



Impact of bark beetle calamity on soil moisture dynamics during floods and droughts in 2013 – case study of Rokytka Brook catchment, Šumava Mts., Czech Republic

Lukas Vlcek, Jan Kocum, Bohumir Jansky, and Ludek Sefrna
Charles University in Prague, Czech Republic (vlcek@natur.cuni.cz)

This paper describes the dynamics of soil moisture in the experimental catchment of Rokytka Brook, Otava River basin, Šumava National Park, Czech Republic. This area has a long-term problems with bark beetle which results predominantly in the spruce forest perdition. This phenomenon has resulted not only in a change of a vegetation composition, but also it has impacted the development of local land cover, soil moisture dynamics or the storage capacity of soils and the potential retention conditions within the basin .

The experimental catchment, where the research was carried out, consists by 2/3 of terrestrial soil (Entic Podzol). The soil is covered by the dead forest (former spruce forest before bark beetle calamity) and by the beech forest (former spruce-beech forest). The rest of the basin consists of well-developed peatbogs that represents a typical example of a peatbog in Šumava Mts. In terms of vegetation, the area can be divided into a lower part consisting of healthy waterlogged spruce forest, the mountain pine covers the middle part and the upper part is covered mostly by the cotton grass. In the part where terrestrial soils predominate, measuring of soil pressures and temperatures at two depths (20 and 60 cm) at two sites (former spruce-beech and spruce forest) has been carried out since 2012. Due to the bark beetle calamity, the spruce forest has become withered and thus the vegetation cover has changed. Meteorological data (precipitation, air temperature, humidity) are collected by meteorological stations located within the basin or used from nearby stations (solar radiation, wind speed). The outflow from the experimental catchment is also measured.

The aim of this paper is to simulate the dynamics of a soil moisture condition before bark beetle outbreak, to compare the differences and changes of a soil moisture and retention ability of a typical soil type in the case of a characteristic headwater catchment in Šumava Mts. For the simulation of a soil moisture dynamics in Entic Podzol, the model called HYDRUS 1D was used. Firstly, the model was calibrated for a present-day land cover, thus for dead spruce and healthy beech forest. Then the evapotranspiration data of healthy spruce and spruce-beech forest research were used and applied into the model. Subsequently, the dynamics of soil moisture and the outflow from the catchment were recalculated. The simulations were applied during extreme rainfall events (June 2013) and during the dry period (July 2013).

The paper contributes to the long-term hydrological research of peatbogs and their role within the runoff process in one of the major headwater regions of the Czech Republic with the existence of this phenomenon. Results were also compared to findings carried out on the Bavarian side of Šumava Mts. which was affected by the bark beetle calamity prior to the Czech part.