EGU2020-7719
https://doi.org/10.5194/egusphere-egu2020-7719
EGU General Assembly 2020

Identification of droughts and heatwaves in the Western Mediterranean, variability and impacts on vegetation and wildfires using the coupled ORCHIDEE-WRF regional model

Antoine Guion[1], Solène Turquety[2], Jan Polcher[3], Romain Pennel[4], and Lluis Fita[5]
[1]Sorbonne Université, Faculté des sciences, Laboratoire de Météorologie Dynamique (LMD), IPSL, France
[2]Sorbonne Université, Faculté des sciences, Laboratoire de Météorologie Dynamique (LMD), IPSL , France
[3]CNRS, Ecole Polytechnique, Laboratoire de Météorologie Dynamique (LMD), IPSL , France
[4]Université Paris-Saclay, Ecole Polytechnique, Laboratoire de Météorologie Dynamique (LMD), IPSL , France
[5]Universidad de Buenos Aires, CONICET, Centro de Investigaciones del Mar y la Atmosfera (CIMA), UMI, Argentina

In line with what is expected in a context of global warming, droughts and heatwaves have increased both in frequency and intensity over the last century. Severe wildfires and vegetation depletion can result from those extreme weather events with considerable economic, social and environmental damages.

For the development of mitigation and adaptation strategies, there is a need for exhaustive vulnerability assessments, including the impacts of droughts and heatwaves on the Mediterranean environment.

If heatwave characteristics are well documented, similar studies about droughts are partial. Most of them are focused on meteorological droughts while agronomical ones are more complex to identify.

Using a coupled land surface–atmosphere regional model (ORCHIDEE-WRF) with the integration of plant phenology, we present an analysis of droughts and heatwaves occurring in the Western Mediterranean over the last 40 years. These extreme events are identified using two complementary methods: the Percentile Limit Anomalies (PLA) and the Standardized Precipitation Evapotranspiration Index (SPEI).

Impact assessment analysis show significant and dominant effect of droughts on plant phenology during summer. Evaluated using the Leaf Area Index (LAI), plant depletion can reach more than 50%. Response to drought depends on the vegetation type (long vs short root system) and biome (temperate vs semi-arid).

The impact of these extreme events on fire risk will be presented based on calculations of the wildfire meteorological risk (Fire Weather Index) and an analysis of the fire activity observed by the

MODIS satellite instrument. We show that, even if extreme high temperature is the dominant cause, drought contributes to an increase of risk. Simultaneous heatwaves and droughts are the worst environmental conditions. The observed burned area can be ±4 times greater than during non-extreme conditions and the fire duration ±0.25 times longer.