



## **Developing a European Drought Observatory for Monitoring, Assessing and Forecasting Droughts Across the European Continent**

Jürgen Vogt, Paulo Barbosa, Barbara Hofer, and Andrew Singleton

European Commission, Joint Research Centre, Institute for Environment and Sustainability, 21020 Ispra (VA), Italy  
(juergen.vogt@jrc.ec.europa.eu)

Drought is one of the major weather-related disasters. Persisting over months or years, droughts can affect large areas and may have serious environmental, social and economic impacts. These impacts depend on the duration, severity and spatial extent of the precipitation deficit, but also on the environmental and socio-economic vulnerability of affected regions.

Over the last decades many European countries have repeatedly been affected by droughts, resulting in considerable ecological and economic damage. Climate change studies further indicate a trend towards increasing climate variability in many parts of the world, most likely resulting in more frequent drought occurrences also in Europe. The need for an adequate monitoring and management is, therefore, evident and has recently triggered action at different political and management levels.

An adequate management of droughts requires up-to-date information on the occurrence and severity of drought episodes as well as information on possible impacts and the probability of their duration. JRC, therefore, develops the prototype of a European Drought Observatory (EDO) to monitor, assess and forecast drought events across the entire European continent. As droughts can affect the entire water cycle (e.g., precipitation, soil moisture, stream flow and groundwater) and have direct impacts on the vegetation cover, all these components need careful monitoring. To do so, a suite of indicators is calculated from different data sources in order to capture various aspects of a drought event and to forecast its probable evolution. In order to provide information at different operational scales, close collaboration with national and regional observatories needs to be ensured through adequate interoperability arrangements, thus providing comparable information at different spatial and temporal resolutions.

At the core of the European Drought Observatory (EDO) are a web portal and map server presenting up-to-date drought relevant information for entire Europe to the public and to decision makers in policy and water resources management. The current version of the EDO map server publishes continental information based on data processed and analysed at JRC. Available drought products include a monthly updated Standardized Precipitation Index (SPI), daily updated modelled soil moisture anomalies, and remote sensing observations on the state of the vegetation cover (i.e. anomaly of the fraction of Absorbed Photosynthetically Active Radiation (fAPAR), Normalized Difference Water Index (NDWI)). A one-week soil moisture anomaly forecast complements the picture. First interoperability arrangements allow accessing more detailed information at national and river basin scale. In addition, time series of drought indices can be retrieved for all administrative regions in Europe, visualizing the temporal evolution over several years.

Current research work is focusing on validating the available products, extending the interoperability with national and regional drought information systems and testing medium-range probabilistic drought forecasting products. Probabilistic forecasts are attractive in that they provide an estimate of the range of uncertainty in a particular forecast. Longer-term goals include the development of long-range drought forecasting products, the development of methodologies for monitoring drought impact and the integration of EDO in a global drought monitoring system.

The talk will provide an overview on the development of the system, the different products, and some preliminary results of an approach for forecasting the 3-month Standardised Precipitation Index (SPI-3) probabilities derived from an ensemble of precipitation forecasts from the European Centre for Medium Range Weather Forecast (ECMWF). Finally, challenges for developing an integrated system for a comprehensive understanding of drought and its impacts will be discussed.