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Carbon dynamics in aboveground biomass of co-dominant plant species: related rather to leaf life span than to species

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This study investigates the role of individual organisms in whole ecosystem carbon (C) fluxes. It is currently unknown if different plant community members share the same or different kinetics of C pools in aboveground biomass, thereby adding (or not) variability to the first steps in ecosystem C cycling.
We assessed the residence times in metabolic and non-metabolic (or structural) C pools and the allocation pattern of assimilated C in aboveground plant parts of four co-existing, co-dominant species from different functional groups in a temperate grassland community. For this purpose continuous, 14-16 day long $13CO_2/12CO_2$-labeling experiments were performed in Sept. 2006, May 2007 and Sept. 2007, and the tracer kinetics were analysed with compartmental modeling.
In all experimental periods, the species shared vastly similar residence times in metabolic C (5-8 d). In contrast, the residence times in non-metabolic C ranged from 20 to 58 d (except one outlier) and the fraction of fixed C allocated to the non-metabolic pool from 7 to 45%. These variations in non-metabolic C kinetics were not systematically associated with species or experimental periods, but exhibited close relationships with (independent estimates of) leaf life span, particularly in the grasses.
This adds new meaning to leaf life span as a functional trait in the leaf and plant economics spectrum and its implication for C cycle studies in grassland and also forest systems. As the four co-dominant species accounted for ∼80% of total community shoot biomass, we should also expect that the observed similarities in pool kinetics and allocation will scale up to similar relationships at the community level.