



The role of forest type on throughfall during extreme precipitation events - A comparison of methods using data from the Pohorje mountains (NE Slovenia)

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Extreme precipitation in the Alpine region is a major environmental factor due to high frequency of such events and consequences such as flooding of populated valley floors, erosion, avalanches, debris flow and landslides endangering exposed settlements. However, the effects of extreme precipitation are buffered by forest cover, therefore forest management practices should aim towards decreased surface runoff and soil erosion in alpine climates. In Central Europe, many pure Norway spruce stands, established on primary beech sites, were converted into mixed stands over the last 60 years. The conversion of forest management from spruce monocultures into mixed deciduous-coniferous forests changed the forest structure dramatically. This changes could influence the hydrological processes on the catchment scale, associated with major river flooding following extreme precipitation events.

In this study, the effect of forest management on the partitioning of rainfall into throughfall and stemflow in coniferous and mixed deciduous-coniferous stands on Pohorje mountains in NE Slovenia were investigated. Four spruce *Picea abies* (L. Karst) stands were compared to four mixed spruce-beech *Fagus sylvatica* (L.) stands with prevailing forest plant community *Cardamine Savensi Fagetum* with small areas of *Sphagno – Piceetum*, *Bazzanio - Piceetum* and *Rhytidodelpholorei - Piceetum* intermixed. The monthly throughfall from rain collectors and half-hourly throughfall from automated rain gauges in growing seasons from 2008 till 2012 were analyzed in order to estimate the throughfall under forest canopies. In the mixed spruce-beech stands the monthly stemflow on beech trees was also measured. For the precipitation in the open an automated weather station and rainfall collectors in an open area located very close to the research plots were used.

There were small differences in seasonal throughfall found between the coniferous and mixed deciduous-coniferous stands. The seasonal throughfall was highest in the spruce stands, ranging from 78 % to 96 % of the bulk precipitation. In mixed spruce-beech stands seasonal throughfall ranged from 76 % to 96 % of the of the bulk precipitation, respectively. Seasonal stemflow on beech trees was 4 to 5 % of the bulk precipitation. An illustration using half-hourly throughfall data during extreme precipitation events also showed small differences in throughfall intensities among the coniferous and mixed deciduous-coniferous stands.

The implementation of hydrology-oriented silvicultural measures via a more accurate prediction of the impacts of tree species conversion on throughfall in this type of alpine forest is discussed.