- The VV polarization effective in detecting vertical structures and is less susceptible to interference from forests.
- The VH polarization is more sensitive to terrain irregularities and is useful in distinguishing different types of vegetation.

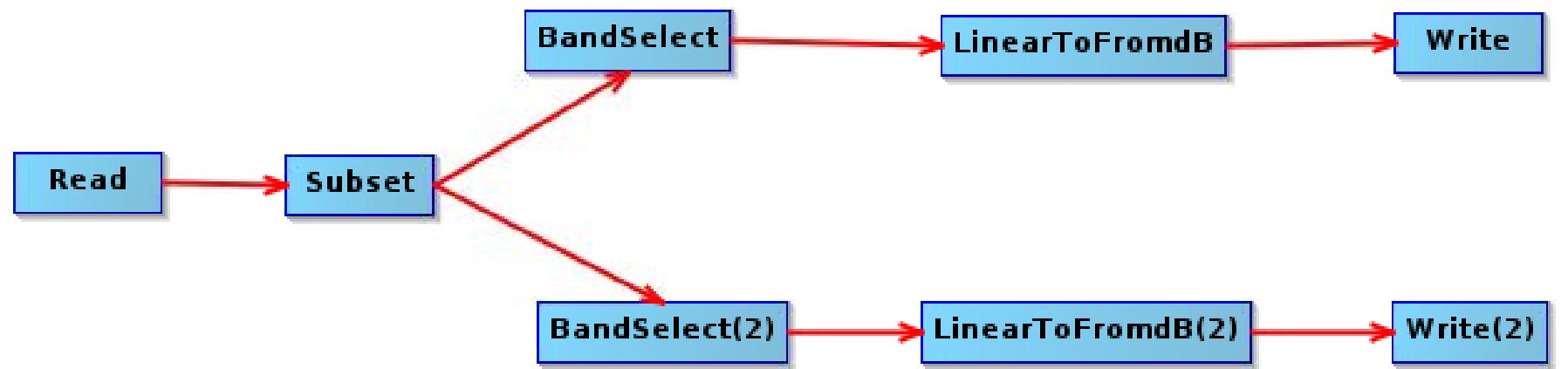
# Data preprocessing with SNAP graph



As a first step, the data were processed using the SNAP software, developed by ESA.

To improve geolocation accuracy, the "Apply Orbit File" option was used, then was eliminated thermal noise, followed by "Calibration" to reflect the measured physical quantities. After cropping the data to the area of interest, "Terrain Correction" was applied to minimize distortions caused by terrain variations.

# Data preprocessing with SNAP graph



Using the TIFF file, the coordinates in the EPSG 4326 system were converted to pixel numbers on the raster. The resulting values were used in the "Subset" option to crop the raster to the predefined area of interest. The data with VV and VH polarization was converted from linear scale to decibel scale and saved into two separate TIFF files.

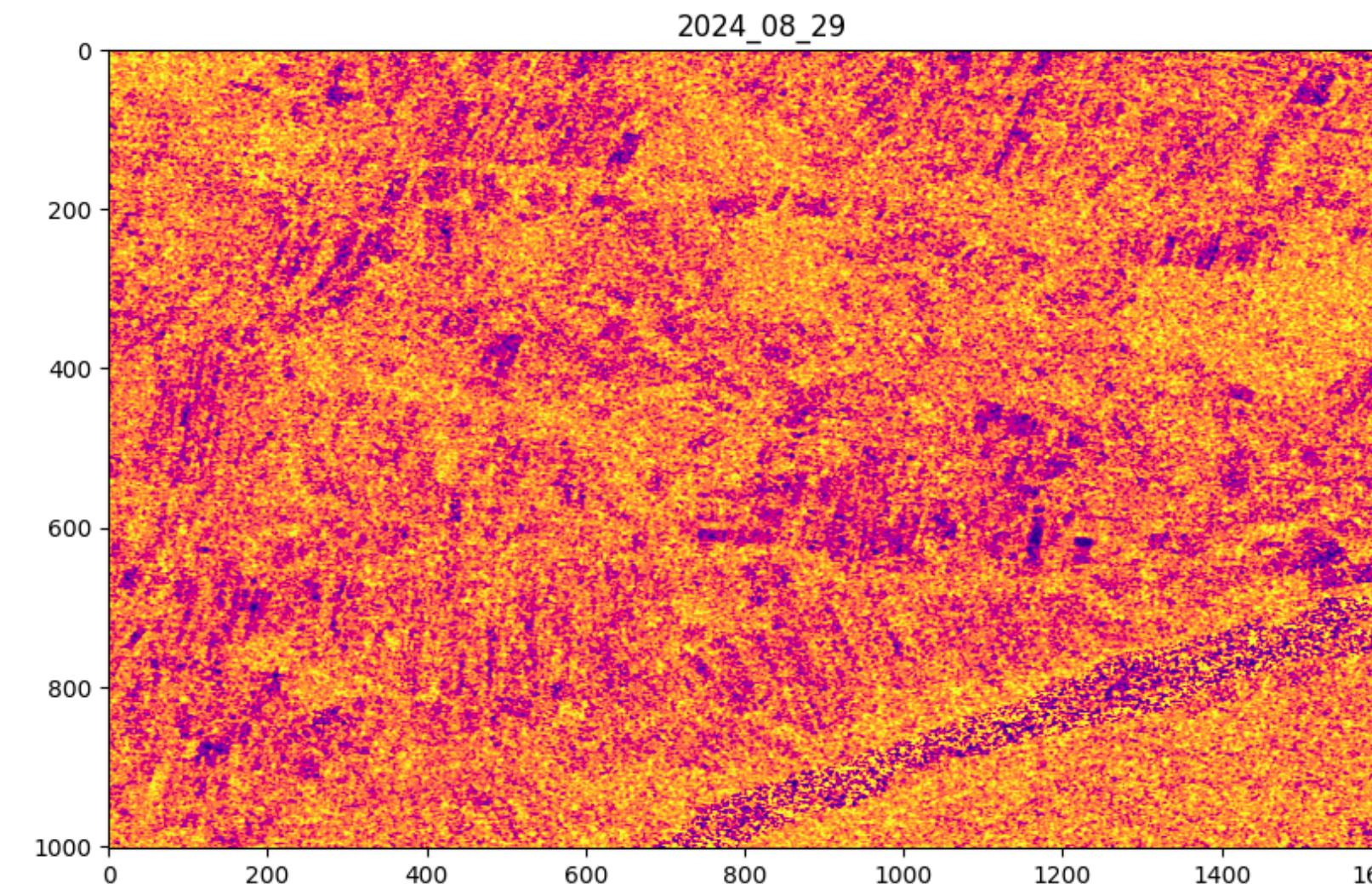
The data processing in both graphs takes approximately 7.5 minutes.

# Calculation of RVI

The RVI was calculated using the formula:

$$\text{RVI} = (4 \times \text{VH}) / (\text{VV} + \text{VH})$$

Blue areas indicate no vegetation, which could be water or harvested fields; pink areas represent low vegetation; and yellow areas represent forests.





A photograph of Earth from space, showing clouds and continents against a dark background.

Thank you