EGU21-9426, updated on 19 Sep 2021
https://doi.org/10.5194/egusphere-egu21-9426
EGU General Assembly 2021

The Effect of Droughts on Ecosystem Water-Use-Efficiency in Europe

Christian Poppe Teran[1], Bibi Naz[1], Roland Baatz[1], Harrie-Jan Hendricks-Franssen[1], Nikolaos Nikolaidis[2], and Harry Vereecken[1]

[1]Jülich Research Center GmbH, Institute of Bio- and Geosciences: Agrosphere (IBG 3), Jülich, Germany
[2]Department of Environmental Engineering, Technical University Of Crete, Chania, Greece

Hydrological extremes in Europe, such as droughts, are expected to increase in frequency and severity with advancement of climate change. The consequences for ecosystem functioning and processes, including biomass production and evapotranspiration, have not yet been thoroughly mapped.

Ecosystem water use efficiency (WUE) describes the amount of carbon assimilated as biomass per unit of water. WUE was examined for various case studies and global assessments, yet disagreements in the methodologic approach and uncertainties hinder generic understanding of WUE variability. As a link between the carbon cycle, water cycle and vegetation states, disclosure of WUE courses across European ecosystems enables important estimates of past, present and future ecosystem dynamics.

Here we generated a long-term and high resolution observational and reanalysis data-set of WUE over Europe by interpolation of high level observation products (GLASS, CRU TS v4) and reanalysis data sets (ERA5-Land, COSMO-REA6, ESSMRA) to a 3 x 3km grid. This European Drought and Water Use Efficiency data-set (EDWUE) contains variables for calculating WUE using three different approaches, as well as indicators of meteorological and agricultural droughts.

Drought effects on WUE will be analyzed to investigate the sensitivity of ecosystem processes to extreme weather conditions at regional and local scale by comparison of WUE and drought indices time-series. Spatiotemporal analyses of the EDWUE data-set across European ecosystems will discover differences in patterns and potential trends of WUE between regions and decode the dependencies on ecosystem composition, geographical characteristics, and climate and occurring weather extremes. Intercomparisons between the different WUE calculations will allow to draw conclusions on the roots of particular WUE dynamics.