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Assessment of radiocarbon measurement of dissolved organic carbon for small samples by MICADAS

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Radiocarbon (14C) composition of dissolved organic carbon (DOC) provides critical constraints on its sources, transformation and cycles. UV-irradiation is considered as an effective approach to oxidize the fresh/salty DOC to CO2 of samples with typical low concentration for high precision radiocarbon measurements. However, the challenge of this method is the complete oxidation of sufficient DOC with low procedural blanks. An UV-oxidation system at the Ocean University of China (OUC) can process 12 DOC samples simultaneously with high oxidation efficiency (>95%) and high reproducibility, and a mini carbon dating system (MICADAS) at the OUC Radiocarbon Accelerator Mass Spectrometer Center is suitable for radiocarbon measurements. Thus, to evaluate the radiocarbon measurement performance for small DOC samples by MICADAS, we applied two CO2 collection approaches on a vacuum line after UV-oxidation for fresh and salty samples (KI trap vs. No KI trap), two reference standards, oxalic acid II (OX-II, modern) and glycine (Gly, dead), and a series of natural DOC samples from the Pearl River-Estuary-northern South China Sea continuum with different salinities. Our results showed that the procedural blanks of UV-oxidation and generated CO2 collection of these two approaches were not very different, i.e. 1.65±0.50 μgC with F14C = 0.485±0.145 and 1.70±0.51 μgC with F14C = 0.412±0.124 for procedural blank, respectively. The procedural blank of small DOC samples was comparable with that of regular size DOC samples (< 2μgC), and the F14C values of field DOC samples were also in line with previous studies. Therefore, UV-oxidation method combined MICADAS measurement provided powerful tool to generate high throughput data to understand compositional, spatial and temporal variabilities of DOC.

Student Submission

No

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