THE CHALLENGE OF IRRIGATION MANAGEMENT IN CYPRUS USING COPERNICUS

Copernicus can contribute to the rational management of the limited available water resources and assist farmers and stakeholders.

The challenge

Climate scenarios for the Eastern Mediterranean, based on large-scale climate models, predict further aridification and increasing variability of regional precipitation. One of the most important challenges in the Eastern Mediterranean region is the adaptation to climate change in the water sector linked to water stress and water scarcity. According to the European Environment Agency, the problem of irrigation in Europe is mostly concentrated along the region of the Mediterranean where some countries use more than 80% of total freshwater abstraction for agricultural purposes. The need for water management at regional level, combined with the development and use of technological tools, can contribute to the rational management of the limited available water resources.

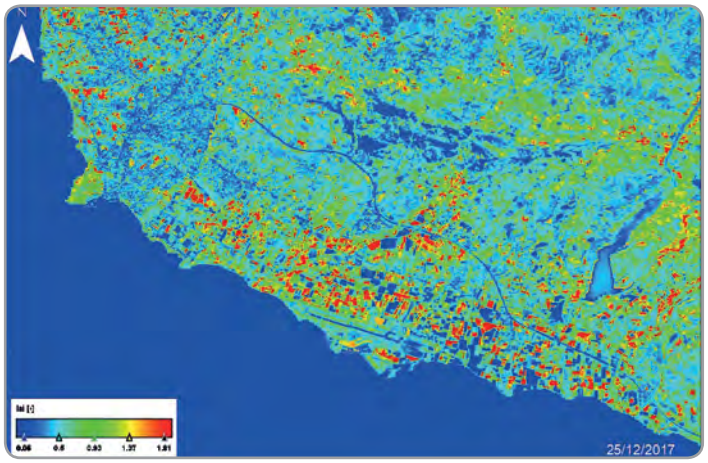
The space based solution

A novel method for estimating crop evapotranspiration (ETc) on a systematic basis using remote sensing techniques has been established by the ERATOSTHENES Research Centre (ERC). To reach this goal, ground truth data consisting of meteorological and remotely sensed data, modelling techniques and energy balance algorithms were employed and combined. Spectral signatures of selected local crop types were acquired during each of the phenological stages. Subsequently, semi-empirical models were developed regarding crop canopy factors of each crop, following its phenological stages. Vegetation Indices were created from spectroradiometric measurements during crops' phenological stages. These indices were used to describe the crop canopy factors, namely, Leaf Area Index (LAI) and Crop Height (CH). The developed semi-empirical models were found to yield strong correlation coefficients.

The models were evaluated with very satisfactory results. The models were finally used to modify the algorithms decided to be adopted in this project, namely, SEBAL and Penman-Monteith, adapted to satellite data. When employing the semi-empirical models for modifying the two algorithms, the results were even more accurate and without any significant difference (Papadavid et al., 2013). Maps of crop evapotranspiration were created from the satellite images and the corresponding values were retrieved using Landsat-5 TM and Landsat-7 ETM+ images. Based on existing knowledge, researchers from the ERC, are working on adapting the existing methodology to retrieve ETc values using Sentinel-2 data.

Benefits to Citizens

The retrieved information can be distributed to agricultural producers, water management authorities, and other end-users, for more cost-effective farming. Furthermore, data products provide visual mapping and time-series information allowing end-users to obtain information on spatial and temporal patterns of crop canopy development and water requirements which can offer benefits to water resource management and strategies on water allocation priorities.



Map of Leaf Area Index (LAI) using Sentinel-2 satellite image for the area of Pafos in Cyprus.

Credit: Contains modified Copernicus Sentinel data [2018]

Thematic Area: AGRICULTURE, FOOD, FORESTRY AND FISHERIES

Region of Application: CYPRUS

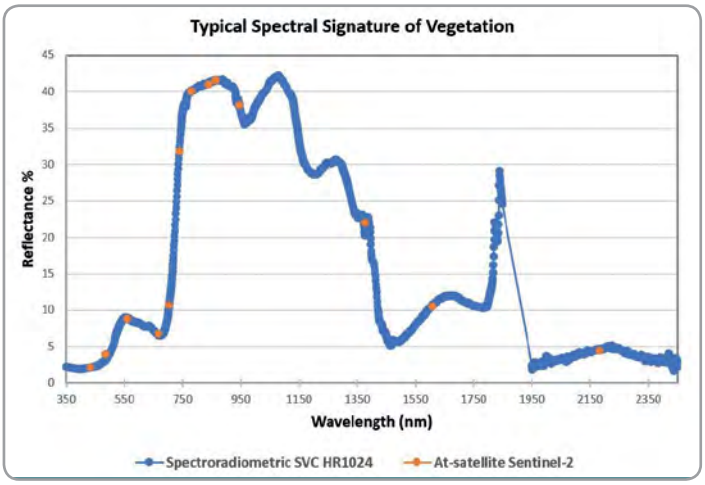
Sentinel mission used: S2

Copernicus Service used: –

Usage Maturity Level: 1

Outlook to the future

In the near future, the major goal is to be able to provide potential end-users and stakeholders (farmers and water managers) with accurate estimations of crop irrigation needs through the estimation of evapotranspiration by combining Landsat-OLI, Sentinel-2 and Sentinel-3 data. This can increase the temporal and spatial resolution of the available data and provide information on a systematic basis with high frequency and accuracy. The Copernicus Programme through its Sentinel missions can provide freely available satellite data with high spatial and temporal resolution which can be used to support the effective use of water resources for irrigation purposes. The EXCELSIOR project envisions upgrading the existing ERC into a Centre of Excellence (ECoE) for creating an inspiring environment for conducting basic and applied research and innovation through the integrated use of remote sensing and space-based techniques for monitoring the environment. One of the priorities of the ECoE is to provide a comprehensive solution to farmers through the development of smart irrigation systems.



Spectral signature of vegetation presenting the reflectance values using both field spectroradiometric measurements and at-satellite reflectance for Sentinel-2.

> "The EXCELSIOR project envisions the establishment of a Centre of Excellence in Earth Observation and Remote Sensing in the Eastern Mediterranean."
>
> ***Professor Diofantos G. Hadjimitsis EXCELSIOR Project Coordinator***

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ABOUT COPERNICUS4REGIONS

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The model cases focus on local and regional authorities who successfully applied Copernicus data in 8 major public policy domains.
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