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Influence of rainfall microstructure on rainfall interception

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Rainfall interception is part of the hydrological cycle. Precipitation, which hits vegetation, is retained on the leaves and branches, from which it eventually evaporates into the atmosphere (interception) or reaches the ground by dripping from the canopy, falling through the gaps (throughfall) and running down the stems (stemflow). The process is influenced by various meteorological and vegetation parameters. Often neglected meteorological parameter influencing rainfall interception is also rainfall microstructure. Rain is a discrete process consisting of various numbers of individual raindrops with different sizes and velocities. This properties describe rainfall microstructure which is often neglected in hydrological analysis and replaced with rainfall intensity.

Throughfall, stemflow and rainfall microstructure have been measured since the beginning of the year 2014 under two tree species (Betula pendula and Pinus nigra) on a study plot in Ljubljana, Slovenia. The preliminary analysis of the influence of rainfall microstructure on rainfall interception has been conducted using three events with different characteristics measured in May 2014. Event A is quite short with low rainfall amount and moderate rainfall intensity, whereas events B and C have similar length but low and high intensities, respectively.

Event A was observed on the 1st of May 2014. It was 22 minutes long and delivered 1.2 mm of rainfall. The average rainfall intensity was equal to 3.27 mm/h. The event consisted of 1,350 rain drops with average diameter of 1.517 mm and average velocity of 5.110 m/s. Both Betula pendula and Pinus nigra intercepted similar amount of rainfall, 68 % and 69 %, respectively.

Event B was observed in the night from the 7th to 8th of May 2014, it was 16 hours and 18 minutes long, and delivered 4.2 mm of rainfall with average intensity of 0.97 mm/h. There were 39,108 raindrops detected with average diameter of 0.858 mm and average velocity of 3.855 m/s. Betula pendula (23 %) has intercepted significantly less rainfall than Pinus nigra (85%).

Event C was also observed in the night time between 11th and 12th of May 2014, it lasted 4 hours and 12 minutes and delivered 34.6 mm of rainfall with an average intensity equal to 8.24 mm/h. During the event 147,236 raindrops with average diameter of 1.020 mm and average velocity of 4.078 m/s were detected. Betula pendula has intercepted only 6 % of rainfall whereas Pinus nigra intercepted majority of rainfall, namely 85 %.

In case of B. pendula rainfall interception is increasing with higher velocity whereas it is lower for medium diameters than for smaller or larger diameters. Rainfall interception under P. nigra is decreasing with higher velocities and behaving similar as under B. pendula for different diameters but with less obvious difference between diameter classes. We will continue with the measurements and further analysis of several rainfall events will be prepared.