Application of Dual Carbon Isotopes in Ecosystem Studies

Neung-Hwan Oh[1,2]*, Eun-Ju Lee[1], Ji-Yeon Cha[1], Seung-Cheol Lee[1], and Kyu-Yeon Lee[1]
[1]Department of Environmental Planning, Graduate School of Environmental Studies, Seoul National University, Seoul, Republic of Korea
[2]Environmental Planning Institute, Seoul National University, Seoul, Republic of Korea
*E-mail: onh@snu.ac.kr

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Understanding carbon cycle in ecosystems is crucial to predict the changes of the environment under climate change. Dual carbon isotope (^{14}C, ^{13}C) analysis provides a powerful tool to track the sources of carbon in terrestrial and aquatic ecosystems. While the $\delta^{13}C$ provides information on the sources of carbon such as carbonates, C3 plants, and C4 plants, the $\Delta^{14}C$ can be used to calculate the contribution of fossil-fuel derived carbon. The dual carbon isotope analysis has been applied for a variety of samples including rain, sleet, PM2.5, stream water, river water, and soils in ecosystems of South Korea. The $\delta^{13}C$ ranged from -30.0‰ in particulate organic carbon in a river to -4.3‰ in dissolved inorganic carbon in a river, while the $\Delta^{14}C$ ranged from -561.9‰ in organic carbon of PM2.5 to >30,000‰ in dissolved organic carbon of sleet, demonstrating strong dependence of the carbon isotope ratios on sample types as well as seasons. Despite of the potentials of the dual carbon isotope analysis, the number of reported values of them in South Korea is still relatively small, warranting future studies on a variety of ecosystems fully utilizing the tool.