Geophysical Research Abstracts
Vol. 20, EGU2018-7740, 2018
EGU General Assembly 2018

The role of methane oxidation in the carbon cycle of the lower Amazon River

Henrique Sawakuchi (1,2,4), Nicholas Ward (3), David Bastviken (4), Marcelo Z. Moreira (1), Plinio B. Camargo (1), Vania Neu (5), Aline M. Valerio (6), Alan C. Cunha (7), Diani F. S. Less (7), Joel E. M. Diniz (7), Daimio C. Brito (7), and Jeffrey Richey (8)

(1) Center of Nuclear Energy in Agriculture, University of São Paulo, Piracicaba, Brazil, (2) Department of Ecology and Environmental Science, Umeå University, Umeå, Sweden, (henrique.sawakuchi@umu.se), (3) Marine Sciences Laboratory, Pacific Northwest National Laboratory, Sequim, USA, (4) Department of Thematic Studies –Environmental Change, Linköping University, Linköping, Sweden, (5) Instituto Sócio Ambiental e dos Recursos Hídricos, Universidade Federal Rural da Amazônia, Belém, Brazil, (6) Departamento de Sensoriamento Remoto, Instituto Nacional de Pesquisas Espaciais, São José dos Campos, Brazil, (7) Departamento de Meio Ambiente e Desenvolvimento, Universidade Federal do Amapá, Macapá, Brazil, (8) School of Oceanography, University of Washington, Seattle, USA

Inland waters are recognized as an important source of methane (CH_4) to the atmosphere. Recent estimates have shown that the emissions from rivers and streams can be equivalent in order of magnitude to the uptake of CH_4 by soils. The CH_4 emitted to the atmosphere is a fraction of CH_4 that is not subjected to methane oxidation (MOX). Aquatic MOX may represent an important sink of CH_4. Microbial consumption of CH_4 in large rivers in the Amazon basin can be responsible for the reduction in emissions to the atmosphere of up to 2 $TgCH_4$ yr^{-1}. The consumed CH_4 is converted into partly CO_2 and partly biomass, that becomes available to the food web along the river continuum and potentially in the ocean. The relative magnitude of these two CH_4 fates and how they influence the aquatic carbon cycle is not well known. Here, we present ecosystem MOX estimates combined with ^{13}C-CH_4 enrichment incubations to evaluate the importance of MOX and the transformation rates of dissolved CH_4 into biomass and CO_2 in the water column of the lower Amazon River. Fluxes to the atmosphere were measured to better understand the CH_4 dynamics and the role CH_4 plays in the aquatic carbon cycle. Floating chamber measurements of CH_4 fluxes, stable isotopic composition of the surface water dissolved CH_4, and bubbles retrieved from shallow areas near the shore, along with surface water incubations with labeled ^{13}C-CH_4, were made during the rising water season in February 2016. The overall ecosystem MOX prevented approximately 56-74 % of the CH_4 emissions. The incubations showed transfer of the ^{13}C labeled CH_4 into both biomass and CO_2, indicating that the consumed CH_4 is converted into biomass that can support downstream food webs.