

German Remote Sensing Data Center (DFD)

Remote sensing based water stress dynamics monitoring and drought impact prediction

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MOTIVATION

Climate change with rising temperatures and altered precipitation patterns is expected to increase the frequency and severity of droughts, especially in southern Europe. Reliable water stress information and drought prediction is required to assist in anticipating and managing drought impacts. Therefore, within the EU Horizon project NOSTRADAMUS (Data Cube and Copernicus Data for Food Security and European Independence), a drought monitoring and early warning system is being developed.

APPROACH

Near-real time Earth Observation data and derived products are utilized to deliver a regular monitoring of water stress dynamics and drought conditions. The application is based on anomaly detection and a Combined Drought Indicator (CDI) approach (Figure 1). Short- to medium-range weather forecast (precipitation, temperature) from the ECMWF real-time forecast are being incorporated to support the prediction of drought evolution.

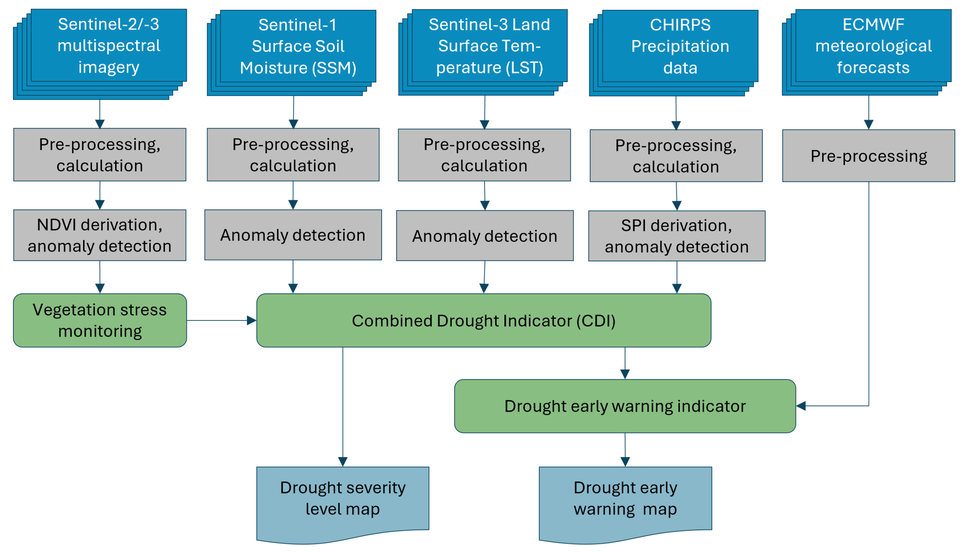


Figure 1: Flowchart for deriving water stress dynamics, drought monitoring and early warning maps.

RESULTS

The application generates spatially explicit maps showing different drought severity levels and early warnings of potential drought impacts. Using vegetation indicators as the spatial backbone, results are provided at at 10 m (Sentinel-2) or 300 m (Sentinel-3) spatial resolution. Given the temporal resolution of the input data, drought conditions can be updated at 5-day intervals (Figure 2). Evaluation of the model performance has been conducted against established drought monitoring products (Figure 3).

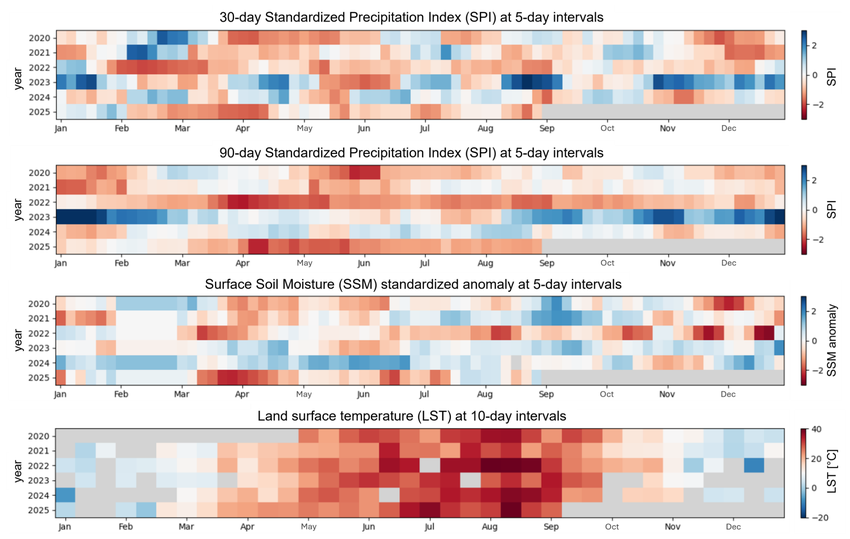


Figure 2: Exemplary time series of pre-processed input data used in the CDI at a project demonstration site near Bernburg (Saale), Saxony-Anhalt, Germany.

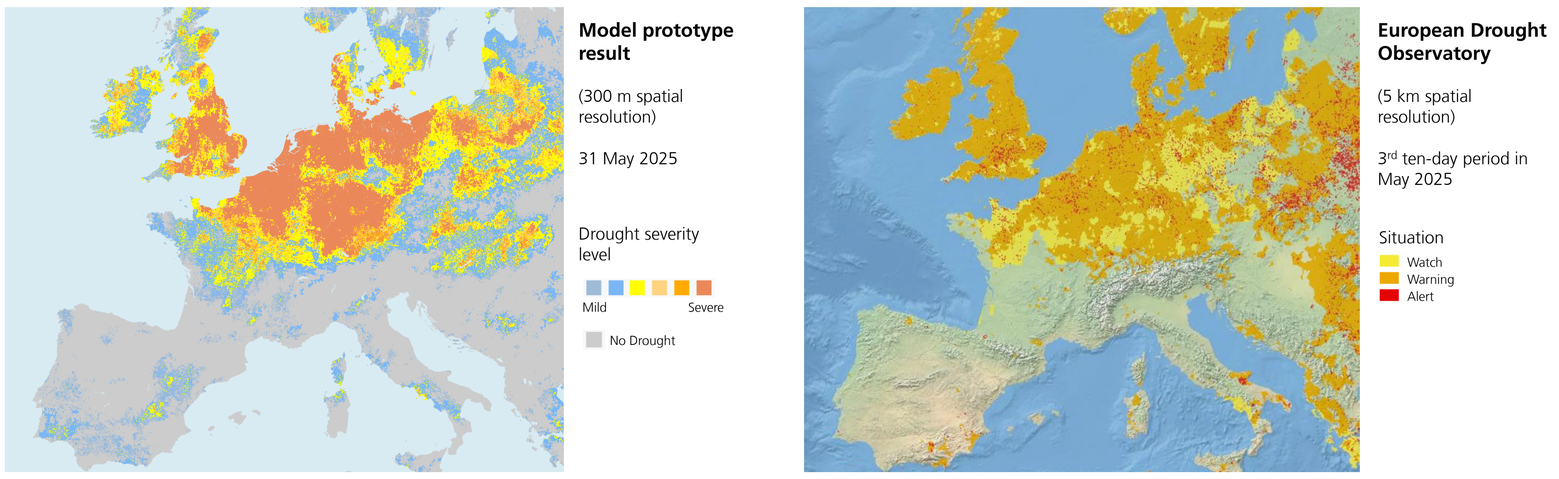


Figure 3: Exemplary comparison of model result (left) with the European Drought Observatory product (right) for the drought situation of 31 May 2025 in Europe.

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NOSTRADAMUS

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