Geophysical Research Abstracts
Vol. 14, EGU2012-1482, 2012
EGU General Assembly 2012


# Dual-chamber measurements of $\delta$13C of soil-respired $CO_2$ partitioned using a field-based three end-member model

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Reliably estimating the heterotrophic component of RS is crucial for the characterisation of an ecosystem's net C balance. However, the contribution of 'historical' soil C (SOM) to total soil respiration (RS) in forest remains still uncertain. One of the contributing factors of this uncertainty is the difficulty to reliably measure and partition key carbon-cycle processes. Isotopic methods, such as natural variations in carbon isotope composition ($\delta$13C) of soil respiration, are more frequently being applied, and show promise in separating heterotrophic and autotrophic contributions to RS. In this study we report the partitioning of soil-surface $CO_2$ effluxes, measured in forests in Italy and in Germany, using a new field-based $\delta$13C method and a three end-member mixing model. Soil-surface $CO_2$ flux was partitioned into components derived from root, litter/humus and SOM sources, and compared this with the conventional partitioning into autotrophic and heterotrophic components (two end-member mixing model). In addition, we used a novel dual-chamber technique to ensure that measurements of $\delta$13CRs were subjected to minimal artefacts during measurement. Our results provide new information about the contributions of belowground components to the $CO_2$ flux at the soil surface, and show an alternative approach to the partitioning of RS components using their 13C signatures.