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Effects of long-term field experiments on early stage litter decomposition in Austria and Sweden

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Soil organic matter decomposition affects the local and global C cycles. Decomposition is mainly affected by soil type and climatic conditions, for a given quality of organic material. This study tested the effect of land use and management, litter type, and climate on the early stage decomposition rate in long-term field experiments (LTEs) in Austria and Sweden. Standardized litter (Rooibos and Green tea) were used according to the Tea Bag Index (TBI) protocol (Keuskamp et al. 2013) for comparison of litter decomposition rate (k) and stabilization factor (S) in 11 sites in Austria (2015 and 2016) and 9 sites in Sweden (2016). The tea bags were buried at 8 cm depth and collected after ~90 days. Austrian LTEs focused on mineral nitrogen fertilization, mineral potassium fertilization, organic fertilization, tillage systems, and crop residues management. The LTEs evaluated in Sweden focused mainly on annual and perennial crops, mineral fertilization, and tillage systems. The impact of environmental parameters (air temperature and precipitation) was modeled to normalize the variance due to climatic effects at each site. The preliminary results show that in Austria TBI decomposition differed more between sites than between treatments at the same LTE. Minimum tillage treatment had significantly higher decomposition rates compared to reduced and conventional tillage. In Sweden, decomposition rate differed more between treatments than between sites. Fertilized plots showed higher stabilization than unfertilized, and maximum N fertilization had the highest k , while unfertilized had the lowest k . The effect of different tillage systems on k and S were variable across sites and treatments, although ploughing tended to result in the lowest k . The northernmost site resulted in the highest k value. Results indicated higher stabilization in perennial forage crops compared to annual crops. We also considered time-series decomposition for some sites with measurements at different time points by the TBI approach (retrieving tea bags after 15, 30, 60, and 90 days), and the use of Random Forest regressions to evaluate the importance of pedo-climatic variables on early stage decomposition.