

**CARBON-14 AGES OF PRODUCTS FROM RUTHENIUM TETROXIDE
OXIDATION OF MACROMOLECULAR ORGANIC MATTER IN MARINE
SEDIMENTS**

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Concurrently deposited organic carbon in aquatic sediments can derive from multiple sources that differ markedly in age. Autochthonous biomass, transported terrestrial biomass, and kerogen eroded from sedimentary rock can all contribute to the total organic carbon in the system. Deconvolving these various sources is of great importance not only in understanding an organic matter cycling within a specific environment, but in constraining global carbon cycling and budgets. In recent years, techniques have been developed to measure the carbon-14 ages of individual compounds (Eglinton *et al.*, 1996; Smittenberg *et al.*, 2002). Characterization of the ages of extractable source-specific biomarkers in a variety of environments has highlighted the complexity of sources and processes that contribute to organic matter content and composition (e.g., Eglinton *et al.*, 1997). Thus far, compound-specific carbon-14 measurements have primarily been applied to solvent extractable carbon pools, leaving a large percentage of the total organic carbon isotopically uncharacterized at the molecular level. In this study, we expand upon this approach by combining chemical degradation of the insoluble macromolecular organic matter preserved in a variety of aquatic sediments with carbon-14 age determination, in an attempt to further constrain the inputs and fate of organic carbon in these systems.

Ruthenium tetroxide (RuO₄) is a relatively mild and selective oxidizing agent that allows the isolation of aliphatic and alicyclic compounds from kerogen or other macromolecules (Standen *et al.*, 1991). It selectively targets aromatic units, converts ether bonds into ester bonds, and alkenes into aldehydes and ketones (Boucher *et al.*, 1990). Thus, cross-linked aliphatic and alicyclic compounds are liberated from the macromolecular matrix and rendered amenable to characterization by traditional chromatographic and spectroscopic techniques for extractable molecules. This chemical degradation technique has been applied to study the composition of biopolymers (e.g., Blokker *et al.*, 1998; Blokker *et al.*, 2006; Tegelaar *et al.*, 1989) as well as fossil and modern kerogens (e.g., Li *et al.*, 2004; Standen *et al.*, 1991; Yoshioka & Ishiwatari, 2005). Additionally, the carbon-13 isotopic value of the resulting products has been shown to reflect the bulk isotopic composition of the original kerogen (Kuypers *et al.*, 2002). RuO₄ oxidation in combination with a determination

of the Carbon-14 ages are being determined for RuO₄ oxidation products from a range of marine surface sediment samples that have previously been characterized in terms of their molecular ¹⁴C composition and differ widely in source input and depositional environment. In this way, assessments can be made concerning the origin and pre-depositional history of macromolecular components of sedimentary organic matter.

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