

## PROJECT INFORMATION

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**Project title:** Impacts of the 2018/19 drought on European forests: From site to continental scale

**Project ID:** 204

**Contact person:** Ana Bastos // abastos@bgc-jena.mpg.de

## PROJECT DESCRIPTION

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Extreme summer temperatures in western and central Europe have become more frequent and heatwaves more prolonged over the past decades. The drought and heat that affected central and northern Europe in summer 2018 (DH2018) was one of the strongest events in the first two decades of the 21st century, and had strong impacts on European ecosystems' productivity (Bastos et al. 2020a, b). In central Europe, below- or close to average rainfall and warm temperatures persisted during the subsequent seasons, thereby prolonging the drought conditions throughout 2019. Although forests can regulate water-use during droughts, access water deeper in the ground and make use of carbon reserves, this might not be enough to support trees under prolonged drought such as the case of 2018/19.

Using Enhanced Vegetation Index (EVI) from MODIS, we evaluated how ecosystems in the drought-affected region in central and eastern Europe responded to the occurrence of two consecutive dry summers. We find that only ca. 21% of the area negatively impacted by drought in summer 2018 fully recovered in 2019 and that 18% of the area showed a worsening of plant status during summer 2019.

We found a cluster of tree-dominated pixels where EVI worsened from 2018 to 2019, in spite of drought being slightly alleviated which can be related with increased tree mortality but also to insect outbreaks or diseases. The remote-sensing data lack the level of detail (spatial resolution, process representation) required to evaluate the impacts of the drought on forests only in the identified degradation hotspots, as most pixels in central Europe are a mix of croplands / grasslands and forests. Therefore, we want to compare our results from the large-scale continental analysis with those from forest monitoring plots, particularly LAI, biomass, crown condition assessments, tree vitality, foliage and litterfall, as well as soil-water when available. We hope that this analysis can increase the robustness of the large-scale results found and improve understanding on the specific impacts of this extreme drought on European forests.

## References

- Bastos, A.; Ciais, P.; Friedlingstein, P.; Sitch, S.; Pongratz, J.; Fan, L et al. Direct and seasonal legacy effects of the 2018 heat wave and drought on European ecosystem productivity. *Science advances*, American Association for the Advancement of Science, 2020 a, 6, eaba2724
- Bastos, A.; Fu, Z.; Ciais, P.; Friedlingstein, P.; Sitch, S.; Pongratz, J et al. Impacts of extreme summers on European ecosystems: a comparative analysis of 2003, 2010 and 2018. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 2020 b, 375, 20190507