

^{14}C dating of early Holocene paleosols using ramped pyrolysis of organic carbon

L. VETTER^{1*}, A. FERNANDEZ¹, B. E. ROSENHEIM²
AND T. E. TÖRNQVIST¹

¹Department of Earth and Environmental Sciences, Tulane University, New Orleans, LA 70118, USA
(*correspondence: lvetter@tulane.edu)

²College of Marine Sciences, University of South Florida, St. Petersburg, FL 33701, USA

Holocene sea-level records frequently rely on ^{14}C dating of basal peat to constrain the age of sea-level transgression during the last deglaciation [1], usually through dating of identifiable charcoal or plant fragments. When basal peat is eroded or absent, underlying Holocene paleosols rich in organic carbon but lacking identifiable plant remains can sometimes offer an alternative. However, bulk ^{14}C dates of paleosol organic carbon provide ages older than the time of soil burial [2]. Recently, ramped pyrolysis radiocarbon analysis of sedimentary organic material has been employed as a tool for elucidating ^{14}C age spectra and carbon cycle dynamics in sediments with multiple organic carbon sources [3]. In this study, we evaluate the use of the ramped pyrolysis technique for obtaining ^{14}C ages from early Holocene paleosols.

We collected sediment cores from three sites in southeastern Louisiana. Each site features an immature early Holocene paleosol overlain by basal peat that accumulated in an estuarine marsh, in turn overlain by lagoonal muds. For each paleosol (1-2% organic carbon), decarbonated samples were heated at 5°C min^{-1} from ambient laboratory temperature to 800°C . The decomposition products were oxidized to CO_2 and collected in 5 aliquots over the entire temperature profile. We performed an identical ramped pyrolysis protocol on each corresponding peat sample. Collected CO_2 gas was then graphitized for ^{14}C analysis. In addition, we collected charcoal fragments and other plant macrofossils from each peat bed for conventional AMS ^{14}C dating. We present the thermal ^{14}C age spectrum of organic carbon for each co-occurring peat and paleosol pair, with special attention paid to ^{14}C age differences between the two materials. We compare ^{14}C ages from low-temperature splits of ramped pyrolysis and plant macrofossils. Our results have implications for the potential use of ramped pyrolysis ^{14}C dating of paleosols.

[1] Li *et al* (2012), *Earth Plan. Sci. Lett.* **315-316**, 41-50 [2] Schaetzl and Anderson (2005), *NY, Cambridge Pr.*, 817 p. [3] Rosenheim *et al* (2013), *Radiocarbon* **55**, 115-126