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Winter climate extremes and their role for priming SOM decomposition under the snow

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The central research question of this project is how soil respiration and soil microbial community composition and activity of subalpine grasslands are affected by extreme winter climate events, such as mid-winter snowmelt and subsequent advanced growing season date.

In the scope of this talk, focus will be laid on the assumptions that (1) reduced snow cover leads to intensive freeze-thaw cycles in the soil with larger amplitudes of microbial biomass, DOC and soil CO_2 production and efflux over the course of winter, and shifts peak microbial activity to deeper soil layers with limited and recalcitrant substrate; (2) causes a shift in microbial community composition towards decreased fungal/bacterial ratios; and (3) results in a stronger incorporation of labile C in microbial biomass and more pronounced priming effects of soil organic matter turnover.

Our findings indicate that snow removal, induces a strong and immediate negative effect on the physiology of soil microbes, impairing them in their capacity for turnover of SOM in the presence of labile substances (priming). This effect however is transient and soil microbes recover within the same winter. The reason for that is that snow removal did not produce any measurable (PLFA) changes in soil microbial community composition. The advanced start of the growing season, as a result of snow removal in mid-winter, granted the bacterial part of the microbial community more active in the uptake of labile substrates and the turnover of SOM than the fungal one. This finding is in line with the concept for a seasonal shift towards bacterial-dominated summer microbial community composition and could bring about implications for the plant-microbe competition for resources at the onset of the growing season.