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# Wildfire impact on Boreal hydrology: empirical study of the Västmanland fire 2014 (Sweden)

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Last summer, we saw many extreme wildfires in Greece, California and Australia, but also in countries less prone to wildfires, such as Sweden. With more productive forestry, humans have controlled the wildfires in the Boreal forests effectively and they thus became rare under many decades. However, with on-going global warming, wildfires are expected to become more frequent and more severe also in the Boreal environment. Wildfires change the land-cover, which in turn may affect hydrological fluxes and the water balance, but it is not yet clear what impact the wildfires may have at the catchment scale. This information can be crucial for societal preparedness to indirect consequences after wildfires in a future climate. Hence, this study aims at detecting and quantifying hydrological impacts from Boreal wildfires.

During the summer of 2014, the Västmanland fire in central Sweden burned 14 000 hectares and removed the Boreal forest severely. In this presentation, we compare empirical time-series from pre- and post-wildfire conditions in this region. We combine both remote sensing and hydrologic data in a paired catchment methodology, comparing 2 catchments highly affected by the wildfire with 2 unaffected catchments nearby, of similar character in physiography, size (about 20 km2), and climate, to avoid the impact of natural variability. A total of 23 hydrological characteristics were defined trying to isolate hydrological processes possibly affected by the wildfire. The results show three main changes due to the wildfire: (1) variation in duration and timing of snow season and the main spring streamflow peak associated to the melting, (2) change in consecutive flow conditions and (3) variations in flashiness from rainfall-events, especially during summer. This is related to an earlier and quicker snowmelt due to the increased solar radiation reaching this snowpack, the reduction of snow albedo due to charred forest remains and the higher exposition to wind of the snowpack and a change in interception and evapotranspiration rates from vegetation after the wildfire, respectively. Consequently, wildfires do impact Boreal hydrology, however, it should be noted that overall the detected impact on hydrology from wildfires is rather small compared to other on-going environmental changes (for instance direct effects of climate change or river regulations).

Reference

Pimentel, R. and Arheimer, B.: Wildfire impact on Boreal hydrology: empirical study of the Västmanland fire 2014 (Sweden), Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2018-387, in review, 2018.