



The fingerprint of the summer 2018 drought in Europe on ground-based atmospheric CO₂ measurements

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During the summer of 2018 a widespread drought developed over Northern and Central Europe. The significant increase in temperature and the reduction of soil moisture have disturbed CO₂ exchanges with terrestrial ecosystems by various mechanisms such as the reduction of photosynthesis, or fires which were particularly important in Sweden at the end of July 2018. In this study we characterize the resulting perturbation of the seasonal cycle of the atmospheric CO₂ concentrations. Thanks to the deployment of a dense network of atmospheric monitoring stations, most of them contributing to the ICOS European infrastructure, there is in 2018 an excellent coverage of all regions affected by drought to investigate how large scale ecosystem flux anomalies impacted CO₂ gradients between stations. The density of stations was unprecedented compare to previous drought events in 2003 and 2015. Most of the ICOS stations were installed between 2015 and 2017, which does not provide sufficiently long time series for an analysis of anomalies in CO₂ concentrations. Consequently we have compared the seasonal CO₂ cycle observed in 2018 and 2017 at more than 25 European stations by extending the ICOS data with measurement stations contributing to WDCGG or national networks. The summer minimum of CO₂ concentration associated with was less marked (by 3 to 5 ppm) in 2018 in most of the stations located in northern Europe. On the other hand, the CO₂ build up phase after July was slower in 2018 compared to 2017, suggesting an extension of the late growing season. The few long time series available are used to put into perspective the amplitude of the CO₂ anomaly observed in 2018 compared to previous European droughts in 2003, 2010 and 2015.