

## **Methane Emissions across Aquatic Systems - From Headwater Streams to the Open Ocean**

JUDITH A. ROSENTERER<sup>1</sup>, ALBERTO V. BORGES<sup>2</sup>,  
CARLOS M. DUARTE<sup>3</sup>, PETER A. RAYMOND<sup>4</sup>, PAUL A.  
DEL GIORGIO<sup>5</sup>, YVES T. PRARIE<sup>5</sup>, DAVID OLEFELDT<sup>6</sup>,  
BRADLEY D. EYRE<sup>1\*</sup>

<sup>1</sup>Centre for Coastal Biogeochemistry, Southern Cross  
University, Lismore, NSW, 2480, Australia  
(\*correspondence: bradley.eyre@scu.edu.au)

<sup>2</sup>Université de Liège, Unité d'Océanographie Chimique,  
Institut de Physique (B5a), 4000 Liège, Belgium

<sup>3</sup>King Abdullah University of Science and Technology  
(KAUST), Red Sea Research Center (RSRC), Thuwal,  
23955-6900, Saudi Arabia

<sup>4</sup>School of Forestry and Environmental Sciences, Yale  
University, New Haven, Connecticut 06115, United  
States

<sup>5</sup>Groupe de Recherche Interuniversitaire en Limnologie  
(GRIL), Département des Sciences Biologiques  
Université du Québec à Montréal, Montréal, Canada

<sup>6</sup>Department of Renewable Resources, University of Alberta,  
Edmonton, AB, T6G 2R3, Canada

Aquatic systems are an important, but poorly constrained, source of methane (CH<sub>4</sub>) to the atmosphere. The coastal ocean in particular has been insufficiently represented in global methane budgets and assessments like the IPCC 5<sup>th</sup> report. Here, we present a new meta-analysis of CH<sub>4</sub> emissions from the coastal ocean including inner estuaries, salt-marshes, mangroves, seagrass meadows, tidal flats, aquaculture ponds, coral reefs and the continental shelf. Coastal ocean emissions will be compared to those of the open ocean, and inland systems, including headwater streams, terrestrial permafrost thawing, rivers, lakes, natural ponds, reservoirs, non-tidal freshwater wetlands, and rice paddies. The main factors controlling CH<sub>4</sub> emissions in different aquatic ecosystems, and research gaps, will also be discussed.