



Climate Change, Air Pollution and Global Challenges: Chapter 7. Soil Respiration and Soil Organic Matter Decomposition in Response to Climate Change (Developments in Environmental Science)

Jörg Kruse, Judy Simon, Heinz Rennenberg

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Climate change will likely affect the carbon balance of terrestrial soils via shifts in photosynthetic carbon input relative to soil respiratory CO₂ loss. This review is focused on the effects of enhanced temperature and altered precipitation on soil respiration—that is, the sum of autotrophic root and heterotrophic microbial respiration. We highlight key processes that determine the substrate supply for the microbial decomposer community. These processes include (i) root exudation of low-molecular carbon compounds, (ii) enzymatic degradation of labile and recalcitrant soil organic matter (SOM) and (iii) physicochemical protection of SOM. The sensitivities of these processes to soil temperature and moisture differ, aggravating mechanistic interpretation of bulk soil respiration in response to global change. Variation in soil respiration can also result from acclimation of autotrophic root respiration, or shifts in microbial carbon use efficiency. On the basis of such key processes, we evaluate the apparent flexibility of instantaneous temperature responses of soil respiration.

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