Climate Detectives 23-24

Tracciare la biodiversità con i dati satellitari ? Uno studio possibile

Tracking biodiversity with satellite data? A possible study

Identify the local environmental/climate problem you want to investigate *

The agricultural landscape of "Conca di Nola" the name of the area of our country, due to the presence of particular pedoclimatic conditions, is made up of hilly micro-units with a priceless heritage of native genetic resources, the result of the long selection work carried out by man over the of the centuries. This biodiversity must be protected in order to avoid the risk that, over time, many of these resources will be lost due to erosion processes and climatic change. The students work on the problem of ongoing loss of biodiversity, genetics and geography. The analysis will performed by use of satellite data and their correlation with the data collected in outdoor experience

Project topic *

Flora and fauna

Research question *

Connecting Earth Observation to High-Throughpu Biodiversity Data a possibile study?

Describe how you plan to investigate the problem identified and which data you plan to analyse.

The student will work in the first phase to collect data to characterise the fruit species in our territory. Our land presents itself as one of the richest regions in vegetation and fruit trees the climate is temperate, with summer periods of drought and rainy winters, but in the last year, the climatic changes have modified this situation. The students collect data from outdoor education practices. In the great areas, they will observe the status of plants and trees. After this data will correlate with the date of the Eo observation, in particular, the student will observe the colour of the leaves and the percentage of water, the soil of the surrounding plain is remarkably fertile, with mineral elements. Finally, they will be made a laboratory experience to add information on species present the same samples could track population-genetic diversity. This work will be used to monitoring of environmental drivers that are visible to EO and on our area of Pomigliano d'Arco and helps link biodiversity to ecosystem functions and services by the municipality to valorize the land and our area.

Submission

Summary of the project

In this project, the students analyse multispectral images to map the land surface of "*Regi Lagni area*" a vast surface area (equal to approximately 1300 km2), in particular, our study is related to Pomigliano d'Arco city crossed by the riverbed/canal of "Santo Spirito" it rises to the left of the *Regi Lagni* stream in the heart of the Campania valley.   These areas are characterized by the presence of dark, deep, well-drained, permeable, easily workable volcanic soils Figure 1

Limestone soils have a medium to moderately fine texture, with moderate drainage, and the water table which can also become very superficial during the humid season. through its colour changing the students monitoring changes of the biodiversity that are associated with the environment and climate of our territory. The study was performed by comparing the observed multispectral images to the real vegetation present in one of the most important our urban green areas named "*Parco delle acque*" .The comparison shows a change in biodiversity in particular through a change of shades of green respecting the image and photos pin last years in the same period. The students   engage that the monitoring of the colours of areas is essential to identify problems connected to climate change and to monitor changes in biodiversity of specific territory

Figure 1 (this morphologic characteristic of soil of Campania plain)

Main results

The students start the study with downloading and analysis the multispectral images related to a range time period by december 2022 to december 2023 The analisys was performed collecting data on the trend of the vegetation reflectance curve which is regulated at different wavelengths by the content and type of leaf pigments, the internal structure of the leaf and the water content. The students observed a changing in colour of elements which determine the characteristic behavior of vegetation in the visible bands (they absorb in blue and red and reflect in green) and in the near and medium infrared. As shown in Figure 2 the normalized difference vegetation index (NDVI) changing from 18 march 2023 to 14 february 2024 there are a variation in the number of green pixel. The students calculate the value of reflectance as this formula $NDVI = NIR-Red/NIR+Red$ It is a measure of the state of vegetation health based on how plants reflect light at certain wavelengths. The value range of the NDVI is -1 to 1. Negative values of NDVI (values approaching -1) correspond to water. Values close to zero (-0.1to 0.1) generally correspond to barren areas of rock, sand, or snow. Low, positive values represent shrub and grassland (approximately 0.2 to 0.4), while high values indicate temperate and tropical rainforests (values approaching 1). The higher the value, the greater the vigor of the vegetation. Figure 3. In conclusion, the students observed a variation in the NDVI and in the shades of green in the same study area which demonstrates a change in the plant. species. .

Figure 2: the study performed by students on NDVI a of the same area in different period of the year
Figure 3: Reflectance variation of the same area of intrest

Action to help

The students understand through this study the importance of monitoring biodiversity in our territory and they emphasize the role in sustaining ecosystem services, such as producing clean water and food; regulating and adapting to climate change; supporting nutrient cycles, maintaining health, and many other social and cultural benefits, are well known by the students. By the use of experimental activity the students elaborate a specific project in which satellite data are correlated to real data obtained in the laboratory of our school. The idea is to create a laboratory protocol for the evaluation the protection and safeguarding of the our green urban area *"Parco delle Acque"* The e specific behaviour for each of the following factors: leaf pigments, clorophyll, which constitutes approximately 65% of the pigments, the pigments and the epidermis reaching the parenchyma and mesophyll can give direct information on the state which being more or less developed depending on the state of health of the plant, the specific variety and species and correlating to the satellite.. The study was performed with experimental activity known as Chromatografy : from a leaf, 10 disks of known diameter are obtained (corresponding to approximately 0.5 g in weight milled) and the total surface area and their fresh weight is calculated. Next the discs come placed in a previously pre-cooled mortar and, after adding liquid nitrogen or quartz crystals, the material is reduced to a very fine powder with the pestle. At the end of our separation we will observe the following situation The identification of a compound can be made based on the distance travelled related to it of the front, i.e. calculating the RF value. RF = Start-band distance/ Start-front distance The evaluation will performed with of extraction leaf pigments and chlorophyll and correlated them with the data with the multispectral image.