

**A DIRECT TEST OF THE RELATIONSHIP BETWEEN ORGANIC MATTER
REACTIVITY AND PARTICLE ASSOCIATIONS IN MARINE SEDIMENTS**

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Organic matter cycling through marine sediments represents an important component of the global carbon cycle. Despite numerous studies, our understanding of the factors dictate the degradation or preservation of organic matter remains limited. Two key recent observations that impinge on this issue are (i) the importance of organic matter-mineral associations as a crucial factor in preservation, and (ii) that organic matter deposited on the sea floor can be readily resuspended and laterally transported prior to its ultimate burial. Evidence for the latter process stems from natural abundance ^{14}C measurements on individual organic compounds isolated from sediments which have revealed that organic matter can be substantially pre-aged prior to, and during transport to its ultimate site of deposition (e.g., Ohkouchi et al., 2002; Mollenhauer et al., 2005).

In this study, we seek to examine the interrelationships between organic matter-mineral particle association, lateral transport and organic carbon burial in continental margin sediments. We exploit the age differences between freshly synthesized phytodetritus deposited from overlying surface waters and pre-aged algal residues supplied laterally on particles (e.g., in nepheloid layers). We seek to confirm the hypothesis that, due to the formation of an intimate association with detrital mineral phases, laterally advected organic matter will be less prone to degradation during diagenesis relative to freshly phytoplankton detritus (Mollenhauer & Eglinton, 2007).

In order to test this hypothesis, sediment from the Jordan Basin in the Gulf of Maine (an area of focusing and deposition of fine-grained sediments) was incubated under aerobic conditions for up to one year and the concentrations and ^{14}C natural abundances in lipid biomarkers (alkenones, fatty acids) were determined. We predict that the ^{14}C content of alkenones will decrease during the course of the experiment as young, labile alkenones are preferentially degraded over their pre-aged advected counterparts. Results from this study will be discussed in terms of our understanding of the controls on organic matter degradation in aquatic sediments.

REFERENCES

- Mollenhauer G., and Eglinton T.I. (2007) Diagenetic and sedimentological controls on the composition of organic matter preserved in California Borderland Basin sediments. *Limnol. Oceanogr.* 52(2). In press.
- Mollenhauer G., Kienast M, Lamy F., Meggers H., Schneider R.R., Hayes J.M. and Eglinton T.I.(2005) An evaluation of ¹⁴C age relationships between co-occurring foraminifera, alkenones, and total organic carbon in continental margin sediments. *Paleoceanog.*, **20**, PA1016, 2004PA001103.
- Ohkouchi, N., Eglinton T. I., Keigwin L. D., and Hayes J. M. (2002), Spatial and temporal offsets between proxy records in a sediment drift, *Science*, **298**, 1224–1227.