

What can carbon isotopes tell us about the nature of photo-labile dissolved organic carbon?

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Dissolved organic carbon (DOC) is one of the largest pools of actively cycling reduced carbon in the environment. One poorly-constrained loss term for DOC is its photo-degradation to inorganic carbon. It is well known that the irradiation of terrigenous DOC with sunlight preferentially bleaches color and photodegrades aromatics, including lignin and condensed aromatics. It is also known that lignin exhibits a depleted carbon isotopic signature in relation to other compound classes. In recent work, we directly determined the ¹³C of DIC photoproducts from terrigenous DOC. The photoproduct DIC was depleted in ¹³C consistent with the photo-oxidation of a terrigenous aromatic source such as lignin. Oceanic waters are depleted in lignin relative to terrigenous DOC. Thus it is unclear whether DIC photoproducts from oceanic DOC will be enriched or depleted in ¹³C relative to its source material. We have undertaken a series of measurements of photoproduct inorganic carbon from DOC in order to test for this across a wide range of environments.