EGU22-3742, updated on 19 Aug 2022
https://doi.org/10.5194/egusphere-egu22-3742
EGU General Assembly 2022

Effects of drought and warming treatments on CO2 fluxes in shrubland ecosystems across European environmental gradients

Qiaoyan Li[1], Albert Tietema[2], Sabine Reinsch[3], Gabriele Guidolotti[4], Inger Kappel Schmidt[1], Giovanbattista de Dato[5], Bridget Emmett[3], Eszter Lellei-Kovács[6], and Klaus Steenberg Larsen[1]

[1]Geosciences and Natural Resource Management, University of Copenhagen, Denmark (qli@ign.ku.dk)
[2]Institute for Biodiversity and Ecosystem Dynamics, University of Amsterdam, The Netherlands
[3]UK Centre for Ecology & Hydrology, Environment Centre Wales, Bangor, United Kingdom
[4]Research Institute on Terrestrial Ecosystems (IRET), National Research Council (CNR), Porano (TR), Italy
[5]CREA Council for Agricultural Research and Economics, Research Centre for Forestry and Wood Arezzo, Italy
[6]Institute of Ecology and Botany, Centre for Ecological Research, Hungary

Shrubland ecosystems are vulnerable and typical ecosystems across European countries, but now they are facing a range of threats and an uncertain future because of climate change. Within the INCREASE project, six shrubland ecosystems along a geographical and climatic gradient across Europe from Wales and Denmark in the North, over The Netherlands to Hungary and Italy in the South, were exposed to ecosystem-level warming and extended periods of drought using automated curtain technologies. Sites ranged naturally from xeric to hydric. During our measurement period, mean annual precipitation (MAP) was reduced by 8-25%, while mean annual air temperature (MAT) was increased year-round by 0.2 - 0.9 □.

Previously, Reinsch et al. (2017) * showed that aboveground net primary production (ANPP) was relatively resilient to the climate treatments while soil respiration (R_s) was reduced in xeric to mesic sites but increased in the hydric site. However, quantification of the gross primary production (GPP) or ecosystem respiration (R_{eco}) rates and their responsiveness to climate manipulations have not previously been published. We will here present data from the six shrubland sites along the European climate gradient of the responses of GPP and R_{eco} to drought and warming expressed as annual relative change (%) from the untreated control along a Gaussen index (GI). Results are in contrast to the previously reported decrease in R_s responsiveness with increased aridity. For both R_{eco} and GPP rates, our preliminary results indicate that the more arid sites have a stronger, negative effect of drought suggesting different response patterns of autotrophic and heterotrophic components of the ecosystems.

*Reinsch, S., Koller, E., Sowerby, A. et al. Shrubland primary production and soil respiration diverge along European climate gradient. Sci Rep 7, 43952 (2017). https://doi.org/10.1038/srep43952