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# No effect of long-term soil warming on diffusive soil inorganic and organic nitrogen fluxes in a temperate forest soil

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The capacity of forest plants to sequester C is closely linked to soil nitrogen (N) availability, a major control of plant growth and ecosystem functioning. An increase of soil temperature caused by climate change affects C and N cycling in forest soils, but implications for plant available N have remained largely unclear. In recent short-term laboratory incubation studies, an increase in soil temperature has not only led to a significant increase in diffusive N fluxes, but also to a concomitant shift in bioavailable N quality for plant and microbial uptake, i.e. towards a higher proportion of inorganic N forms compared to small organic N forms such as amino acids. However, long-term effects of soil warming on diffusive soil N fluxes *in situ* remain largely unknown. Applying the microdialysis technique, we quantified *in situ* diffusive fluxes of amino acids, ammonium and nitrate at the long-term soil warming experimental site Achenkirch (Tyrol, Austria). This site is one of the few climate manipulation experiments operational for more than 15 years and has already provided a wealth of novel insights into the potential effects of global warming on forest ecosystem responses. Results from four sampling campaigns (n = 1152 microdialysis samples) during the growing season showed no effect of warming on diffusive N fluxes. Diffusive ammonium fluxes increased from spring towards autumn while nitrate fluxes followed an opposite trend. Compared to other temperate and boreal forest soils, the proportion of amino acids in the total diffusive N flux in this carbonate soil was low (13 - 30%), while the proportions of ammonium (21 – 67%) and nitrate were high (19 – 58%). In conclusion, our results suggest that *in situ* diffusive N fluxes, as well as the proportions of different N forms, were unaffected after 15 years of soil warming. Accordingly, warming may not be expected to increase diffusive soil N supply for root uptake in the topsoil in the long run. Diffusive N availability was mainly determined by seasonal effects and by the small-scale heterogeneity of the soil matrix.