Methane Production in Lake and Wetland Sediments in the Maritime Antarctica (Fildes Peninsula, King George Island)

Caetano , L[1], Petsch, C.[2] R. Vieira[1,2], Cosme , L.[1] H. Marotta[1]
[1]Sedimentary and Environmental Processes Laboratory – UFF - Brazil
[2]Polar and Climate Center – UFRGS – Brazil

OBJECTIVE

To evaluate the effects of experimental warming on CH_4 production rates in lake and wetland sediments, encompassing a temperature gradient from different IPCC scenarios.

METHODS

This study was carried out in 4 lakes and 2 wetlands at a deglaciated area of the Fildes Peninsula, King George Island (Fig.1) We assumed a control similar to the mean temperature in this region (-2 ºC), and other three warmer conditions (2, 4 and 7 ºC/Temperature of the predicted IPCC scenarios), which were kept constant using 4 high-precision thermostatic baths for incubations of lake and wetland sediments (N= 03 and 02 respectively).

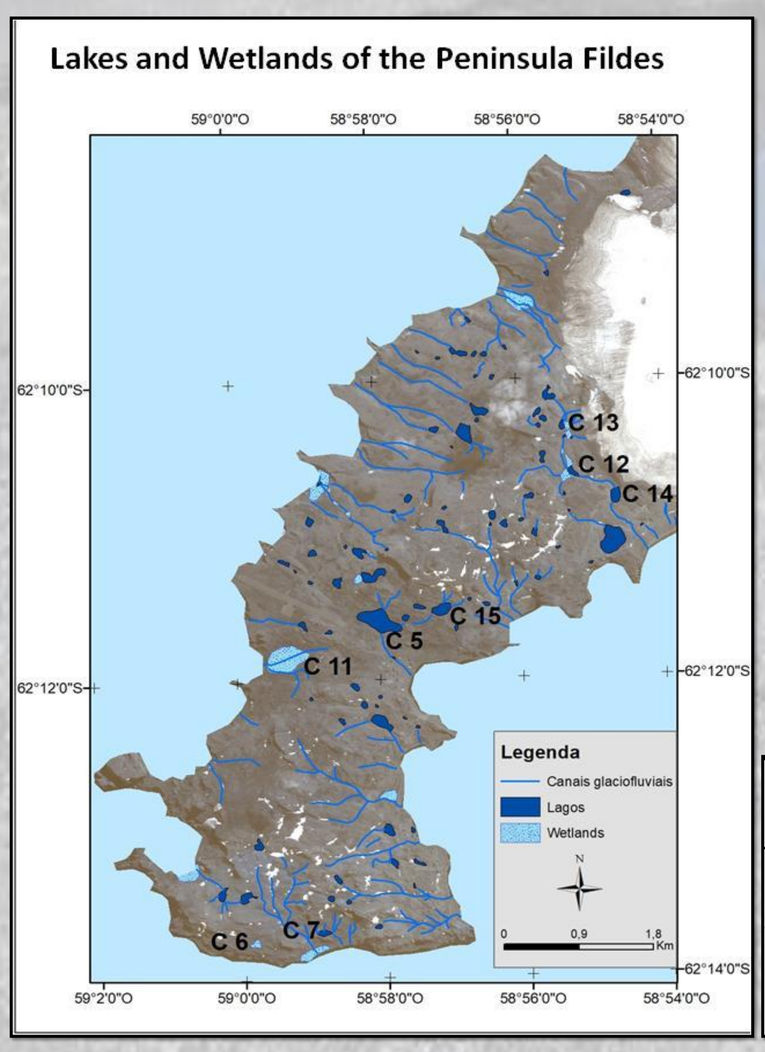
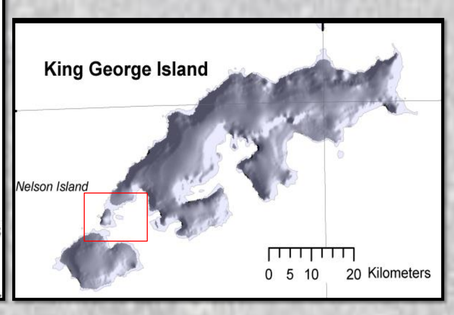


Figure 1: Inland waters of the Fildes Peninsula.



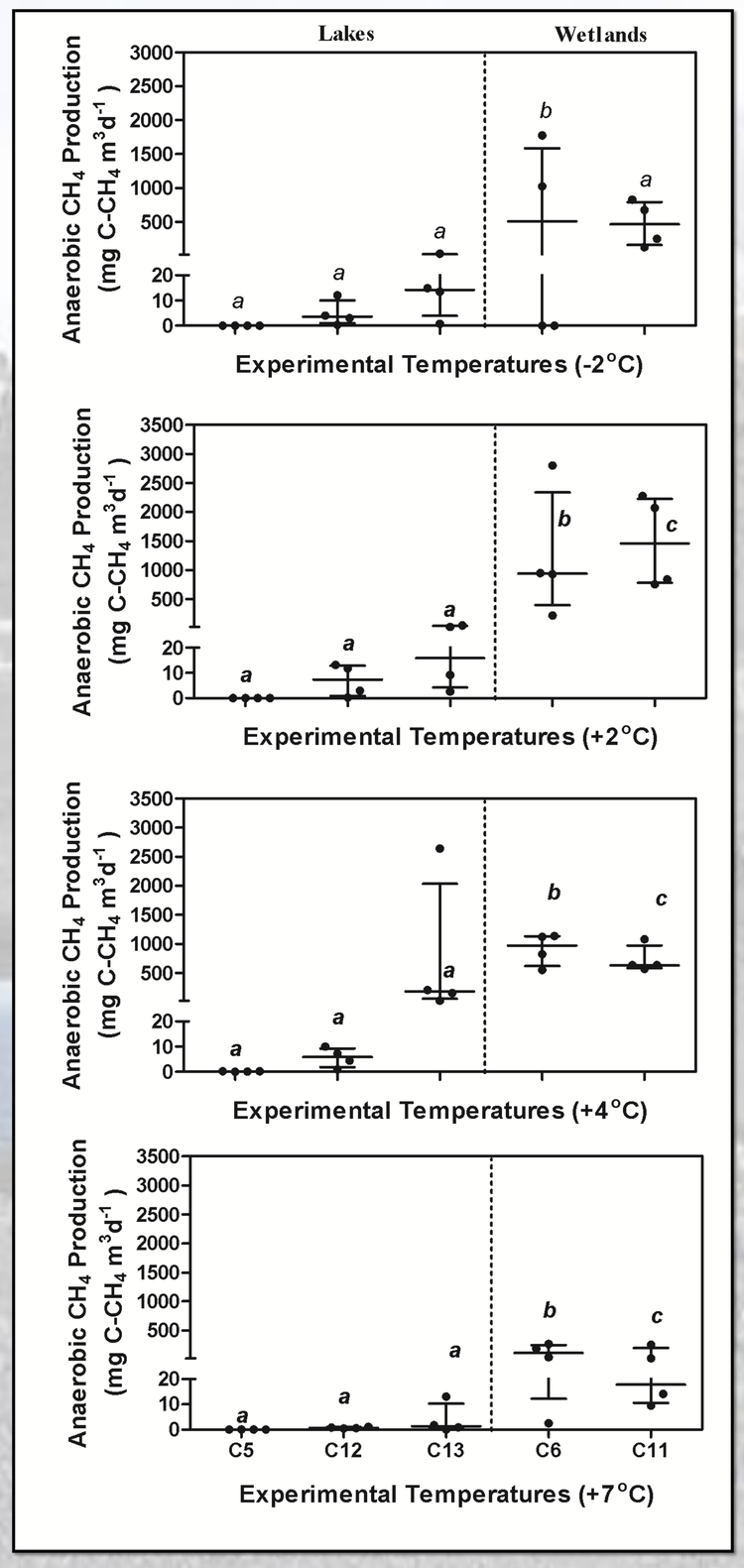


Figure 3: CH_4 production in sub-polar aquatic sediments of the Maritime Antarctic (Fildes Peninsula, King George Island) comparing the environments for each temperature of the predicted IPCC scenarios. The same letters represent non-significant differences between the ecosystems (Tukey-Kramer, p> 0.05, panel 3A). Horizontal bars indicate medians with 25-75% interquartile.

WETLANDS

LAKES

Figure 2: Types of inland waters studied.

RESULTS

Sediment CH_4 production by organic decomposition varied widely among ecosystems and temperatures (Tukey-Kramer, $p<0.05$; Fig. 3) Our findings indicate an overall positive effect of warming on methanogensis in aquatic sediments especially in more conservative warming scenarios. Wetlands showed on meadian higher values of CH_4 production at temperatures +2, +4 and 7ºC. However, the C13 lake presented a greater breadth for the temperature of + 4 °C than the other environments.

CONCLUSION

The observed high deviation from the medians reflects variable responses of CH_4 production in each experimental temperature due to significant heterogeneity among ecosystems, suggesting that these rates could become increasingly intense and variable depending on aquatic sediments. The temperature-sensitive methanogenesis reported here could contribute to reduce vast organic carbon stocks in melting flooded areas, representing a potentially important component to increase atmospheric concentrations of greenhouse gases in a warmer world.

Support:

Acknowledgments:
MCTI/CNPq - Programa Antártico Brasileiro - PROANTAR. INCT-Criosfera
INACH - Instituto Antártico Chileno