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Contribution of carbonates to soil CO_2 emissions from calcareous soils

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Most previous studies on total carbon dioxide (CO_2) efflux from soils have assumed that the main source is from soil microbial and plant root respiration. However, carbonates can be a significant pool of inorganic C in calcareous soils and represent a potential source of CO_2 emissions. The goal of this research was to identify the sources and their contribution to total CO_2 emissions by measuring the isotopic signature of the CO_2 emitted. Root- and plant residue-free samples of a calcareous Luvisolic silt loam soil were incubated in the laboratory for 14 d and the isotopic signature of the CO_2 released (δ13C CO_2) was analyzed using isotope ratio mass spectrometry. Carbonates and soil organic matter have unique δ13C CO_2 signatures which can be used to quantify the sources of CO_2 production. A two-end mixing model was used to estimate the proportions CO_2 of evolved from soil carbonates and from decomposing soil organic matter. Of the emitted CO_2 collected during the incubation, 62-74% originated from soil inorganic C. The validity of these laboratory results to field studies of δ13C CO_2 emissions of this same soil will be presented.