Model estimation of natural terrestrial methane emission and their stable carbon isotope ratio at broad scale

*Akihiko Ito[1]

1. National Institute for Environmental Studies

Methane (CH_4) is the second potent greenhouse gas and an important short-lived climatic pollutant. However, because of its complicated sources and sinks, there remain large uncertainties in the global and regional budget of methane. In this study, a process-based terrestrial ecosystem model, Vegetation Integrative SImulator for Trace gases (VISIT), was used to simulate CH_4 emission from natural wetlands and CH_4 uptake by upland soil oxidation. The VISIT model captures carbon and nitrogen cycling by using simple box flow schemes and simulates exchange between atmosphere and ecosystem of greenhouse gases in a biogeochemical manner. To separate the observed CH_4 variability into biological and fossil-fuel components, it is effective to use stable carbon isotopes. Biologically-produced methane has lower (more depleted in ^{13}C) stable carbon isotope ratio than that from fossil fuel exploitation, but the ratio varies with substrates used for CH_4 production. Namely, CH_4 produced from carbon dioxide has lower ratio than that produced from acetate, and therefore, wetland CH_4 models should estimate the production rate taking account of its substrate composition. In this presentation, a preliminary result of the spatial distribution and temporal change in $^{13}C/^{12}C$ ratio of CH_4 produced in wetlands. Finally, the present author would discuss possible collaborations with atmospheric observations and future tasks.

Keywords: Methane, Wetland, Stable carbon isotope ratio, Process-based model

