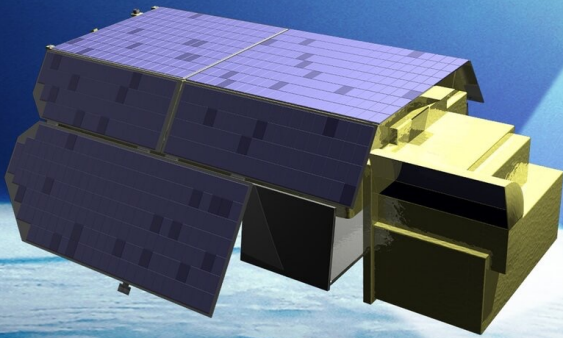


November 2023

# How can TRUTHS help with food, agriculture & water



ESA, 2023

## The Challenge

In 2022, about 9.2% of the world's population was facing chronic hunger, equivalent to about 735 million people<sup>[1]</sup>.

In 2022, Europe experienced its hottest summer, and consequently 327,000 km<sup>2</sup> (ca 22%) of croplands were affected by drought conditions, contributing towards crop failures<sup>[2]</sup>.

As global temperatures continue to increase, warmer and drier winter months further reduce river levels and the levels of water storage in reservoirs across Europe.



Figure 1: La Viñuela reservoir, Spain (Image: © EU, 2022)

## How remote sensing from satellites can help

The Fraction of Absorbed Photosynthetically Active Radiation (fAPAR) represents the amount of incoming solar radiation that is absorbed by land vegetation for photosynthesis. It is measured from space by comparing the amount of reflected sunlight in different spectral bands (colours).

*Continuous time-series of satellite observations underpin drought monitoring programmes*

fAPAR anomalies are a reliable variable for detecting and assessing drought impacts on crop canopies<sup>[3]</sup>. The European Drought Observatory uses spatial patterns of satellite fAPAR anomalies to detect vegetated areas affected by drought in its combined drought indicator<sup>[4]</sup>.

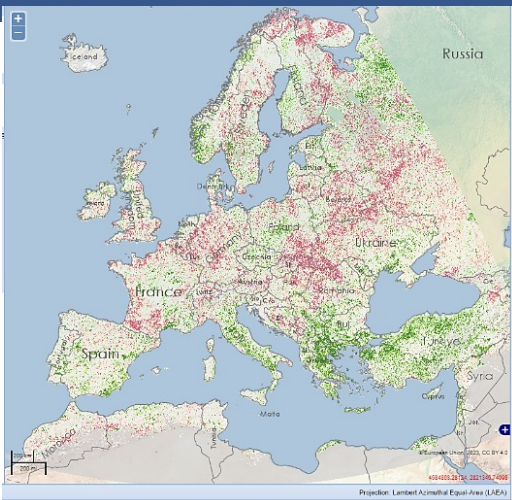


Figure 2: fAPAR anomaly for September 2022. [Map source.](#)



Figure 3: Utilising UAVs for validation of surface reflectance satellite products.



Figure 4: PAR sensors deployed for validation of fAPAR satellite products.

## How TRUTHs will be able to help

The Traceable Radiometry Underpinning Terrestrial- & Helio- Studies (TRUTHS) climate focused satellite mission, will help to facilitate an improved understanding of changes in the Earth's climate<sup>[6]</sup>. Including measurements of the Earth's spectral reflectance and fAPAR with unprecedented accuracy.

fAPAR anomalies are dependent on having a long-term consistent time-series of satellite observations. TRUTHS will enable the harmonisation of products from multiple satellites leading to a time-series which exceeds the length of individual missions.

## What are we doing now?

The National Physical Laboratory (NPL) is involved in the validation of satellite surface reflectance and biophysical products for the European Space Agency (ESA).

As the UK's National Metrology Institute (NMI), NPL has been leading efforts to develop best practises 'standards' for measurements and international consistency through comparisons of measurement techniques and ensuring that they are. SI traceable<sup>[7]</sup>.

## Bibliography

- [1] United Nations, "The Sustainable Development Goals Report," 2023.
- [2] European Environment Agency, "Drought impact on ecosystems in Europe," 2023. [[Online](#)].
- [3] N. Gobron, B. Pinty, F. Mélin, M. Taberner, M. Verstraete, A. Belward, T. Lavergne and J.-L. Widowski, "The state of vegetation in Europe following the 2003 drought," *International Journal of Remote Sensing*, vol. 26, no. 9, pp. 2013-2020, 2005.
- [4] European Drought Observatory, "Combined Drought Indicator," [[Online](#)].
- [5] European Drought Observatory, "FAPAR Anomaly," [[Online](#)].
- [6] National Physical Laboratory, "TRUTHS: A climate and calibration satellite mission," [[Online](#)].
- [7] L. Brown, F. Camacho, V. García-Santos, N. Origo, B. Fuster, H. Morris, J. Pastor-Guzman, J. Sánchez-Zapero, R. Morrone, J. Ryder, J. Nightingale, V. Boccia and J. Dash, "Fiducial reference measurements for vegetation bio-geophysical variables: an end-to-end uncertainty evaluation framework," *Remote Sensing*, vol. 13, no. 16, 2021.

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