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Carbon and mercury stable isotope fractionation during aqueous MeHg photoreduction

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The natural processes of breakdown and formation of chemical species often act as isotopic filters that leave characteristic traces (fingerprints) in the isotopic composition of compounds. These fingerprints can be used then to investigate the biogeochemical pathways and/or to trace the origin of certain pollutant compounds of interest like mercury (Hg). In 2007 Bergquist and Blum[1] studied the Hg stable isotopic fractionation during the photochemical reduction and decomposition of mercury compounds (Hg^{2+} and methyl mercury (MeHg), respectively) in water samples. Later, in 2010, Zhang and Hsu-Kim[2] investigated more specifically the role of dissolved organic ligands on Hg stable isotopic fractionation during the photodegradation of MeHg. However, what happens to the stable isotopic composition of the carbon atom of the methyl ($-CH_3$) group during MeHg photochemical degradation is unknown. If we want to use the $\delta^{13}C_{MeHg}$ to understand the origin of the C source in MeHg, then we need to account for C isotope fractionation during MeHg breakdown. In the present work we repeated the photodegradation studies by Bergquist and Blum as well as those of Zhang and Hsu-Kim, to analyze and characterize C isotope fractionation of the methyl group of MeHg by using a new compound specific isotope analysis technique (CSIA): purge and trap – gas chromatography – combustion – isotope ratio mass spectrometry (PT-GC-C-IRMS)[3], [4].

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