

Stable carbon isotopic composition of low molecular weight dicarboxylic acids and oxoacids: Seasonal and decadal trends in the marine aerosols from the western North Pacific

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Low molecular weight (LMW) dicarboxylic acids such as oxalic acid (C₂) are major fraction of organic aerosols^[1]. To better understand long-term atmospheric changes in the western North Pacific, we collected marine aerosol samples in 2001-2013 on weekly basis at a remote island, Chichijima (27° 04'E; 142° 13'N), located in the outflow region of Asian aerosols and their precursors. Here we studied $\delta^{13}\text{C}$ of diacids (C₂-C₉) and oxoacids (C₂-C₉) using GC/C/IRMS after BF₃/n-butanol derivatization^[2].

$\delta^{13}\text{C}$ of oxalic acid showed relatively high $\delta^{13}\text{C}$ values (-22‰ to -2‰, av. -12‰). The isotope ratios increased from winter to summer. Summertime photochemical aging of organic aerosols likely causes significant enrichment of ¹³C in oxalic acid during the transport. It may be caused by kinetic isotopic fractionation during the photo degradation of oxalic acid in the presence of Fe (III), and/or the gas/particle partitioning of glyoxal and glyoxylic acid, which are potential sources of oxalic acid. We also found a gradual decrease in $\delta^{13}\text{C}$ of oxalic acid from 2001 to 2013. This decadal trend may suggest a decline of the atmospheric oxidation capability in the western North Pacific.

[1] Kawamura et al. (2010) *J. Geophys. Res.*, **115**, D21306, doi:10.1029/2010JD014299. [2] Kawamura and Watanabe (2004) *Anal. Chem.* **76**, 5762-5768.