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Abiotic processes involved in net ecosystem CO2 exchange and hidden gaseous reservoirs

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Micrometeorological measurements are currently estimating net ecosystem CO2 exchange around the globe on "flux towers", forming a FLUXNET community and are a critical source of information for the validation and improvement of models used to study regional and global carbon cycles. In these investigations, the net CO2 flux has generally been interpreted as a biological flux (photosynthesis and respiration) neglecting non-biological processes which are therefore not taken into account in ecosystem-scale carbon cycle research. However, recent publications reveal a possible contribution of abiotic processes related to karst weathering/precipitation and ventilation of subterranean cavities with magnitudes relevant at least on short time scales (hourly, daily and annually). In this context, although biological processes (photosynthesis and respiration) and their partitioning are well known for some ecosystems, their interactions with these abiotic processes are still unknown. Further research is needed regarding the decomposition of net CO2 exchange into abiotic and biological contributions, possibly via isotopic analyses, leaf-level fluxes and coupled models of biogeochemistry to confirm these results from micrometeorology. Nowadays, deconvolution of geochemical and biological CO2 fluxes is being done using the geochemical model WITCH [Goddéris, et al., 2006]; and those first results of this partitioning will be shown. In addition, a first rude approximation estimates that the subterranean CO2 pool could represents more than half of the total CO2 content of the atmosphere. Therefore, the non negligible role of cavities as a temporal depot of CO2 coming from different processes, along with seasonal ventilation, requires further investigation towards a better understanding of its drivers.