A06-O19

FORWARD AND INVERSE MODELLING OF GREENHOUSE GASES IN THE ARCTIC AND SUBARCTIC REGIONS

Dmitry Belikov *(National Institute for Environmental Studies; National Institute of Polar Research; Tomsk State University, Japan)*
Maksyutov Shamil *(National Institute for Environmental Studies, Japan)*
Hiroshi Takagi *(National Institute for Environmental Studies, Japan)*
Alexander Ganshin *(Central Aerological Observatory, Russian Federation)*
Ruslan Zhuravlev *(Central Aerological Observatory, Russian Federation)*

dmitry.belikov@nies.go.jp

Arctic and subarctic regions are large carbon reservoirs. Permafrost soils covering about 25% of the land surface in the Northern Hemisphere store nearly twice as much carbon as is currently present in the atmosphere (Brown et al., 1997). Schuur et al. (2009) found that areas which have thawed over the last 15 years show annual losses of old carbon that are 40% greater than those observed in minimally thawed areas, while areas that thawed decades earlier show annual old carbon losses 78% greater than those observed in minimally thawed areas. Organic carbon in permafrost soils may act as a positive feedback to global climate change due to enhanced biospheric respiration rates with warming (Koven et al., 2011).

In this work, we use forward and inverse simulation employing the National Institute for Environmental Studies (NIES) three-dimensional transport model (TM) and GOSAT retrieval data to analyze the distribution of CO_2 and CH_4 in the subarctic. We studied seasonal cycle and interannual variability. We also discuss the impact of emissions from strong wildfires occurring in the summer of 2010 in central western Russia, the USA, and Canada on enhanced CO_2 concentrations in the Arctic and subarctic.

1. Brown, J., Ferrians, O.J., Heginbottom, J.A., Melnikov, E.S., 1997. Circum-arctic Map of Permafrost and Ground-ice Conditions. U.S. Geol. Surv, Washington DC. Circum-Pacific Map, CP-45.
2. Koven, C.D., Ringeval, B., Friedlingstein, P., Ciais, P., Cadule, P., Khvorostyanov, D., Krinner, G., Tarnocai, C., 2011. Permafrost carbon-climate feedbacks accelerate global warming. P. Natl. Acad. Sci. USA 108, 14769e14774.
3. Schuur, E.A.G., Vogel, J.G., Crummer, K.G., Lee, H., Sickman, J.O., Osterkamp, T.E., 2009. The effect of permafrost thaw on old carbon release and net carbon exchange from tundra. Nature 459, 556e559.