

Spatial variability of CO₂, CH₄ and N₂O from hilly forest soils ? comparison of summer and litter-fall season in FM Tama

Sonoko Dorothea Kimura^{1*}, Ayaka Mo Kishimoto², Noriko Oura², Seikoh Sekikawa³,
Shinichiro Yonemura², Shigeto Sudo², Atushi Hayakawa⁴, Kazunori Minamikawa²,
Yusuke Takata², Hiroshi Hara¹

¹TUAT, ²NAES, ³Tamagawa Univ., ⁴Akita Pref. Univ.

Greenhouse gas emissions are highly dependent on topography in the forest (Nishina et al. 2009, Florinsky et al. 2004). In this study greenhouse gas emissions from forest soil was measured at rolling hill regions to investigate the influence of topography and vegetation on the spatial variability of carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O). The study site was FM Tamakyuryo, a research station of TUAT located in Hachioji, Tokyo. The vegetation is secondary deciduous forest dominated by oak and coniferous forest with cedar and cypress. The FM Tamakyuryo is surrounded by urban area and is known to have high N deposition. The N deposition from May 2006 to December 2006 was 19.7 kg N ha⁻¹y⁻¹ as open bulk deposition outside the forest and 50.6 kg N ha⁻¹y⁻¹ inside the cedar forest.

The gas flux was measured at 100 point, within a 100 x 100m plot divided in 10 grids on July 25th and Dec. 5th 2008. The elevation in the plot ranges from 144-180m. The plot ID is 1-10 from north to the south and A-J from west to east. 58 grids was covered 100% by secondary deciduous forest and 16 grids were covered more than 50% by coniferous trees. The measurement was conducted using the closed chamber technique and all the measurement was conducted between 13:00 -15:00.

CO₂, CH₄ and N₂O flux was higher in July than December (Fig 1). CO₂ flux ranged from 43 to 224 mg C m⁻²h⁻¹ in July and from 14 to 81 mg C m⁻²h⁻¹ in December. The northern area showed higher values in both times. CH₄ flux was -0.106 to 0.042 mg C m⁻²h⁻¹ in July and -0.089 to 0.007 mg C m⁻²h⁻¹ in December. Valley area (E4-J4, I5-I8) showed high fluxes in both periods. N₂O flux ranged from 0.001 to 0.299 mg N m⁻²h⁻¹ in July and -0.001 to 0.064 mg N m⁻²h⁻¹ in December. The N₂O flux had hot spots at both periods, which was different at both periods. The spatial patterns of the three gasses was analyzed in relation to topography and vegetation.

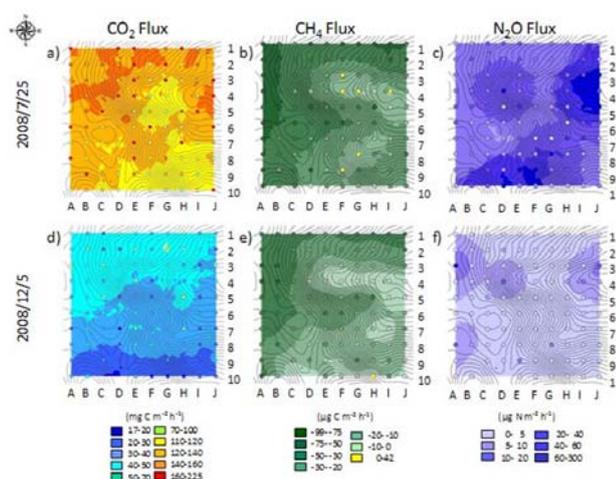


Fig 1. CO₂, CH₄ and N₂O flux in July and December

* Dots indicate the sampling point, the line the elevation (5m interval)

Keywords: Greenhouse gas, rolling hills, forest, spatial variability