Geophysical Research Abstracts
Vol. 20, EGU2018-10931, 2018
EGU General Assembly 2018

Understanding hydrological effects of a forest fire combing in-situ discharge measurements and Earth Observations: the Västmanland fire (Sweden)

Rafael Pimentel, David Gustafsson, Johan Strömqvist, Goran Lindström, and Berit Arheimer
SMHI, Swedish Meteorological and Hydrological Institute, SE-601 76 Norrköping, Sweden (rafael.pimentel@smhi.se)

Land cover changes at watershed scale constitute key issues in general hydrology. Wildfires are one of the drivers of these changes, whose occurrence is rising in north latitudes. The increasing trends in temperature and its direct consequences, more and longer drought periods, in addition to the changes in the snow season, shorter and earlier, increment the water availability during spring and reduce the flow during the summer, favouring the conditions to generate a wildfire. The radical shift in the vegetation pattern during these events gives an opportunity to study the interaction between forest and hydrological response at watershed scale. This study analyses hydrological effects that a forest fire produced in Västmanland, central Sweden, during the summer of 2014. The methodology proposed defines several indicators before and after the fire and, inside and outside the fire area, to evaluate the hydrological changes produced in the system but taking into account the possible changes in climate pattern. 4 subbasins with an average size of 20 km2 were analysed. A total of 25 indicators were defined trying to isolate each of the hydrological processes affected by the fire and they were defined based on both in situ flow measurements and remote sensing information (e.g. year potential evapotranspiration from MODIS, yearly volume at the outlet of the subbasins, fraction of vegetation or total volume at the outlet of the subbasin during the snow period, among other). The results show a small change in the snow dynamics over the fire-forest area with longer duration of the snow season but with bigger flow picks generated during the winter, that is, it is easier for the snow to be accumulated on the ground but it is also easier its fusion. In relation with the flow signature, the low flows are a bit higher in the fired area after the fire event. The analysis of some flow measurements downstream the fired area have also allowed defining a relationship between the percentage of upstream area fired and the changes of flow signatures, stablishing a relative scale where the forest fire effects have no impact.