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Conservation area designation in the Andes

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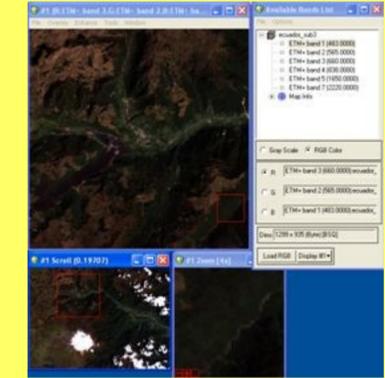
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Páramo National Park in Ecuador is known for its unique natural resources in high altitude grasslands. The ecosystems of Páramo consist mostly of rare species and are the key protected area for exceptionally high endemism. ENVI software enables to make an analysis of the area and to produce a map based on 2 criteria: **vegetation amount** and **altitude**. We need to show vegetation growing on different heights and to create 3D-Visualization of our analysis.

1. Displaying the Main Image



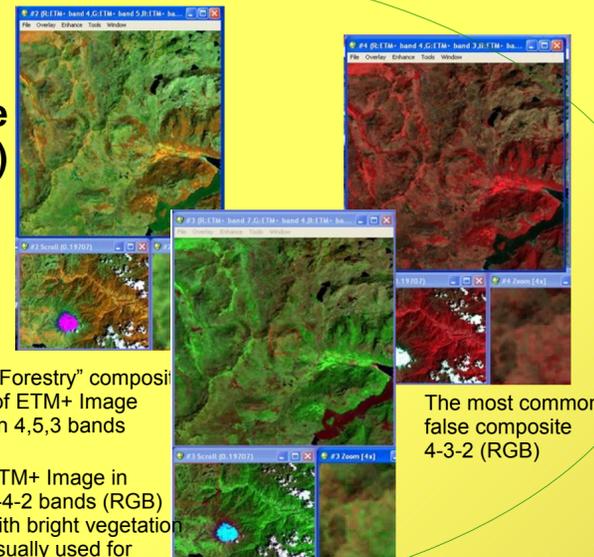
True-colour composite of the ETM+image In-bands 3,2,1 (RGB). The default contrast is bad, therefore enhancement is necessary.

2. Enhancing the Contrast of the Image (Enhance-Gaussian)



Contrast stretched ETM+image In bands 3,2,1 (RGB).

2.

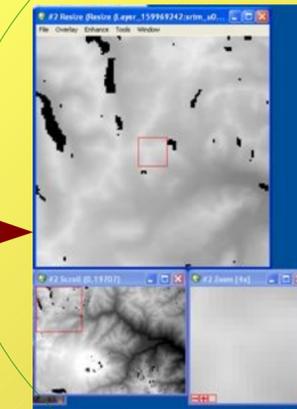


"Forestry" composite of ETM+ Image in 4,5,3 bands

ETM+ Image in 7-4-2 bands (RGB) with bright vegetation usually used for general public

The most common false composite 4-3-2 (RGB)

3. Uploading the SRTM-Data



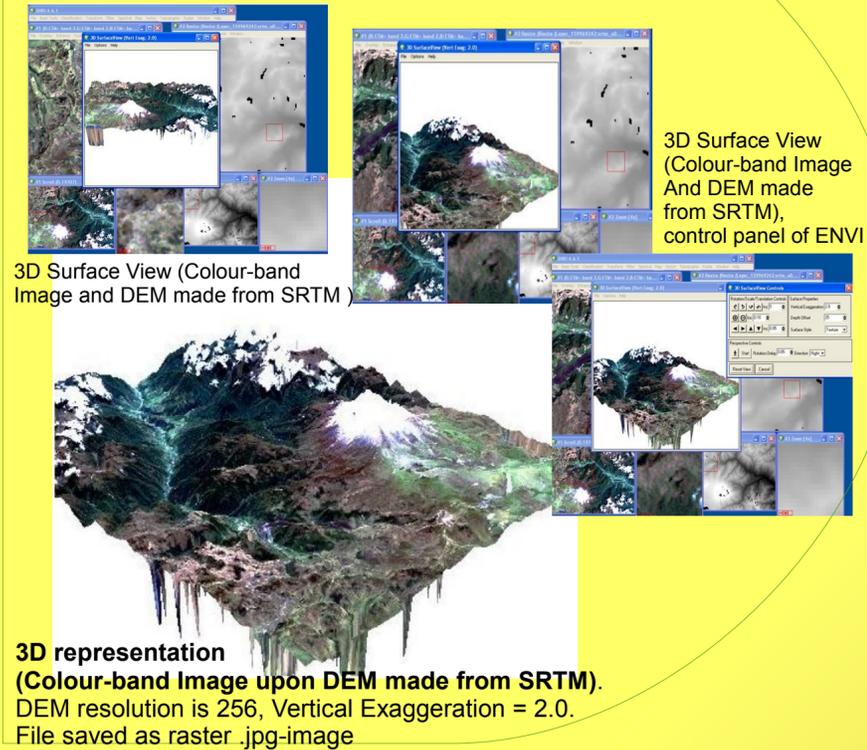
SRTM-image (Shuttle Radar Topography Mission) displayed in ENVI.

(SRTM_resamp1285) It has only 1 Band, So that we display it In grey colour.

SRTM is necessary to derive elevation model. It has .hgt format and Contains the height of terrain in meters.

4. 3 D-Visualising the Landscape

3D Surface View (Colour-band Image upon DEM made from SRTM), other point of 3D – view, manipulated by the mouse and moving around the screen.

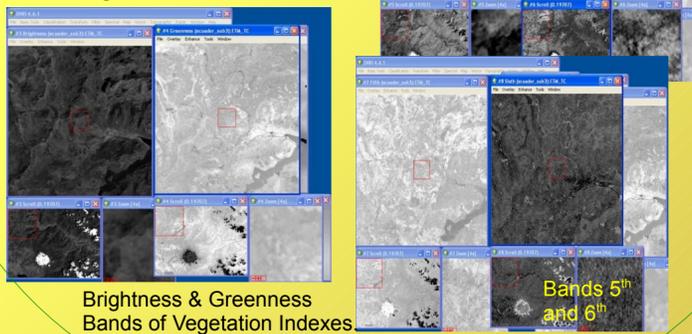


3D Surface View (Colour-band Image And DEM made from SRTM), control panel of ENVI

3D representation (Colour-band Image upon DEM made from SRTM). DEM resolution is 256, Vertical Exaggeration = 2.0. File saved as raster .jpg-image

5. Calculating the Greenness Index

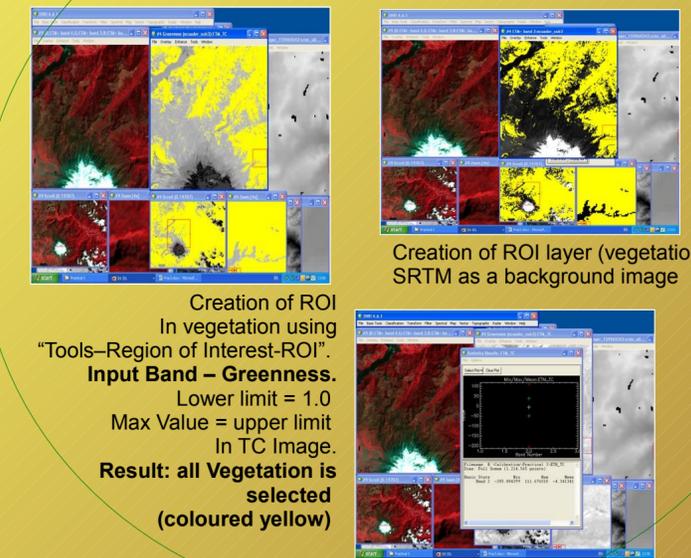
Creating the Greenness Indexes Is necessary for classification the different vegetation communities ("Transform – Tasseled Cap" ENVI) Each of the TC Bands is represented in grey scale. ETM_TC file. Right: Wetness and 4th Band.



Brightness & Greenness Bands of Vegetation Indexes
 TC Greenness Index gives us a value of zero greenness – no vegetation ! We use it for creating ROI

5.

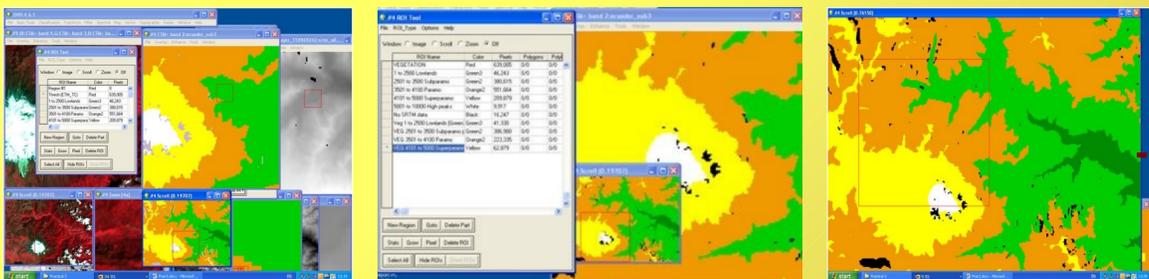
6. Creation the Vegetation Layer ROI – Region of Interest



Creation of ROI In vegetation using "Tools-Region of Interest-ROI".
Input Band – Greenness.
 Lower limit = 1.0
 Max Value = upper limit In TC Image.
Result: all Vegetation is selected (coloured yellow)

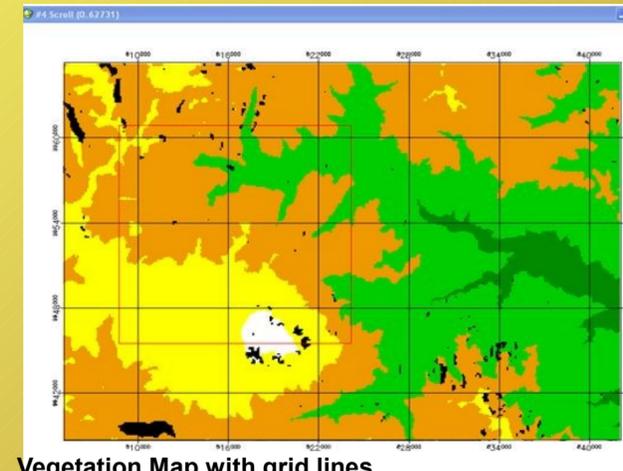
Computation of Statistics (vegetation)

7. Creation the Altitude Layer



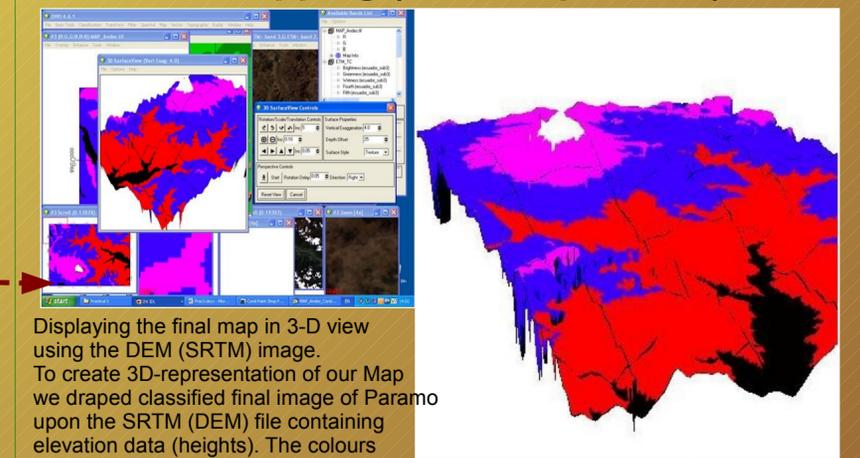
Creating the Altitude Zones using "Intersect Regions" for the each pair of ROIs. Final altitude zones that we interested in are: **Lowland Vegetation (1-2500m), Subparamo Vegetation (2501-3500), Paramo Vegetation (3501-4100) and Superparamo Vegetation (4101 – 5000)**. All these zones are shown on the map in different colours (yellow, beige, two greens)

8. Mapping and Design



Vegetation Map with grid lines.
 We finally added Geographic coordinate system representing a Grid Line on the Map. Map saved as Geo-TIFF.

9. 3D-Mapping (Final Map + DEM)



Displaying the final map in 3-D view using the DEM (SRTM) image. To create 3D-representation of our Map we draped classified final image of Paramo upon the SRTM (DEM) file containing elevation data (heights). The colours were changed by ENVI due to TIFF- conversion

3D-Representation of the Classified Image