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Dynamic nitrogen deposition thresholds during forest stand development in a Douglas fir forest analysed with two nitrogen models SMART2 and MERLIN

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Abstract. This study focuses on spatial variability of throughfall water and chemistry and forest floor water content within a Douglas fir (*Pseudotsuga menziesii*, Franco L.) forest plot. Spatial patterns of water and chemistry (NH_4^+, NO_3^-, SO_4^{2-}, Cl^-, Mg^{2+}, Ca^{2+}, Na^+ and K^+) were compared and tested for stability over time. The spatial coefficient of variation (CV) was between 18 and 26% for amounts of throughfall water and ions, and 17% for forest floor water content. Concentrations and amounts of all ions were correlated significantly. Ion concentrations were negatively correlated with throughfall water amounts, but, except for NH_4^+, there was no such relation between throughfall water and ion amounts. Spatial patterns of throughfall water fluxes and forest floor water contents were consistent over time; patterns of ion fluxes were somewhat less stable. Because of the spatial variability of forest floor thickness and drainage, it was not possible to relate patterns in throughfall water directly to patterns in water content. The spatial variability of throughfall nitrogen and forest floor water contents can cause significant variability in NO_3^- production within the plot studied.

Keywords: nutrient throughfall, forest floor water, spatial variability, time-stability, nitrogen

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