Geophysical Research Abstracts,
Vol. 11, EGU2009-3850-1, 2009
EGU General Assembly 2009

Methane fluxes from the mound-building termite species of North Australian savannas

H Jamali (1), SJ Livesely (1), SK Arndt (1), T Dawes-Gromadzki (2), GD Cook (2), and L Hutley (3)

(1) Department of Forest and Ecosystem Science, The University of Melbourne, VIC 3010, Australia (h.jamali@pgrad.unimelb.edu.au), (2) CSIRO, Sustainable Ecosystems, PMB 44, Winnellie NT 0822, Australia, (3) School of Environment and Life Sciences, Charles Darwin University, NT 0909, Australia

Termites are estimated to contribute 3-19% to the global methane emissions. These estimates have large uncertainties because of the limited number of field-based studies and species studied, as well as issues of diel and seasonal variation. We measured methane fluxes from four common mound-building termite species (Microcerotermes nervosus, n=26; M. serratus, n=4; Tumulitermes pastinator, n=5; and Amitermes darwini, n=4) in tropical savannas near Darwin in the Northern Territory, Australia. Methane fluxes from replicated termite mounds were measured in the field using manual chambers with fluxes reported on a mound volume basis. Methane flux was measured in both wet and dry seasons and diel variation was investigated by measuring methane flux every 4 hours over a 24 hour period. Mound temperature was measured concurrently with flux to examine this relationship. In addition, five M. nervosus mounds removed from the field and incubated under controlled temperature conditions over a 24 hour period to remove the effect of varying temperature. During the observation campaigns, mean monthly minimum and maximum temperatures for February (wet season) were 24.7 and 30.8ºC, respectively, and were 20.1 to 31.4 ºC in June (dry season). Annual rainfall in 2008 for Darwin was 1970.1 mm, with a maximum of 670 mm falling in February and no rain in May and June. Methane fluxes were greatest in the wet season for all species, ranging from 265.1±101.1 (T. pastinator) to 2256.6±757.1 (M. serratus) μg CH4-C/m3/h. In the dry season, methane fluxes were at their lowest, ranging from 10.0±5.5 (T. pastinator) to 338.0±165.9 (M. serratus) μg CH4-C/m3/h. On a diel basis, methane fluxes were smallest at the coolest time of the day (õ700 hrs) and greatest at the warmest (î400 hrs) for all species, and for both wet and dry seasons. Typical diel variation in flux from M. serratus dominated mounds ranged from 902.6±261.9 to 1392.1±408.1 μg CH4-C/m3/h in wet season and 99.6±57.4 to 556.2±254.9 μg CH4-C/m3/h in dry season. While mounds of M. nervosus had diel variations in methane fluxes in the field, no diel variation was observed when incubated under constant laboratory temperature for 24 hours. This demonstrates that diel variation was not due to the movement of termites in and out of the mounds, but was due to temperature variation. Methane flux varied significantly according to termite species and at seasonal and diel time scales which, if not accounted for, could result in large under- or over-estimation of methane emissions from termites when flux data are extrapolated to landscape scales.