Geophysical Research Abstracts
Vol. 20, EGU2018-11244, 2018
EGU General Assembly 2018

Rainfall interception by Dense Ombrophilous Forest – A study in Subtropical Brazil

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The rainfall interception by forests plays a major role in determining total evaporation and the amount of water and solutes available to the soil. Those are major components in the water balance and their estimation is highly uncertain. Even though evaporation and the spatial and temporal distribution of rainfall play a major role in hydrological modeling and impact assessment studies, there are very few studies on the interception process in the southern hemisphere, especially in subtropical Brazilian forests. The objective of this study was to investigate the spatial and temporal variation of the canopy interception process (throughfall and stemflow) in the Dense Ombrophilous Forest. The catchment is located in Southern Brazil and belongs to an area of permanent preservation of the Atlantic Forest. The catchment is completely covered by Dense Ombrophilous Forest. The canopy interception was estimated by measuring gross rainfall (Pg), throughfall (Tf) and stemflow (Sf). The Pg monitoring was performed with a rain gauge installed outside the forest. Throughfall was estimated with hand-made rain gauges and the stemflow was estimated with collars connected to the tree. 17 rain gauges were installed within the plot to monitor Tf and we collected Sf from 18 trees. The Pg and Tf were monitored between October 2015 and April 2017, Sf has measured from May 2016 to April 2017. The rainfall was 4938 mm with 238 days without rain.
The relative Tf (expressed as percentage of gross rainfall) averaged between the all collectors varied between 10 and 85 % of the gross rainfall and its spatial distribution was very heterogeneous in this plot. There is significant persistence at the monitoring points. The Sf ranging from 0 and 10% of the gross rainfall. The accumulated canopy interception loss indirectly estimated from the field measurements ranged from 0.21 mm to 242 mm, corresponding to 11% and 100% of gross rainfall. We used Pg, Tf and Sf measurements to estimate canopy storage capacity (Sc) and the fraction of canopy cover (c), which equals the ratio of stemflow (1-p-pt). The values of c and Sc ranged from 0.27 to 0.98 and 0.22 to 3.0 mm, respectively. The values of trunk fraction coefficient (pt) and trunk storage capacity (St) ranged from 0.05 and 0.28 and 0.15 to 2.3. The spatial distribution of throughfall and stemflow depended on the storm characteristics. Another parameter that contributes to distribution is the vegetation characteristic. We verified that the trees that produced large stemflow volumes also contributed to higher throughfall values measured in the Tf gauges in its vicinity.