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Aluminum availability in forest floor of two acidified mountain watersheds

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We measured seasonal variability of soil chemistry in upper organic soil horizons (O and A) in watersheds of two acidified mountain lakes, Plešné (PL) and Čertovo (CT) in Bohemian Forest (Czech Republic). Both the localities are acidified, PL watershed recently undergoes strong changes due to bark beetle infestation followed by forest dieback. Soils were sampled in 6-week period during the years 2008 – 2009. The aim of the study was to investigate changes in Al availability in upper organic soil horizons during year together with changes in nutrient availability and transformations.

We observed significant seasonal variability in concentration of water extractable Al (Al_{H2O}) and exchangeable Al (Al_{EX}, determined as 1M KCl extractable). Concentrations of Al_{H2O}, which represents quickly releasable form of Al, varied between 0.5 – 2.7 mg $kg^{-1}$and 0.5 – 4.4 mg kg^{-1}in the PL - O and PL - A horizons, respectively, and between 0.4 – 1.4 and 0.6 – 3.5 mg kg^{-1}in the CT - O and CT - A horizons, respectively. Concentrations of Al_{H2O} in PL watershed compared to Al_{H2O} concentrations in CT watershed were higher, despite higher soil pH values there. The main peaks of Al_{H2O} concentrations were observed during the winters, while the concentrations were lowest during the springs and the falls. The major part (>90%) of Al_{H2O} was the organically bound Al. Concentrations of Al_{EX}, representing potentially toxic Al form, were approximately 2 – 3 orders of magnitude higher compared to Al_{H2O} concentrations, and were consistently lower in PL watershed.

In H_2O extracts, we observed dramatic increase of available P concentrations in upper organic horizons in PL watershed after elevated litter fall associated with forest dieback. In parallel we also observed changes in nitrogen chemistry, especially significant increase of NH_4-N concentrations in both the horizons. Both the changes in P and N availability in the PL watershed are probably connected with the forest dieback. (For more details on nitrogen transformations in these soils see also Tahovská et al.: *Nitrogen availability in mountain spruce forest floor after defoliation induced by bark beetle infestation*)