

Title: Methane emissions from the salt marshes of Donana wetland: Spatio – temporal variability and controlling factors.

Authors: I. Emma Huertas¹, Mercedes de la Paz², Fiz F. Perez³, Gabriel Navarro¹ and Susana Flecha⁴

Source: Frontiers in Ecology and Evolution (2019) vol.7, article 32

Presenter: Regina Gwaibo - 11183012

Advisor: Dr Tseng, Hsiao-Chun

Date: 12/21/2022

Abstract

Coastal wetlands are significant sources of methane in the atmosphere, however emissions in these ecosystems are poorly constrained as *in situ* data are limited. This study presents the first assessments of spatio-temporal variations in air-water CH₄ fluxes in the salt marshes of Donana wetland. Between March 2016 and March 2018, 16 field campaigns were conducted, surface water CH₄ concentrations were measured using static-head space equilibrium gas chromatography in seven sites representing salt marshes located in the land strip close to the estuary. Due to meteorological conditions including tide variations, salinity varies across the salt marshes, although polyhaline marshes are sites closer to the estuary whereas mesohaline marshes are categorized at upstream sites. The CH₄ saturation range was 252 – 36, 735% (average, 170%) and 374 – 620,007% (average 31, 541%) in polyhaline and mesohaline marshes, respectively. These results suggest inhibitory effect of sulfate on methanogenesis, although a linear between dissolved CH₄ concentration and salinity was not observed. In contrast, water temperature and chlorophyll *a* were significantly and positively correlated with CH₄, indicating sedimentary methanogenesis by temperature, and organic matter availability boosted by primary productivity. Thus, there is possibility that some CH₄ might come from estuarine inputs. Air-water CH₄ fluxes ranged from 2.6 to 720 μmol m⁻² d⁻¹ (average 104 μmol m⁻² d⁻¹) in the polyhaline and and from 5.6 to 12,715 μmol m⁻² d⁻¹ (average 637 μmol m⁻² d⁻¹) in the mesohaline marshes, with higher emissions measured during the summer months in all sites. Even though the strongest environmental drivers of dissolved CH₄ accumulation seemed to be temperature and productivity, the spatio-temporal patterns observed suggest that methane dynamics in the Doñana salt marshes are controlled by a mosaic of processes rather than by a single environmental force.

Reference

Huertas, I. E., Flecha, S., Navarro, G., Pérez, F. F., and de la Paz, M. (2018). Spatio-temporal variability and controls on methane in the Guadalquivir Estuary, Southwestern Europe. *Aqu. Sci.* 80:29. doi: 10.1007/s00027-018-0580-5