Primary productivity in the Sahel region

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→ THE EUROPEAN SPACE AGENCY

Scientific Background and Objectives

Title:

- The main goal of the project is to create a workflow for forecasting primary productivity and its determining climatic factors using remote sensing in the eastern Sahel region

Background:

- Mapping and monitoring the primary productivity in the Sahel region is crucial because the agriculture sector usually depends on the physical environment (mainly on soils), and on the variability and distribution of rainfall. The soils are generally well-drained and have a thin layer of organic matter, which can support limited cultivation and agricultural production. Evaluating the water retention and storage of the soil is an important issue.

Objectives:

- Understanding the spatiotemporal variation in primary productivity and its determining climatic factors can play a key role in promoting socio-political stability and protecting and restoring ecosystem services, to assist decision-makers, and farmers. Given the broad spatial coverage of the eastern Sahel, remote sensing and earth observation techniques have a great potential to forecast climate data and primary productivity in an objective and reliable manner.

Study Area

- The Sahel-region is situated on the south part of the Sahara, it is often called the shore of the desert

- The region covers about 3.1 million km2 of land, with 407.4 million people.

- The annual rainfall pattern occurs between 100-600mm

- Temperatures range from 32° to 35° from April to July

- Despite the rainfall variability the agriculture and livestock are the primary sources of livelihood for 80–90 % of the population of the Sahel region

Research Outline

Data sources

- data with a long-term record are preferred for the project

- Remote sensing data, precipitation, soil information (soilgrid, global lithology map, FAO soil info, GLOSIS by GSP)

Data	Sensor / data portal	Temporal range
Soil moisture	Multiple microwave sensors; (http://www.esa-soilmoisture-cci.org)	1978 – 2021
Land Surface Temperature	Sentinel-3 SLSTR; (https://sentinels.copernicus.eu/web/sentinel/missions/sentinel-3/data-products/slstr)	2016 – 2021
Primary productivity	Vegetation Indices derived from Sentinel-2; (https://sentinel.esa.int/web/sentinel/sentinel-data-access)	2015 – 2021
Precipitation	CHIRPS; (https://www.chc.ucsb.edu/data/chirps)	1981 – 2021

Analysis workflow
- Different open software will be explored, such as R, Python and Google Earth Engine

Expected outputs
- The primary productivity maps as the main output of the project will be useful infromation for most African users when working with EO data

- Government officials responsible for such activities as the environment, agriculture and animal husbandry will directly benefit from the outputs of this project

- The up-to-date data on the dynamics of productivity will promote sustainable agriculture and therefore achieving the SDGs with respect to ending hunger and reducing conflicts

Project Team

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