



Methane emissions in the Pantanal, South America, during the low water season – importance of environmental variables and within-lake variability

David Bastviken (1), Ana Lucia Santoro (2), Humberto Marotta (2), Luana Queiroz Pinho (2), Debora Calheiros (3), Patrick Crill (4), and Alex Enrich-Prast (2)

(1) Department of Thematic Studies – Water and Environmental Studies, Linköping University, 58183 Linköping, Sweden (david.bastviken@liu.se), (2) Department of Ecology, Federal University of Rio de Janeiro, 68020 Rio de Janeiro, Brazil (aenrich@biologia.ufrj.br), (3) Center for Agricultural Research in the Pantanal – Embrapa Pantanal, Caixa Postal 109.

Corumbá – MS, Brazil. 79.320-900 (debora@cpap.embrapa.br), (4) Department of Geology and Geochemistry, Stockholm University, 10691 Stockholm, Sweden (patrick.crill@geo.su.se)

Freshwater environments contribute on the order of 75% of the natural methane (CH₄) emissions. While there are indications that tropical lakes emit 58-400 % more CH₄ per area unit than similar environments in boreal and temperate biomes, direct measurements of tropical lake emissions are scarce. We measured CH₄ emissions from 15 lakes in the Pantanal region of South America, one of the world's largest tropical wetland areas, during the low water period. Measured fluxes ranged from 3.9 to 74.2 mmol m⁻² d⁻¹ and the average flux from all studied lakes was 8.79 mmol m⁻² d⁻¹ (equivalent to 131.8 mg CH₄ m⁻² d⁻¹). Ebullition accounted for 91 % of the flux (28-98 % on individual lakes). The use of floating diffusion chambers underlain by a submersed bubble shield in combination with regular, unshielded chambers provides a straightforward way of separating diffusive flux and ebullition. We observed diurnal cycling of emission rates and therefore 24 hour measurements are recommended compared to measurements not accounting for the full diurnal cycle. Within-lake variability of CH₄ emissions may be equally or more important than between-lake variability in floodplain areas, and this study identified habitats within lakes having widely different flux rates. Future measurements with static floating chambers should be based on many individual chambers distributed in the various sub-environments shown to differ in emissions in order to account for the within-lake variability.