EGU2020-11431
https://doi.org/10.5194/egusphere-egu2020-11431
EGU General Assembly 2020

14C estimation of soil C02 turnover rates in Ultisols with different land use

Alexander Cherkinsky[1], Ravi Prasad[1], Hong Sheng[1], Zachary Brecheisen[2], and Daniel Richter[2]
[1]Center for Applied Isotope Studies, University of Georgia, Athens, United States of America (acherkin@uga.edu)
[2]Duke University, Durham, United States of America

The CO_2 flux from soil is a large and significant flux in most ecosystems and can account for more than 2/3 of total ecosystem respiration. In many cases, CO_2 flux from soil is estimated by the eddy covariance technique or by classical chamber method with measures of bulk concentration and isotopic composition of carbon dioxide. Whereas most these studies estimated CO_2 flux from the soil surface, we analyzed its concentration and isotope composition directly in soil profiles down to 5m depth.

This experiment was conducted in Sumter National Forest by NSF Calhoun CZO research program. A 10cm diameter auger was used to core up to 5 m depth and capped PVC pipe segments of 750 cm^3 volume serve as gas reservoirs, each with two gas impermeable tubes that connected the gas reservoirs. Soil gas reservoirs are installed at 5m, 3m, 1.5m, and 0.5m depths from the soil surface. On a three-week interval, soil gases were extracted with a pump and analyzed in the field for CO_2 and O_2 concentration with samples collected in Tedlar bags for analysis. The samples were collected in summer 2016 under 3 different land uses: hardwood stands that are taken to be never cultivated; old-field pine stands, which had been used for growing cotton in 19^{th} century and then abandoned; and cultivated sites which were used growing cotton, but for the last 50-60 years for growing corn, wheat, legume, sorghum, and sunflowers.

The radiocarbon analyses in the soil CO_2 profile were conducted for the first time. It was discovered that concentration of 14C increased with depth and $\Delta^{14}C$ changed from 40-60%o in the top 0.5m to about 80-140 ‰ at 5m depth depending on land use.