

## An open-source database for the synthesis of soil radiocarbon data: International Soil Radiocarbon Database (ISRaD) version 1.0

Corey R. Lawrence, Jeffrey Beem-Miller, Alison M. Hoyt, Grey Monroe, Carlos A. Sierra, Shane Stoner, Katherine Heckman, Joseph C. Blankinship, Susan E. Crow, Gavin McNicol, Susan Trumbore, Paul A. Levine, Olga Vindušková, Katherine Todd-Brown, Craig Rasmussen, Caitlin E. Hicks Pries, Christina Schädel, Karis McFarlane, Sebastian Doetterl, Christine Hatté, Yujie He, Claire Treat, Jennifer W. Harden, Margaret S. Torn, Cristian Estop-Aragonés, Asmeret Asefaw Berhe, Marco Keiluweit, Ágatha Della Rosa Kuhnén, Erika Marin-Spiotta, Alain F. Plante, Aaron Thompson, Zheng Shi, Joshua P. Schimel, Lydia J. S. Vaughn, Sophie F. von Fromm, Rota Wagai

### Angaben zur Veröffentlichung / Publication details:

Lawrence, Corey R., Jeffrey Beem-Miller, Alison M. Hoyt, Grey Monroe, Carlos A. Sierra, Shane Stoner, Katherine Heckman, et al. 2020. "An open-source database for the synthesis of soil radiocarbon data: International Soil Radiocarbon Database (ISRaD) version 1.0." *Earth System Science Data* 12 (1): 61–76.  
<https://doi.org/10.5194/essd-12-61-2020>.

### Nutzungsbedingungen / Terms of use:

CC BY 4.0



## *Supplement of*

# **An open-source database for the synthesis of soil radiocarbon data: International Soil Radiocarbon Database (ISRaD) version 1.0**

**Corey R. Lawrence et al.**

*Correspondence to:* Corey R. Lawrence ([clawrence@usgs.gov](mailto:clawrence@usgs.gov))

The copyright of individual parts of the supplement might differ from the CC BY 4.0 License.

## Studies within ISRaD version 1.0

---

Currently, there are 195 entries in ISRaD, which are from the following publications:

- Agnelli, A., Trumbore, S. E., Corti, G., & Ugolini, F. C. (2002). The dynamics of organic matter in rock fragments in soil investigated by  $^{14}\text{C}$  dating and measurements of  $^{13}\text{C}$ . *European Journal of Soil Science*, 53(1), 147–159. doi:10.1046/j.1365-2389.2002.00432.x
- Atarashi-Andoh, M., Koarashi, J., Ishizuka, S., & Hirai, K. (2012). Seasonal patterns and control factors of  $\text{CO}_2$  effluxes from surface litter, soil organic carbon, and root-derived carbon estimated using radiocarbon signatures. *Agricultural and Forest Meteorology*, 152, 149–158. doi:10.1016/j.agrformet.2011.09.015
- Baisden, W. T., Amundson, R., Cook, A. C., & Brenner, D. L. (2002). Turnover and storage of C and N in five density fractions from California annual grassland surface soils. *Global Biogeochemical Cycles*, 16(4), 64–1–64–16. doi:10.1029/2001gb001822
- Baisden, W. T., & Parfitt, R. L. (2007). Bomb  $^{14}\text{C}$  enrichment indicates decadal C pool in deep soil? *Biogeochemistry*, 85(1), 59–68. doi:10.1007/s10533-007-9101-7
- Baisden, W. T., Parfitt, R. L., Ross, C., Schipper, L. A., & Canessa, S. (2011). Evaluating 50 years of time-series soil radiocarbon data: towards routine calculation of robust C residence times. *Biogeochemistry*, 112(1-3), 129–137. doi:10.1007/s10533-011-9675-y
- Basile-Doelsch, I., Amundson, R., Stone, W. E. E., Masiello, C. A., Bottero, J. Y., Colin, F., ... Meunier, J. D. (2005). Mineralogical control of organic carbon dynamics in a volcanic ash soil on La Reunion. *European Journal of Soil Science*, 0(0), 050912034650042. doi:10.1111/j.1365-2389.2005.00703.x
- Bauters, M., Vercleyen, O., Vanlauwe, B., Six, J., Bonyoma, B., Badjoko, H., ... Boeckx, P. (2019). Long-term recovery of the functional community assembly and carbon pools in an African tropical forest succession. *Biotropica*, 51(3), 319–329. doi:10.1111/btp.12647
- Becker-Heidmann, P., & Scharpenseel, H.-W. (1986). Thin Layer  $\delta^{13}\text{C}$  and  $\text{D}^{14}\text{C}$  Monitoring of “Lessive” Soil Profiles. *Radiocarbon*, 28(2A), 383–390. doi:10.1017/s0033822200007499
- Becker-Heidmann, P., & Scharpenseel, H.-W. (1989). Carbon Isotope Dynamics in Some Tropical Soils. *Radiocarbon*, 31(03), 672–679. doi:10.1017/s0033822200012273
- Becker-Heidmann, P., Andresen, O., Kalmar, D., Scharpenseel, H.-W., & Yaalon, D. H. (2002). Carbon Dynamics in Vertisols as Revealed by High-Resolution Sampling. *Radiocarbon*, 44(1), 63–73. doi:10.1017/s0033822200064687
- Berg, B., & Gerstberger, P. (2004). Element Fluxes with Litterfall in Mature Stands of Norway Spruce and European Beech in Bavaria, South Germany. *Biogeochemistry of Forested Catchments in a Changing Environment*, 271–278. doi:10.1007/978-3-662-06073-5\_16

Please visit [soilradiocarbon.org](http://soilradiocarbon.org) for the most up-to-date list.

- Berhe, A. A., Harden, J. W., Torn, M. S., Kleber, M., Burton, S. D., & Harte, J. (2012). Persistence of soil organic matter in eroding versus depositional landform positions. *Journal of Geophysical Research: Biogeosciences*, 117(G2), n/a–n/a. doi:10.1029/2011jg001790
- Biedenbender, S. H., McClaran, M. P., Quade, J., & Wertz, M. A. (2004). Landscape patterns of vegetation change indicated by soil carbon isotope composition. *Geoderma*, 119(1-2), 69–83. doi:10.1016/s0016-7061(03)00234-9
- Binkley, D., & Resh, S. C. (1999). Rapid Changes in Soils Following Eucalyptus Afforestation in Hawaii. *Soil Science Society of America Journal*, 63(1), 222. doi:10.2136/sssaj1999.03615995006300010032x
- Bird, M., Santruckova, H., Lloyd, J., & Lawson, E. (2002). The isotopic composition of soil organic carbon on a north-south transect in western Canada. *European Journal of Soil Science*, 53(3), 393–403. doi:10.1046/j.1365-2389.2002.00444.x
- BOL, R., HUANG, Y., MERIDITH, J. A., EGLINTON, G., HARKNESS, D. D., & INESON, P. (1996). The <sup>14</sup>C age and residence time of organic matter and its lipid constituents in a stagnohumic gley soil. *European Journal of Soil Science*, 47(2), 215–222. doi:10.1111/j.1365-2389.1996.tb01392.x
- Bol, R., Bolger, T., Cully, R., & Little, D. (2003). Recalcitrant soil organic materials mineralize more efficiently at higher temperatures. *Journal of Plant Nutrition and Soil Science*, 166(3), 300–307. doi:10.1002/jpln.200390047
- Butman, D., Raymond, P., Oh, N.-H., & Mull, K. (2007). Quantity, <sup>14</sup>C age and lability of desorbed soil organic carbon in fresh water and seawater. *Organic Geochemistry*, 38(9), 1547–1557. doi:10.1016/j.orggeochem.2007.05.011
- Butnor, J. R., Samuelson, L. J., Johnsen, K. H., Anderson, P. H., González Benecke, C. A., Boot, C. M., ... Zarnoch, S. J. (2017). Vertical distribution and persistence of soil organic carbon in fire-adapted longleaf pine forests. *Forest Ecology and Management*, 390, 15–26. doi:10.1016/j.foreco.2017.01.014
- Caner, L., Toutain, F., Bourgeon, G., & Herbillon, A.-J. (2003). Occurrence of sombric-like subsurface A horizons in some andic soils of the Nilgiri Hills (Southern India) and their palaeoecological significance. *Geoderma*, 117(3-4), 251–265. doi:10.1016/s0016-7061(03)00127-7
- Carbone, M. S., Winston, G. C., & Trumbore, S. E. (2008). Soil respiration in perennial grass and shrub ecosystems: Linking environmental controls with plant and microbial sources on seasonal and diel timescales. *Journal of Geophysical Research: Biogeosciences*, 113(G2), n/a–n/a. doi:10.1029/2007jg000611
- Carbone, M. S., Still, C. J., Ambrose, A. R., Dawson, T. E., Williams, A. P., Boot, C. M., ... Schimel, J. P. (2011). Seasonal and episodic moisture controls on plant and microbial contributions to soil respiration. *Oecologia*, 167(1), 265–278. doi:10.1007/s00442-011-1975-3
- Carbone, M. S., Richardson, A. D., Chen, M., Davidson, E. A., Hughes, H., Savage, K. E., & Hollinger, D. Y. (2016). Constrained partitioning of autotrophic and heterotrophic

Please visit [soilradiocarbon.org](http://soilradiocarbon.org) for the most up-to-date list.

respiration reduces model uncertainties of forest ecosystem carbon fluxes but not stocks. *Journal of Geophysical Research: Biogeosciences*, 121(9), 2476–2492. doi:10.1002/2016jg003386

- Castanha, C., Trumbore, S. E., & Amundso, R. (2012). Mineral and Organic Matter Characterization of Density Fractions of Basalt- and Granite-Derived Soils in Montane California. An Introduction to the Study of Mineralogy. doi:10.5772/36735
- Chabbi, A., Kögel-Knabner, I., & Rumpel, C. (2009). Stabilised carbon in subsoil horizons is located in spatially distinct parts of the soil profile. *Soil Biology and Biochemistry*, 41(2), 256–261. doi:10.1016/j.soilbio.2008.10.033
- Chen, Q., Sun, Y., Shen, C., Peng, S., Yi, W., Li, Z., & Jiang, M. (2002). Organic matter turnover rates and CO<sub>2</sub> flux from organic matter decomposition of mountain soil profiles in the subtropical area, south China. *CATENA*, 49(3), 217–229. doi:10.1016/s0341-8162(02)00044-9
- Cherkinsky, A. E. (1996). <sup>14</sup>C Dating and Soil Organic Matter Dynamics in Arctic and Subarctic Ecosystems. *Radiocarbon*, 38(2), 241–245. doi:10.1017/s0033822200017616
- Chiti, T., Neubert, R. E. M., Janssens, I. A., Certini, G., Curiel Yuste, J., & Sirignano, C. (2009). Radiocarbon dating reveals different past managements of adjacent forest soils in the Campine region, Belgium. *Geoderma*, 149(1-2), 137–142. doi:10.1016/j.geoderma.2008.11.030
- Chiti, T., Certini, G., Grieco, E., & Valentini, R. (2010). The role of soil in storing carbon in tropical rainforests: the case of Ankasa Park, Ghana. *Plant and Soil*, 331(1-2), 453–461. doi:10.1007/s11104-009-0265-x
- Chiti, T., Certini, G., Forte, C., Papale, D., & Valentini, R. (2015). Radiocarbon-Based Assessment of Heterotrophic Soil Respiration in Two Mediterranean Forests. *Ecosystems*, 19(1), 62–72. doi:10.1007/s10021-015-9915-4
- Chiti, T., Rey, A., Jeffery, K., Lauteri, M., Mihindou, V., Malhi, Y., ... Valentini, R. (2018). Contribution and stability of forest-derived soil organic carbon during woody encroachment in a tropical savanna. A case study in Gabon. *Biology and Fertility of Soils*, 54(8), 897–907. doi:10.1007/s00374-018-1313-6
- Chiti, T., Díaz-Pinés, E., Butterbach-Bahl, K., Marzaioli, F., & Valentini, R. (2017). Soil organic carbon changes following degradation and conversion to cypress and tea plantations in a tropical mountain forest in Kenya. *Plant and Soil*, 422(1-2), 527–539. doi:10.1007/s11104-017-3489-1
- Chorover, J., Amistadi, M. K., & Chadwick, O. A. (2004). Surface charge evolution of mineral-organic complexes during pedogenesis in Hawaiian basalt. *Geochimica et Cosmochimica Acta*, 68(23), 4859–4876. doi:10.1016/j.gca.2004.06.005
- Conen, F., Zimmermann, M., Leifeld, J., Seth, B., & Alewell, C. (2008). Relative stability of soil carbon revealed by shifts in  $\delta^{15}\text{N}$  and C:N ratio. *Biogeosciences*, 5(1), 123–128. doi:10.5194/bg-5-123-2008
- Crews, T. E., Kitayama, K., Fownes, J. H., Riley, R. H., Herbert, D. A., Mueller-Dombois, D., & Vitousek, P. M. (1995). Changes in Soil Phosphorus Fractions and Ecosystem Dynamics

Please visit [soilradiocarbon.org](http://soilradiocarbon.org) for the most up-to-date list.

across a Long Chronosequence in Hawaii. *Ecology*, 76(5), 1407–1424.  
doi:10.2307/1938144

- Crow, S. E., Reeves, M., Schubert, O. S., & Sierra, C. A. (2014). Optimization of method to quantify soil organic matter dynamics and carbon sequestration potential in volcanic ash soils. *Biogeochemistry*, 123(1-2), 27–47. doi:10.1007/s10533-014-0051-6
- CUSACK, D. F., TORN, M. S., McDOWELL, W. H., & SILVER, W. L. (2010). The response of heterotrophic activity and carbon cycling to nitrogen additions and warming in two tropical soils. *Global Change Biology*. doi:10.1111/j.1365-2486.2009.02131.x
- Cusack, D. F., Chadwick, O. A., Hockaday, W. C., & Vitousek, P. M. (2012). Mineralogical controls on soil black carbon preservation. *Global Biogeochemical Cycles*, 26(2), n/a–n/a. doi:10.1029/2011gb004109
- Cusack, D. F., Chadwick, O. A., Ladefoged, T., & Vitousek, P. M. (2012). Long-term effects of agriculture on soil carbon pools and carbon chemistry along a Hawaiian environmental gradient. *Biogeochemistry*, 112(1-3), 229–243. doi:10.1007/s10533-012-9718-z
- Czimczik, C. I., Schmidt, M. W. I., & Schulze, E.-D. (2005). Effects of increasing fire frequency on black carbon and organic matter in Podzols of Siberian Scots pine forests. *European Journal of Soil Science*, 56(3), 417–428. doi:10.1111/j.1365-2389.2004.00665.x
- Czimczik, C. I., & Trumbore, S. E. (2007). Short-term controls on the age of microbial carbon sources in boreal forest soils. *Journal of Geophysical Research: Biogeosciences*, 112(G3), n/a–n/a. doi:10.1029/2006jg000389
- Czimczik, C. I., & Welker, J. M. (2010). Radiocarbon Content of CO<sub>2</sub> Respired from High Arctic Tundra in Northwest Greenland. *Arctic, Antarctic, and Alpine Research*, 42(3), 342–350. doi:10.1657/1938-4246-42.3.342
- De Freitas, H. A., Pessenda, L. C. R., Aravena, R., Gouveia, S. E. M., de Souza Ribeiro, A., & Boulet, R. (2001). Late Quaternary Vegetation Dynamics in the Southern Amazon Basin Inferred from Carbon Isotopes in Soil Organic Matter. *Quaternary Research*, 55(1), 39–46. doi:10.1006/qres.2000.2192
- Desjardins, T., Andreux, F., Volkoff, B., & Cerri, C. C. (1994). Organic carbon and <sup>13</sup>C contents in soils and soil size-fractions, and their changes due to deforestation and pasture installation in eastern Amazonia. *Geoderma*, 61(1-2), 103–118. doi:10.1016/0016-7061(94)90013-2
- Doetterl, S., Six, J., Van Wesemael, B., & Van Oost, K. (2012). Carbon cycling in eroding landscapes: geomorphic controls on soil organic C pool composition and C stabilization. *Global Change Biology*, 18(7), 2218–2232. doi:10.1111/j.1365-2486.2012.02680.x
- Doetterl, S., Stevens, A., Six, J., Merckx, R., Van Oost, K., Casanova Pinto, M., ... Boeckx, P. (2015). Soil carbon storage controlled by interactions between geochemistry and climate. *Nature Geoscience*, 8(10), 780–783. doi:10.1038/ngeo2516
- Dörr, H., & Münnich, K. O. (1980). Carbon-14 and Carbon-13 in Soil CO<sub>2</sub>. *Radiocarbon*, 22(3), 909–918. doi:10.1017/s0033822200010316

Please visit [soilradiocarbon.org](http://soilradiocarbon.org) for the most up-to-date list.

- Dörr, H., & Münnich, K. O. (1986). Annual Variations of the  $^{14}\text{C}$  Content of Soil  $\text{CO}_2$ . *Radiocarbon*, 28(2A), 338–345. doi:10.1017/s0033822200007438
- Dörr, H., & Münnich, K. O. (1989). Downward Movement of Soil Organic Matter and Its Influence on Trace-Element Transport ( $^{210}\text{Pb}$ ,  $^{137}\text{Cs}$ ) in the Soil. *Radiocarbon*, 31(03), 655–663. doi:10.1017/s003382220001225x
- Dümig, A., Schad, P., Rumpel, C., Dignac, M.-F., & Kögel-Knabner, I. (2008). *Araucaria* forest expansion on grassland in the southern Brazilian highlands as revealed by  $^{14}\text{C}$  and  $\delta^{13}\text{C}$  studies. *Geoderma*, 145(1-2), 143–157. doi:10.1016/j.geoderma.2007.06.005
- DUTTA, K., SCHUUR, E. A. G., NEFF, J. C., & ZIMOV, S. A. (2006). Potential carbon release from permafrost soils of Northeastern Siberia. *Global Change Biology*, 12(12), 2336–2351. doi:10.1111/j.1365-2486.2006.01259.x
- Elzein, A., & Balesdent, J. (1995). Mechanistic Simulation of Vertical Distribution of Carbon Concentrations and Residence Times in Soils. *Soil Science Society of America Journal*, 59(5), 1328. doi:10.2136/sssaj1995.03615995005900050019x
- Ewing, S. A., Sanderman, J., Baisden, W. T., Wang, Y., & Amundson, R. (2006). Role of large-scale soil structure in organic carbon turnover: Evidence from California grassland soils. *Journal of Geophysical Research*, 111(G3). doi:10.1029/2006jg000174
- Fernandez, I. J., Rustad, L. E., & Lawrence, G. B. (1993). Estimating total soil mass, nutrient content, and trace metals in soils under a low elevation spruce-fir forest. *Canadian Journal of Soil Science*, 73(3), 317–328. doi:10.4141/cjss93-034
- Fierer, N., Chadwick, O. A., & Trumbore, S. E. (2005). Production of  $\text{CO}_2$  in Soil Profiles of a California Annual Grassland. *Ecosystems*, 8(4), 412–429. doi:10.1007/s10021-003-0151-y
- Fontaine, S., Barot, S., Barré, P., Bdioui, N., Mary, B., & Rumpel, C. (2007). Stability of organic carbon in deep soil layers controlled by fresh carbon supply. *Nature*, 450(7167), 277–280. doi:10.1038/nature06275
- Gaudinski, J. B., Trumbore, S. E., Davidson, E. A., & Zheng, S. (2000). *Biogeochemistry*, 51(1), 33–69. doi:10.1023/a:1006301010014
- Gentsch, N., Wild, B., Mikutta, R., Čapek, P., Diáková, K., Schrumpf, M., ... Guggenberger, G. (2018). Temperature response of permafrost soil carbon is attenuated by mineral protection. *Global Change Biology*, 24(8), 3401–3415. doi:10.1111/gcb.14316
- Gillson, L. (2004). Testing non-equilibrium theories in savannas: 1400 years of vegetation change in Tsavo National Park, Kenya. *Ecological Complexity*, 1(4), 281–298. doi:10.1016/j.ecocom.2004.06.001
- Heckman, K., Lawrence, C. R., & Harden, J. W. (2018). A sequential selective dissolution method to quantify storage and stability of organic carbon associated with Al and Fe hydroxide phases. *Geoderma*, 312, 24–35. doi:10.1016/j.geoderma.2017.09.043
- GOH, K. M., STOUT, J. D., & RAFTER, T. A. (1977). RADIOCARBON ENRICHMENT OF SOIL ORGANIC MATTER FRACTIONS IN NEW ZEALAND SOILS. *Soil Science*, 123(6), 385–391. doi:10.1097/00010694-197706000-00007

Please visit [soilradiocarbon.org](http://soilradiocarbon.org) for the most up-to-date list.



- Guillet, B., Faivre, P., Mariotti, A., & Khobzi, J. (1988). The  $^{14}\text{C}$  dates and  $^{13}\text{C}/^{12}\text{C}$  ratios of soil organic matter as a means of studying the past vegetation in intertropical regions: Examples from Colombia (South America). *Palaeogeography, Palaeoclimatology, Palaeoecology*, 65(1-2), 51–58. doi:10.1016/0031-0182(88)90111-3
- GUILLET, B., ACHOUNDONG, G., HAPPI, J. Y., BEYALA, V. K. K., BONVALLOT, J., RIERA, B., ... SCHWARTZ, D. (2001). Agreement between floristic and soil organic carbon isotope ( $^{13}\text{C}/^{12}\text{C}$ ,  $^{14}\text{C}$ ) indicators of forest invasion of savannas during the last century in Cameroon. *Journal of Tropical Ecology*, 17(6), 809–832. doi:10.1017/s0266467401001614
- Hall, S. J., McNicol, G., Natake, T., & Silver, W. L. (2015). Large fluxes and rapid turnover of mineral-associated carbon across topographic gradients in a humid tropical forest: insights from paired  $^{14}\text{C}$  analysis. *Biogeosciences Discussions*, 12(2), 891–932. doi:10.5194/bgd-12-891-2015
- Harden, J. W., Fries, T. L., & Pavich, M. J. (2002). *Biogeochemistry*, 60(3), 317–336. doi:10.1023/a:1020308729553
- Hardie, S. M. L., Garnett, M. H., Fallick, A. E., Ostle, N. J., & Rowland, A. P. (2009). Bomb- $^{14}\text{C}$  analysis of ecosystem respiration reveals that peatland vegetation facilitates release of old carbon. *Geoderma*, 153(3-4), 393–401. doi:10.1016/j.geoderma.2009.09.002
- Hardie, S. M. L., Garnett, M. H., Fallick, A. E., Rowland, A. P., Ostle, N. J., & Flowers, T. H. (2011). Abiotic drivers and their interactive effect on the flux and carbon isotope ( $^{14}\text{C}$  and  $\delta^{13}\text{C}$ ) composition of peat-respired  $\text{CO}_2$ . *Soil Biology and Biochemistry*, 43(12), 2432–2440. doi:10.1016/j.soilbio.2011.08.010
- Harkness, D. D., Harrison, A. F., & Bacon, P. J. (1986). The Temporal Distribution of “Bomb”  $^{14}\text{C}$  in a Forest Soil. *Radiocarbon*, 28(2A), 328–337. doi:10.1017/s0033822200007426
- Hatton, P.-J., Kleber, M., Zeller, B., Moni, C., Plante, A. F., Townsend, K., ... Derrien, D. (2012). Transfer of litter-derived N to soil mineral–organic associations: Evidence from decadal  $^{15}\text{N}$  tracer experiments. *Organic Geochemistry*, 42(12), 1489–1501. doi:10.1016/j.orggeochem.2011.05.002
- Heckman, K. A. (2010). Pedogenesis & Carbon Dynamics Across A Lithosequence Under Ponderosa Pine. *Zenodo*. <https://doi.org/10.5281/zenodo.1486081>
- Hicks Pries, C. E., Schuur, E. A. G., & Crummer, K. G. (2011). Holocene Carbon Stocks and Carbon Accumulation Rates Altered in Soils Undergoing Permafrost Thaw. *Ecosystems*, 15(1), 162–173. doi:10.1007/s10021-011-9500-4
- Hicks Pries, C. E., Schuur, E. A. G., & Crummer, K. G. (2012). Thawing permafrost increases old soil and autotrophic respiration in tundra: Partitioning ecosystem respiration using  $\delta^{13}\text{C}$  and  $\Delta^{14}\text{C}$ . *Global Change Biology*, 19(2), 649–661. doi:10.1111/gcb.12058
- Hicks Pries, C. E., van Logtestijn, R. S. P., Schuur, E. A. G., Natali, S. M., Cornelissen, J. H. C., Aerts, R., & Dorrepaal, E. (2015). Decadal warming causes a consistent and persistent

Please visit [soilradiocarbon.org](http://soilradiocarbon.org) for the most up-to-date list.



shift from heterotrophic to autotrophic respiration in contrasting permafrost ecosystems. *Global Change Biology*, 21(12), 4508–4519. doi:10.1111/gcb.13032

- Hicks Pries, C. E., Schuur, E. A. G., Natali, S. M., & Crummer, K. G. (2015). Old soil carbon losses increase with ecosystem respiration in experimentally thawed tundra. *Nature Climate Change*, 6(2), 214–218. doi:10.1038/nclimate2830
- Hicks Pries, C. E., Castanha, C., Porras, R. C., & Torn, M. S. (2017). The whole-soil carbon flux in response to warming. *Science*, 355(6332), 1420–1423. doi:10.1126/science.aal1319
- Hicks Pries, C. E., Bird, J. A., Castanha, C., Hatton, P.-J., & Torn, M. S. (2017). Long term decomposition: the influence of litter type and soil horizon on retention of plant carbon and nitrogen in soils. *Biogeochemistry*, 134(1-2), 5–16. doi:10.1007/s10533-017-0345-6
- Horwath, J. L., Sletten, R. S., Hagedorn, B., & Hallet, B. (2008). Spatial and temporal distribution of soil organic carbon in nonsorted striped patterned ground of the High Arctic. *Journal of Geophysical Research*, 113(G3). doi:10.1029/2007jg000511
- Hsieh, Y.-P. (1996). Soil Organic Carbon Pools of Two Tropical Soils Inferred by Carbon Signatures. *Soil Science Society of America Journal*, 60(4), 1117. doi:10.2136/sssaj1996.03615995006000040022x
- Huang, Y., Bol, R., Harkness, D. D., Ineson, P., & Eglinton, G. (1996). Post-glacial variations in distributions, <sup>13</sup>C and <sup>14</sup>C contents of aliphatic hydrocarbons and bulk organic matter in three types of British acid upland soils. *Organic Geochemistry*, 24(3), 273–287. doi:10.1016/0146-6380(96)00039-3
- Huang, Y., Li, B., Bryant, C., Bol, R., & Eglinton, G. (1999). Radiocarbon Dating of Aliphatic Hydrocarbons A New Approach for Dating Passive-Fraction Carbon in Soil Horizons. *Soil Science Society of America Journal*, 63(5), 1181. doi:10.2136/sssaj1999.6351181x
- Kaiser, C., Meyer, H., Biasi, C., Rusalimova, O., Barsukov, P., & Richter, A. (2007). Conservation of soil organic matter through cryoturbation in arctic soils in Siberia. *Journal of Geophysical Research*, 112(G2). doi:10.1029/2006jg000258
- Karhu, K., Fritze, H., Hämäläinen, K., Vanhala, P., Jungner, H., Oinonen, M., ... Liski, J. (2010). Temperature sensitivity of soil carbon fractions in boreal forest soil. *Ecology*, 91(2), 370–376. doi:10.1890/09-0478.1
- Katsuno, K., Miyairi, Y., Tamura, K., Matsuzaki, H., & Fukuda, K. (2010). A study of the carbon dynamics of Japanese grassland and forest using <sup>14</sup>C and <sup>13</sup>C. *Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms*, 268(7-8), 1106–1109. doi:10.1016/j.nimb.2009.10.110
- Khomo, L., Trumbore, S., Bern, C. R., & Chadwick, O. A. (2017). Timescales of carbon turnover in soils with mixed crystalline mineralogies. *SOIL*, 3(1), 17–30. doi:10.5194/soil-3-17-2017
- Kleber, M., Mikutta, R., Torn, M. S., & Jahn, R. (2005). Poorly crystalline mineral phases protect organic matter in acid subsoil horizons. *European Journal of Soil Science*, 0(0), 050912034650054. doi:10.1111/j.1365-2389.2005.00706.x

Please visit [soilradiocarbon.org](http://soilradiocarbon.org) for the most up-to-date list.

- KLEBER, M., NICO, P. S., PLANTE, A., FILLEY, T., KRAMER, M., SWANSTON, C., & SOLLINS, P. (2011). Old and stable soil organic matter is not necessarily chemically recalcitrant: implications for modeling concepts and temperature sensitivity. *Global Change Biology*, 17(2), 1097–1107. doi:10.1111/j.1365-2486.2010.02278.x
- Koarashi, J., Iida, T., & Asano, T. (2005). Radiocarbon and stable carbon isotope compositions of chemically fractionated soil organic matter in a temperate-zone forest. *Journal of Environmental Radioactivity*, 79(2), 137–156. doi:10.1016/j.jenvrad.2004.06.002
- KOARASHI, J., ATARASHI-ANDOH, M., ISHIZUKA, S., MIURA, S., SAITO, T., & HIRAI, K. (2009). Quantitative aspects of heterogeneity in soil organic matter dynamics in a cool-temperate Japanese beech forest: a radiocarbon-based approach. *Global Change Biology*, 15(3), 631–642. doi:10.1111/j.1365-2486.2008.01745.x
- Kögel-Knabner, I., Guggenberger, G., Kleber, M., Kandeler, E., Kalbitz, K., Scheu, S., ... Leinweber, P. (2008). Organo-mineral associations in temperate soils: Integrating biology, mineralogy, and organic matter chemistry. *Journal of Plant Nutrition and Soil Science*, 171(1), 61–82. doi:10.1002/jpln.200700048
- Kondo, M., Uchida, M., & Shibata, Y. (2010). Radiocarbon-based residence time estimates of soil organic carbon in a temperate forest: Case study for the density fractionation for Japanese volcanic ash soil. *Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms*, 268(7-8), 1073–1076. doi:10.1016/j.nimb.2009.10.101
- Kramer, M. G., & Chadwick, O. A. (2016). Controls on carbon storage and weathering in volcanic soils across a high-elevation climate gradient on Mauna Kea, Hawaii. *Ecology*, 97(9), 2384–2395. doi:10.1002/ecy.1467
- Krull, E. S., & Skjemstad, J. O. (2003).  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  profiles in  $^{14}\text{C}$ -dated Oxisol and Vertisols as a function of soil chemistry and mineralogy. *Geoderma*, 112(1-2), 1–29. doi:10.1016/s0016-7061(02)00291-4
- Krull, E. S., Skjemstad, J. O., Burrows, W. H., Bray, S. G., Wynn, J. G., Bol, R., ... Harms, B. (2005). Recent vegetation changes in central Queensland, Australia: Evidence from  $\delta^{13}\text{C}$  and  $^{14}\text{C}$  analyses of soil organic matter. *Geoderma*, 126(3-4), 241–259. doi:10.1016/j.geoderma.2004.09.012
- Krull, E. S., Bestland, E. A., Skjemstad, J. O., & Parr, J. F. (2006). Geochemistry ( $\delta^{13}\text{C}$ ,  $\delta^{15}\text{N}$ ,  $^{13}\text{C}$  NMR) and residence times ( $^{14}\text{C}$  and OSL) of soil organic matter from red-brown earths of South Australia: Implications for soil genesis. *Geoderma*, 132(3-4), 344–360. doi:10.1016/j.geoderma.2005.06.001
- Ladyman, S. J., & Harkness, D. D. (1980). Carbon Isotope Measurement as An Index of Soil Development. *Radiocarbon*, 22(3), 885–891. doi:10.1017/s0033822200010286
- Laskar, A. H., Yadava, M. G., & Ramesh, R. (2012). Radiocarbon and Stable Carbon Isotopes in Two Soil Profiles from Northeast India. *Radiocarbon*, 54(1), 81–89. doi:10.2458/azu\_js\_rc.v54i1.15840

Please visit [soilradiocarbon.org](http://soilradiocarbon.org) for the most up-to-date list.

- Lassey, K. R., Tate, K. R., Sparks, R. J., & Claydon, J. J. (1996). Historic Measurements of Radiocarbon in New Zealand Soils. *Radiocarbon*, 38(2), 253–270. doi:10.1017/s003382220001763x
- Lavoie, M., Mack, M. C., & Schuur, E. A. G. (2011). Effects of elevated nitrogen and temperature on carbon and nitrogen dynamics in Alaskan arctic and boreal soils. *Journal of Geophysical Research*, 116(G3). doi:10.1029/2010jg001629
- Lawrence, C. R., Harden, J. W., Xu, X., Schulz, M. S., & Trumbore, S. E. (2015). Long-term controls on soil organic carbon with depth and time: A case study from the Cowlitz River Chronosequence, WA USA. *Geoderma*, 247-248, 73–87. doi:10.1016/j.geoderma.2015.02.005
- Leavitt, S. W., Follett, R. F., Kimble, J. M., & Pruessner, E. G. (2007). Radiocarbon and  $\delta^{13}\text{C}$  depth profiles of soil organic carbon in the U.S. Great Plains: A possible spatial record of paleoenvironment and paleovegetation. *Quaternary International*, 162-163, 21–34. doi:10.1016/j.quaint.2006.10.033
- Lee, H., Schuur, E. A. G., Inglett, K. S., Lavoie, M., & Chanton, J. P. (2011). The rate of permafrost carbon release under aerobic and anaerobic conditions and its potential effects on climate. *Global Change Biology*, 18(2), 515–527. doi:10.1111/j.1365-2486.2011.02519.x
- LEIFELD, J., ZIMMERMANN, M., FUHRER, J., & CONEN, F. (2009). Storage and turnover of carbon in grassland soils along an elevation gradient in the Swiss Alps. *Global Change Biology*, 15(3), 668–679. doi:10.1111/j.1365-2486.2008.01782.x
- Leith, F. I., Garnett, M. H., Dinsmore, K. J., Billett, M. F., & Heal, K. V. (2014). Source and age of dissolved and gaseous carbon in a peatland–riparian–stream continuum: a dual isotope ( $^{14}\text{C}$  and  $\delta^{13}\text{C}$ ) analysis. *Biogeochemistry*, 119(1-3), 415–433. doi:10.1007/s10533-014-9977-y
- Li, Y., & Mathews, B. W. (2010). Effect of conversion of sugarcane plantation to forest and pasture on soil carbon in Hawaii. *Plant and Soil*, 335(1-2), 245–253. doi:10.1007/s11104-010-0412-4
- Liu, W., Moriizumi, J., Yamazawa, H., & Iida, T. (2006). Depth profiles of radiocarbon and carbon isotopic compositions of organic matter and  $\text{CO}_2$  in a forest soil. *Journal of Environmental Radioactivity*, 90(3), 210–223. doi:10.1016/j.jenvrad.2006.07.003
- Lupascu, M., Czimczik, C. I., Welker, M. C., Ziolkowski, L. A., Cooper, E. J., & Welker, J. M. (2018). Winter Ecosystem Respiration and Sources of  $\text{CO}_2$  From the High Arctic Tundra of Svalbard: Response to a Deeper Snow Experiment. *Journal of Geophysical Research: Biogeosciences*, 123(8), 2627–2642. doi:10.1029/2018jg004396
- Lybrand, R. A., Heckman, K., & Rasmussen, C. (2017). Soil organic carbon partitioning and  $\Delta^{14}\text{C}$  variation in desert and conifer ecosystems of southern Arizona. *Biogeochemistry*, 134(3), 261–277. doi:10.1007/s10533-017-0360-7
- Marín-Spiotta, E., Swanston, C. W., Torn, M. S., Silver, W. L., & Burton, S. D. (2008). Chemical and mineral control of soil carbon turnover in abandoned tropical pastures. *Geoderma*, 143(1-2), 49–62. doi:10.1016/j.geoderma.2007.10.001

Please visit [soilradiocarbon.org](http://soilradiocarbon.org) for the most up-to-date list.

- Marin-Spiotta, E., Chadwick, O. A., Kramer, M., & Carbone, M. S. (2011). Carbon delivery to deep mineral horizons in Hawaiian rain forest soils. *Journal of Geophysical Research*, 116(G3). doi:10.1029/2010jg001587
- Mariotti, A., & Peterschmitt, E. (1994). Forest savanna ecotone dynamics in India as revealed by carbon isotope ratios of soil organic matter. *Oecologia*, 97(4), 475–480. doi:10.1007/bf00325885
- Martel, Y. A., & Paul, E. A. (1974). The Use of Radiocarbon Dating of Organic Matter in the Study of Soil Genesis. *Soil Science Society of America Journal*, 38(3), 501. doi:10.2136/sssaj1974.03615995003800030033x
- Masiello, C. A., Chadwick, O. A., Southon, J., Torn, M. S., & Harden, J. W. (2004). Weathering controls on mechanisms of carbon storage in grassland soils. *Global Biogeochemical Cycles*, 18(4), n/a–n/a. doi:10.1029/2004gb002219
- McClaran, M. P., & Umlauf, M. (2000). Desert grassland dynamics estimated from carbon isotopes in grass phytoliths and soil organic matter. *Journal of Vegetation Science*, 11(1), 71–76. doi:10.2307/3236777
- De Tapia, E. M., Rubio, I. D., Castro, J. G., Solleiro, E., & Sedov, S. (2005). Radiocarbon Dates from Soil Profiles in the Teotihuacán Valley, Mexico: Indicators of Geomorphological Processes. *Radiocarbon*, 47(1), 159–175. doi:10.1017/s0033822200052279
- McFarlane, K. J., Torn, M. S., Hanson, P. J., Porras, R. C., Swanston, C. W., Callahan, M. A., & Guilderson, T. P. (2012). Comparison of soil organic matter dynamics at five temperate deciduous forests with physical fractionation and radiocarbon measurements. *Biogeochemistry*, 112(1-3), 457–476. doi:10.1007/s10533-012-9740-1
- Porras, R. C., Hicks Pries, C. E., McFarlane, K. J., Hanson, P. J., & Torn, M. S. (2017). Association with pedogenic iron and aluminum: effects on soil organic carbon storage and stability in four temperate forest soils. *Biogeochemistry*, 133(3), 333–345. doi:10.1007/s10533-017-0337-6
- Meyer, S., Leifeld, J., Bahn, M., & Fuhrer, J. (2012). Free and protected soil organic carbon dynamics respond differently to abandonment of mountain grassland. *Biogeosciences*, 9(2), 853–865. doi:10.5194/bg-9-853-2012
- Mikutta, R., Schaumann, G. E., Gildemeister, D., Bonneville, S., Kramer, M. G., Chorover, J., ... Guggenberger, G. (2009). Biogeochemistry of mineral–organic associations across a long-term mineralogical soil gradient (0.3–4100kyr), Hawaiian Islands. *Geochimica et Cosmochimica Acta*, 73(7), 2034–2060. doi:10.1016/j.gca.2008.12.028
- Milton, G. M., & Kramer, S. J. (1997). Using <sup>14</sup>C as a Tracer of Carbon Accumulation and Turnover in Soils. *Radiocarbon*, 40(2), 999–1011. doi:10.1017/s003382220001897x
- Monreal, C. M., Schulten, H.-R., & Kodama, H. (1997). Age, turnover and molecular diversity of soil organic matter in aggregates of a Gleysol. *Canadian Journal of Soil Science*, 77(3), 379–388. doi:10.4141/s95-064
- Mueller, C. W., Gutsch, M., Kothieringer, K., Leifeld, J., Rethemeyer, J., Brueggemann, N., & Kögel-Knabner, I. (2014). Bioavailability and isotopic composition of CO<sub>2</sub> released

Please visit [soilradiocarbon.org](http://soilradiocarbon.org) for the most up-to-date list.

from incubated soil organic matter fractions. *Soil Biology and Biochemistry*, 69, 168–178. doi:10.1016/j.soilbio.2013.11.006

- Muhr, J., & Borken, W. (2009). Delayed recovery of soil respiration after wetting of dry soil further reduces C losses from a Norway spruce forest soil. *Journal of Geophysical Research*, 114(G4). doi:10.1029/2009jg000998
- Nagy, R. C., Porder, S., Brando, P., Davidson, E. A., Figueira, A. M. e S., Neill, C., ... Trumbore, S. (2018). Soil Carbon Dynamics in Soybean Cropland and Forests in Mato Grosso, Brazil. *Journal of Geophysical Research: Biogeosciences*, 123(1), 18–31. doi:10.1002/2017jg004269
- Nave, L. E., Drevnick, P. E., Heckman, K. A., Hofmeister, K. L., Veverica, T. J., & Swanston, C. W. (2017). Soil hydrology, physical and chemical properties and the distribution of carbon and mercury in a postglacial lake-plain wetland. *Geoderma*, 305, 40–52. doi:10.1016/j.geoderma.2017.05.035
- Nowinski, N. S., Trumbore, S. E., Jimenez, G., & Fenn, M. E. (2009). Alteration of belowground carbon dynamics by nitrogen addition in southern California mixed conifer forests. *Journal of Geophysical Research: Biogeosciences*, 114(G2), n/a–n/a. doi:10.1029/2008jg000801
- Nowinski, N. S., Taneva, L., Trumbore, S. E., & Welker, J. M. (2010). Decomposition of old organic matter as a result of deeper active layers in a snow depth manipulation experiment. *Oecologia*, 163(3), 785–792. doi:10.1007/s00442-009-1556-x
- O'DONNELL, J. A., HARDEN, J. W., MCGUIRE, A. D., KANEVSKIY, M. Z., JORGENSEN, M. T., & XU, X. (2010). The effect of fire and permafrost interactions on soil carbon accumulation in an upland black spruce ecosystem of interior Alaska: implications for post-thaw carbon loss. *Global Change Biology*, 17(3), 1461–1474. doi:10.1111/j.1365-2486.2010.02358.x
- O'Brien, B. J. (1986). The Use of Natural and Anthropogenic <sup>14</sup>C to Investigate the Dynamics of Soil Organic Carbon. *Radiocarbon*, 28(2A), 358–362. doi:10.1017/s0033822200007463
- Ohno, T., Heckman, K. A., Plante, A. F., Fernandez, I. J., & Parr, T. B. (2017). <sup>14</sup>C mean residence time and its relationship with thermal stability and molecular composition of soil organic matter: A case study of deciduous and coniferous forest types. *Geoderma*, 308, 1–8. doi:10.1016/j.geoderma.2017.08.023
- Paul, E. A., Follett, R. F., Leavitt, S. W., Halvorson, A., Peterson, G. A., & Lyon, D. J. (1997). Radiocarbon Dating for Determination of Soil Organic Matter Pool Sizes and Dynamics. *Soil Science Society of America Journal*, 61(4), 1058. doi:10.2136/sssaj1997.03615995006100040011x
- NULL
- Pessenda, L. C. R., Valencia, E. P. E., Camargo, P. B., Telles, E. C. C., Martinelli, L. A., Cerri, C. C., ... Rozanski, K. (1996). Natural Radiocarbon Measurements in Brazilian Soils Developed on Basic Rocks. *Radiocarbon*, 38(2), 203–208. doi:10.1017/s0033822200017574

Please visit [soilradiocarbon.org](http://soilradiocarbon.org) for the most up-to-date list.



- Pessenda, L. C. R., Gouveia, S. E. M., & Aravena, R. (2001). Radiocarbon Dating of Total Soil Organic Matter and Humin Fraction and Its Comparison with  $^{14}\text{C}$  Ages of Fossil Charcoal. *Radiocarbon*, 43(2B), 595–601. doi:10.1017/s0033822200041242
- Phillips, C. L., McFarlane, K. J., Risk, D., & Desai, A. R. (2013). Biological and physical influences on soil  $^{14}\text{CO}_2$  seasonal dynamics in a temperate hardwood forest. *Biogeosciences*, 10(12), 7999–8012. doi:10.5194/bg-10-7999-2013
- Posada, J. M., & Schuur, E. A. G. (2011). Relationships among precipitation regime, nutrient availability, and carbon turnover in tropical rain forests. *Oecologia*, 165(3), 783–795. doi:10.1007/s00442-010-1881-0
- Quideau, S. A., Chadwick, O. A., Trumbore, S. E., Johnson-Maynard, J. L., Graham, R. C., & Anderson, M. A. (2001). Vegetation control on soil organic matter dynamics. *Organic Geochemistry*, 32(2), 247–252. doi:10.1016/s0146-6380(00)00171-6
- Rabbi, S. M. F., Hua, Q., Daniel, H., Lockwood, P. V., Wilson, B. R., & Young, I. M. (2013). Mean Residence Time of Soil Organic Carbon in Aggregates Under Contrasting Land Uses Based on Radiocarbon Measurements. *Radiocarbon*, 55(1), 127–139. doi:10.2458/azu\_js\_rc.v55i1.16179
- Rasmussen, C., Torn, M. S., & Southard, R. J. (2005). Mineral Assemblage and Aggregates Control Carbon Dynamics in a California Conifer Forest. *Soil Science Society of America Journal*, 69(6), 1711. doi:10.2136/sssaj2005.0040
- Rasmussen, C., & White, D. A. (2010). Vegetation Effects on Soil Organic Carbon Quality in an Arid Hyperthermic Ecosystem. *Soil Science*, 175(9), 438–446. doi:10.1097/ss.0b013e3181f38400
- Rasmussen, C., Throckmorton, H., Liles, G., Heckman, K., Meding, S., & Horwath, W. (2018). Controls on Soil Organic Carbon Partitioning and Stabilization in the California Sierra Nevada. *Soil Systems*, 2(3), 41. doi:10.3390/soilsystems2030041
- Resh, S. C., Binkley, D., & Parrotta, J. A. (2002). Greater Soil Carbon Sequestration under Nitrogen-fixing Trees Compared with Eucalyptus Species. *Ecosystems*, 5(3), 217–231. doi:10.1007/s10021-001-0067-3
- Rethemeyer, J., Kramer, C., Gleixner, G., John, B., Yamashita, T., Flessa, H., ... Grootes, P. M. (2005). Transformation of organic matter in agricultural soils: radiocarbon concentration versus soil depth. *Geoderma*, 128(1-2), 94–105. doi:10.1016/j.geoderma.2004.12.017
- Richter, D. D., Markewitz, D., Trumbore, S. E., & Wells, C. G. (1999). Rapid accumulation and turnover of soil carbon in a re-establishing forest. *Nature*, 400(6739), 56–58. doi:10.1038/21867
- Rogers, B. M., Veraverbeke, S., Azzari, G., Czimczik, C. I., Holden, S. R., Mouteva, G. O., ... Randerson, J. T. (2014). Quantifying fire-wide carbon emissions in interior Alaska using field measurements and Landsat imagery. *Journal of Geophysical Research: Biogeosciences*, 119(8), 1608–1629. doi:10.1002/2014jg002657

Please visit [soilradiocarbon.org](http://soilradiocarbon.org) for the most up-to-date list.



- Rumpel, C., Kögel-Knabner, I., & Bruhn, F. (2002). Vertical distribution, age, and chemical composition of organic carbon in two forest soils of different pedogenesis. *Organic Geochemistry*, 33(10), 1131–1142. doi:10.1016/s0146-6380(02)00088-8
- Rumpel, C., Chaplot, V., Chabbi, A., Largeau, C., & Valentin, C. (2008). Stabilisation of HF soluble and HCl resistant organic matter in sloping tropical soils under slash and burn agriculture. *Geoderma*, 145(3-4), 347–354. doi:10.1016/j.geoderma.2008.04.001
- Saiz, G., Bird, M., Wurster, C., Quesada, C. A., Ascough, P., Domingues, T., ... Lloyd, J. (2015). The influence of C<sub>3</sub> and C<sub>4</sub> vegetation on soil organic matter dynamics in contrasting semi-natural tropical ecosystems. *Biogeosciences*, 12(16), 5041–5059. doi:10.5194/bg-12-5041-2015
- Sanderman, J., Creamer, C., Baisden, W. T., Farrell, M., & Fallon, S. (2017). Greater soil carbon stocks and faster turnover rates with increasing agricultural productivity. *SOIL*, 3(1), 1–16. doi:10.5194/soil-3-1-2017
- Scharpenseel, H. W., & Pietig, F. (1973). University of Bonn Natural Radiocarbon Measurements V. *Radiocarbon*, 15(1), 13–41. doi:10.1017/s0033822200058586
- Schimel, J. P., Wetterstedt, J. Å. M., Holden, P. A., & Trumbore, S. E. (2011). Drying/rewetting cycles mobilize old C from deep soils from a California annual grassland. *Soil Biology and Biochemistry*, 43(5), 1101–1103. doi:10.1016/j.soilbio.2011.01.008
- Schöning, I., & Kögel-Knabner, I. (2006). Chemical composition of young and old carbon pools throughout Cambisol and Luvisol profiles under forests. *Soil Biology and Biochemistry*, 38(8), 2411–2424. doi:10.1016/j.soilbio.2006.03.005
- Schulze, K., Borken, W., Muhr, J., & Matzner, E. (2009). Stock, turnover time and accumulation of organic matter in bulk and density fractions of a Podzol soil. *European Journal of Soil Science*, 60(4), 567–577. doi:10.1111/j.1365-2389.2009.01134.x
- Schulze, K., Borken, W., & Matzner, E. (2010). Dynamics of dissolved organic 14C in throughfall and soil solution of a Norway spruce forest. *Biogeochemistry*, 106(3), 461–473. doi:10.1007/s10533-010-9526-2
- NULL
- Schuur, E. A. G., & Trumbore, S. E. (2006). Partitioning sources of soil respiration in boreal black spruce forest using radiocarbon. *Global Change Biology*, 12(2), 165–176. doi:10.1111/j.1365-2486.2005.01066.x
- Schwartz, D., de Foresta, H., Mariotti, A., Balesdent, J., Massimba, J. P., & Girardin, C. (1996). Present dynamics of the savanna-forest boundary in the Congolese Mayombe: a pedological, botanical and isotopic (13C and 14C) study. *Oecologia*, 106(4), 516–524. doi:10.1007/bf00329710
- Shaw, D., Franklin, J., Bible, K., Klopatek, J., Freeman, E., Greene, S., & Parker, G. (2004). Ecological Setting of the Wind River Old-growth Forest. *Ecosystems*, 7(5). doi:10.1007/s10021-004-0135-6

Please visit [soilradiocarbon.org](http://soilradiocarbon.org) for the most up-to-date list.

- Shen, C., Yi, W., Sun, Y., Xing, C., Yang, Y., Yuan, C., ... Liu, T. (2001). Distribution of <sup>14</sup>C and <sup>13</sup>C in Forest Soils of the Dinghushan Biosphere Reserve. *Radiocarbon*, 43(2B), 671–678. doi:10.1017/s0033822200041321
- Sierra, C. A., Trumbore, S. E., Davidson, E. A., Frey, S. D., Savage, K. E., & Hopkins, F. M. (2012). Predicting decadal trends and transient responses of radiocarbon storage and fluxes in a temperate forest soil. *Biogeosciences*, 9(8), 3013–3028. doi:10.5194/bg-9-3013-2012
- Sollins, P., Swanston, C., Kleber, M., Filley, T., Kramer, M., Crow, S., ... Bowden, R. (2006). Organic C and N stabilization in a forest soil: Evidence from sequential density fractionation. *Soil Biology and Biochemistry*, 38(11), 3313–3324. doi:10.1016/j.soilbio.2006.04.014
- Sollins, P., Kramer, M. G., Swanston, C., Lajtha, K., Filley, T., Aufdenkampe, A. K., ... Bowden, R. D. (2009). Sequential density fractionation across soils of contrasting mineralogy: evidence for both microbial- and mineral-controlled soil organic matter stabilization. *Biogeochemistry*, 96(1-3), 209–231. doi:10.1007/s10533-009-9359-z
- Stephan, S., Berrier, J., De Petre, A. A., Jeanson, C., Kooistra, M. J., Scharpenseel, H. W., & Schiffmann, H. (1983). Characterization of in situ organic matter constituents in vertisols from Argentina, using submicroscopic and cytochemical methods — first report. *Geoderma*, 30(1-4), 21–34. doi:10.1016/0016-7061(83)90054-x
- Stout, J. D., & Goh, K. M. (1980). The Use of Radiocarbon to Measure the Effects of Earthworms On Soil Development. *Radiocarbon*, 22(3), 892–896. doi:10.1017/s0033822200010298
- Swanston, C. W., Torn, M. S., Hanson, P. J., Southon, J. R., Garten, C. T., Hanlon, E. M., & Ganio, L. (2005). Initial characterization of processes of soil carbon stabilization using forest stand-level radiocarbon enrichment. *Geoderma*, 128(1-2), 52–62. doi:10.1016/j.geoderma.2004.12.015
- Szymanski, L. M., Sanford, G. R., Heckman, K. A., Jackson, R. D., & Marín-Spiotta, E. (2019). Conversion to bioenergy crops alters the amount and age of microbially-respired soil carbon. *Soil Biology and Biochemistry*, 128, 35–44. doi:10.1016/j.soilbio.2018.08.025
- Tan, W., Zhou, L., & Liu, K. (2013). Soil aggregate fraction-based <sup>14</sup>C analysis and its application in the study of soil organic carbon turnover under forests of different ages. *Chinese Science Bulletin*, 58(16), 1936–1947. doi:10.1007/s11434-012-5660-7
- Taylor, A. J., Lai, C.-T., Hopkins, F. M., Wharton, S., Bible, K., Xu, X., ... Ehleringer, J. R. (2015). Radiocarbon-Based Partitioning of Soil Respiration in an Old-Growth Coniferous Forest. *Ecosystems*, 18(3), 459–470. doi:10.1007/s10021-014-9839-4
- Tefs, C., & Gleixner, G. (2012). Importance of root derived carbon for soil organic matter storage in a temperate old-growth beech forest – Evidence from C, N and <sup>14</sup>C content. *Forest Ecology and Management*, 263, 131–137. doi:10.1016/j.foreco.2011.09.010

Please visit [soilradiocarbon.org](http://soilradiocarbon.org) for the most up-to-date list.

- Tegen, I., & Dörr, H. (1996).  $^{14}\text{C}$  Measurements of Soil Organic Matter, Soil  $\text{CO}_2$  and Dissolved Organic Carbon (1987–1992). *Radiocarbon*, 38(2), 247–251. doi:10.1017/s0033822200017628
- Martinelli, L. A., Pessenda, L. C. R., Espinoza, E., Camargo, P. B., Telles, F. C., Cerri, C. C., ... Trumbore, S. (1996). Carbon-13 variation with depth in soils of Brazil and climate change during the Quaternary. *Oecologia*, 106(3), 376–381. doi:10.1007/bf00334565
- Tifafi, M., Camino-Serrano, M., Hatté, C., Morras, H., Moretti, L., Barbaro, S., ... Guenet, B. (2018). The use of radiocarbon  $^{14}\text{C}$  to constrain carbon dynamics in the soil module of the land surface model ORCHIDEE (SVN r5165). *Geoscientific Model Development*, 11(12), 4711–4726. doi:10.5194/gmd-11-4711-2018
- Tonneijck, F. H., van der Plicht, J., Jansen, B., Verstraten, J. M., & Hooghiemstra, H. (2006). Radiocarbon Dating of Soil Organic Matter Fractions in Andosols in Northern Ecuador. *Radiocarbon*, 48(3), 337–353. doi:10.1017/s0033822200038790
- Torn, M. S., Trumbore, S. E., Chadwick, O. A., Vitousek, P. M., & Hendricks, D. M. (1997). Mineral control of soil organic carbon storage and turnover. *Nature*, 389(6647), 170–173. doi:10.1038/38260
- Torn, M. S., Lapenis, A. G., Timofeev, A., Fischer, M. L., Babikov, B. V., & Harden, J. W. (2002). Organic carbon and carbon isotopes in modern and 100-year-old-soil archives of the Russian steppe. *Global Change Biology*, 8(10), 941–953. doi:10.1046/j.1365-2486.2002.00477.x
- Torn, M. S., Vitousek, P. M., & Trumbore, S. E. (2005). The Influence of Nutrient Availability on Soil Organic Matter Turnover Estimated by Incubations and Radiocarbon Modeling. *Ecosystems*, 8(4), 352–372. doi:10.1007/s10021-004-0259-8
- Trumbore, S. E. (1993). Comparison of carbon dynamics in tropical and temperate soils using radiocarbon measurements. *Global Biogeochemical Cycles*, 7(2), 275–290. doi:10.1029/93gb00468
- Trumbore, S. E., Davidson, E. A., Barbosa de Camargo, P., Nepstad, D. C., & Martinelli, L. A. (1995). Belowground cycling of carbon in forests and pastures of eastern Amazonia. *Global Biogeochemical Cycles*, 9(4), 515–528. doi:10.1029/95gb02148
- De Camargo, P. B., Trumbore, S. E., Martinelli, L. A., Davidson, E. A., Nepstad, D. C., & Victoria, R. L. (1999). Soil carbon dynamics in regrowing forest of eastern Amazonia. *Global Change Biology*, 5(6), 693–702. doi:10.1046/j.1365-2486.1999.00259.x
- TELLES, E. D. C., DE CAMARGO, P. B., MARTINELLI, L. A., TRUMBORE, S. E., DA COSTA, E. S., SANTOS, J., ... MARKEWITZ, D. (2011). LBA-ECO CD-08 Carbon Isotopes in Belowground Carbon Pools, Amazonas and Para, Brazil. ORNL Distributed Active Archive Center. <https://doi.org/10.3334/ornlidaac/1025>
- Trumbore, S. E., Chadwick, O. A., & Amundson, R. (1996). Rapid Exchange Between Soil Carbon and Atmospheric Carbon Dioxide Driven by Temperature Change. *Science*, 272(5260), 393–396. doi:10.1126/science.272.5260.393

Please visit [soilradiocarbon.org](http://soilradiocarbon.org) for the most up-to-date list.

- Koarashi, J., Hockaday, W. C., Masiello, C. A., & Trumbore, S. E. (2012). Dynamics of decadal cycling carbon in subsurface soils. *Journal of Geophysical Research: Biogeosciences*, 117(G3), n/a–n/a. doi:10.1029/2012jg002034
- Marzaioli, F., Lubritto, C., Galdo, I. D., D’Onofrio, A., Cotrufo, M. F., & Terrasi, F. (2010). Comparison of different soil organic matter fractionation methodologies: Evidences from ultrasensitive <sup>14</sup>C measurements. *Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms*, 268(7-8), 1062–1066. doi:10.1016/j.nimb.2009.10.098
- Trumbore, S. E., & Harden, J. W. (1997). Accumulation and turnover of carbon in organic and mineral soils of the BOREAS northern study area. *Journal of Geophysical Research: Atmospheres*, 102(D24), 28817–28830. doi:10.1029/97jd02231
- Trumbore, S. E., Bubier, J. L., Harden, J. W., & Crill, P. M. (1999). Carbon cycling in boreal wetlands: A comparison of three approaches. *Journal of Geophysical Research: Atmospheres*, 104(D22), 27673–27682. doi:10.1029/1999jd900433
- Van Dam, D., van Breemen, N., & Veldkamp, E. (1997). *Biogeochemistry*, 39(3), 343–375. doi:10.1023/a:1005880031579
- Van der Voort, T. S., Hagedorn, F., McIntyre, C., Zell, C., Walthert, L., Schlegli, P., ... Eglinton, T. I. (2016). Variability in <sup>14</sup>C contents of soil organic matter at the plot and regional scale across climatic and geologic gradients. *Biogeosciences*, 13(11), 3427–3439. doi:10.5194/bg-13-3427-2016
- Van Mourik, J. M., Nierop, K. G. J., & Vandenbergh, D. A. G. (2010). Radiocarbon and optically stimulated luminescence dating based chronology of a polycyclic driftsand sequence at Weerterbergen (SE Netherlands). *CATENA*, 80(3), 170–181. doi:10.1016/j.catena.2009.11.004
- Vaughn, L., Torn, M., Porras, R., Curtis, B., & Chafe, O. (2018). *Radiocarbon in Ecosystem Respiration and Soil Pore-Space CO<sub>2</sub> with Surface Gas Flux, Air Temperature, and Soil Temperature and Moisture, Barrow, Alaska, 2012-2014* [Data set]. Next Generation Ecosystems Experiment - Arctic, Oak Ridge National Laboratory (ORNL), Oak Ridge, TN (US); <https://doi.org/10.5440/1364062>
- Wagai, R., Kajiura, M., Asano, M., & Hiradate, S. (2015). Nature of soil organo-mineral assemblage examined by sequential density fractionation with and without sonication: Is allophanic soil different? *Geoderma*, 241-242, 295–305. doi:10.1016/j.geoderma.2014.11.028
- Waldrop, M. P., Harden, J. W., Turetsky, M. R., Petersen, D. G., McGuire, A. D., Briones, M. J. I., ... Pruetz, L. E. (2012). Bacterial and enchytraeid abundance accelerate soil carbon turnover along a lowland vegetation gradient in interior Alaska. *Soil Biology and Biochemistry*, 50, 188–198. doi:10.1016/j.soilbio.2012.02.032
- Wang, Y., Amundson, R., & Trumbore, S. (1996). Radiocarbon Dating of Soil Organic Matter. *Quaternary Research*, 45(3), 282–288. doi:10.1006/qres.1996.0029

Please visit [soilradiocarbon.org](http://soilradiocarbon.org) for the most up-to-date list.

- Wang, Y., Amundson, R., & Trumbore, S. (1999). The impact of land use change on C turnover in soils. *Global Biogeochemical Cycles*, 13(1), 47–57. doi:10.1029/1998gb900005
- Wang, Y., Amundson, R., & Niu, X.-F. (2000). Seasonal and altitudinal variation in decomposition of soil organic matter inferred from radiocarbon measurements of soil CO<sub>2</sub> flux. *Global Biogeochemical Cycles*, 14(1), 199–211. doi:10.1029/1999gb900074
- WANG, L., OUYANG, H., ZHOUM, C.-P., ZHANG, F., SONG, M.-H., & TIAN, Y.-Q. (2005). Soil Organic Matter Dynamics Along a Vertical Vegetation Gradient in the Gongga Mountain on the Tibetan Plateau. *Journal of Integrative Plant Biology*, 47(4), 411–420. doi:10.1111/j.1744-7909.2005.00085.x
- Wunderlich, S., & Borken, W. (2012). Partitioning of soil CO<sub>2</sub> efflux in un-manipulated and experimentally flooded plots of a temperate fen. *Biogeosciences*, 9(8), 3477–3489. doi:10.5194/bg-9-3477-2012

Please visit [soilradiocarbon.org](http://soilradiocarbon.org) for the most up-to-date list.