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Climatic effects on decomposing litter and substrate chemistry along climatological gradients.

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Abstract.
Climatic effects on decomposing litter and substrate chemistry along climatological gradients. B. Berg, Dipartimento Biologia Strutturale e Funzionale, Complesso Universitario, Monte San Angelo, via Cintia, I-80126 Napoli, Italy and Department of Forest Ecology, P.O. Box 27, University of Helsinki, FIN-00014, Helsinki, Finland.

Studies of several processes, using climatic gradients do provide new information as compared with studies at e.g. a single site. Decomposition of plant litter in such gradients give response in decomposition rates to natural climate conditions. Thus Scots pine needle litter incubated in a climate gradient with annual average temperature (AVGT) ranging from -0.5 to 6.8oC had a highly significant increase in initial mass-loss rate with R2 = 0.591 ($p<0.001$) and a 5o increase in temperature doubled the mass-loss rate. As a contrast - needle litter of Norway spruce incubated in the same transect had no significant response to climate and for initial litter a 5o increase increased mass-loss rate c. 6%. For more decomposed Scots pine litter we could see that the effect of temperature on mass-loss rate gradually decreased until it disappeared.
Long-term decomposition studies revealed differences in litter decomposition patterns along a gradient, even for the same type of litter. This could be followed by using an asymptotic function that gave, (i) a measure a maximum level of decomposition, (ii) the initial decomposition rate. Over a gradient the calculated maximum level of decomposition decreased with increasing AVGT.
Other gradient studies revealed an effect of AVGT on litter chemical composition. Pine needle litter from stands under different climate conditions had nutrient concentrations related to AVGT. Thus N, P, K, and S were positively related to AVGT and Mn negatively, all of them significantly. This information may be used to explain the changing pattern in decomposition over the gradient.