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Priming effects: interactions between living and dead organic matter

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The priming effects – increase or decrease in soil organic matter turnover (measured as changes of CO_2 efflux and N mineralization) after addition of available substrates – is not an artifact of incubation studies, but is a natural process sequence in the rhizosphere and detritusphere that is induced by pulses or continuous inputs of fresh organics. Recent publications have shown that priming effect (PE) results from interactions between living (microbial biomass) and dead organic matter and commonly occurs in most plant–soil systems.. The intensity of turnover processes in such hotspots as rhizosphere and detritusphere is at least one order of magnitude higher than in the bulk soil. Various prerequisites for high-quality PE studies will be outlined: calculating the C budget; analysis of the dynamics of released CO_2 and its sources; linking C and N dynamics with microbial biomass changes and enzyme activities; evaluating apparent and real PEs; and assessing PE sources as related to soil organic matter stabilization mechanisms. Approaches for identifying priming, based on the assessment of more than two C sources in CO_2 and microbial biomass will be proposed. Future studies should evaluate directions and magnitude of PEs according to expected climate and land-use changes and the increased rhizodeposition under elevated CO_2 as well as clarifying the ecological significance of PEs. The conclusion is that PEs – the interactions between living and dead organic matter – should be incorporated in models considering microbial biomass as an active driver of C and N turnover.