

# Séminaire

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**salle L. Lliboutry, LGGE**

*Ji-Woong Yang*

*School of Earth and Environmental Sciences, Seoul National University, Seoul 151-747, Republic of Korea*

## **Reconstruction of atmospheric methane mixing ratio during the early Holocene and its control mechanism.**

Methane is one of important greenhouse gases whose principle source is known to be microbial activity in wetland ecosystem, but the control mechanism is still not well understood. Polar ice core is the unique archive that preserves the ancient atmosphere, thus it gives us a good constraints on past biogeochemical cycles. Previous ice core studies successfully revealed a striking correlation between atmospheric methane and climate of northern hemisphere in multi-millennial to orbital timescales. Recently published high-resolution studies tend to concentrate on the last two millennia, but late Holocene methane budget comprises both natural- and anthropogenic effect. Instead, we recovered a high-resolution methane data during early Holocene (started from 11,700 years ago) in which anthropogenic effect on climate is negligible, contributing a better understanding of natural methane control mechanism.

The ice core samples of Siple Dome, Antarctica were analyzed with a newly-developed wet extraction method, which shows a high-precision of about 1 ppb, and also a good agreement with previous measurement carried out at Oregon State University. We present a high-resolution Siple Dome methane composite extending to 7,800 years ago combining two datasets. The long-term decrease of methane mixing ratio is related to insolation change on northern hemisphere, as revealed by the results of previous studies. Gradual depletion of methane stable isotope ratio ( $\delta^{13}\text{C-CH}_4$ ) implies biogenic methane sources have been strengthened relative to other sources. Further, the inter-polar difference (IPD) of methane is nearly stable, but the magnitude is  $\sim 10$  ppb larger than late Holocene. In multi-centennial to millennial time domain, our data shows good correlations with proxies of Greenland temperature ( $\delta^{18}\text{O}_{\text{ice}}$ ), solar activity ( $^{10}\text{Be}$  flux), and terrestrial hydrology ( $\delta^{18}\text{O}_{\text{atm}}$  and  $\Delta_{\text{ELAND}}$ ). Also correlative variation with Mg/Ca sea surface temperature on Soledad basin (east tropical Pacific) suggests a possible impact of El Niño-like climate condition to methane emission.

At the end of this talk I'd like to briefly introduce the recently ongoing research of my lab: carbon dioxide evolution during the early Holocene and the last deglacial period, high-resolution methane analysis for the last millennia, and greenhouse gas content in Alaskan permafrost.