

EGU21-12431

<https://doi.org/10.5194/egusphere-egu21-12431>

EGU General Assembly 2021

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



A methodological framework for assessing changes in future drought risk: evaluation over Australia

Diogo Araujo¹, Francesco Marra², Cory Merow³, and Efthymios Nikolopoulos¹

¹Florida Institute of Technology, Department of Mechanical and Civil Engineering, United States of America (enikolopoulos@fit.edu)

²Institute of Atmospheric Sciences and Climate, National Research Council of Italy, Italy

³University of Connecticut, Department of Ecology and Evolutionary Biology, United States of America

Accumulating evidence on the increase of intensity and frequency of climate extremes such as droughts, necessitates the development of effective climate adaptation procedures. To inform adaptation and mitigation strategies we need to develop improved methodologies for assessing future drought risk. The outputs of such methodologies must be usable by various stakeholders (e.g. water, energy and biodiversity conservation managers) and must be scalable (from regional to global) and methodologically robust. Severity-duration-frequency (SDF) curves serve as a concise way to quantitatively and qualitatively represent anticipated changes in drought risk and thus offer an optimum way to convey information on future drought risk across scientific disciplines and stakeholders. In this work we are presenting a methodological framework for assessing future drought risk that integrates state-of-the-art high-resolution (~10km) climate data from ERA5-Land reanalysis and downscaled CMIP6 projections with novel statistical procedures for robust estimation of SDF curves. Results are presented for Australia and are based on meteorological drought identification based on the widely established indicators of Standardized Precipitation Index (SPI) and Standardized Precipitation Evapotranspiration Index (SPEI). Comparison between historic (1981-2019) and future (2020-2100) drought characteristics reveal that severity and duration tends to increase towards the end of the century. The spatial extent of severe and extreme droughts is also projected to increase, particularly in central and western Australia. The SDF analysis highlights a consistent increase in severity of extreme (i.e. 100yr) drought towards the end of century. While there is still significant uncertainty on the projected magnitude of increase, the multi-model analysis reveals that increasing trend of drought risk is consistent across models. The proposed framework can be applied at global scale and can be easily modified to incorporate additional drought indicators.