Methane saturation in the west antarctic peninsula

Brusselman Axelle[1], Crabeck Odile[1], Muller Sofia[1], Araujo Granda Pablo Alejandro[2], Danis Bruno[3], Dallosto Manuel[4], Fripiat Francois[5] and Delille Bruno[6]

[1] Chemical Oceanography Unit, University of Liege, Allée du 6 août, 19, Bat B5A, 4000 Liège
E-mail: axelle.brusselman@uliege.be
[2] Chemical engineering faculty, Central University of Ecuador, Quito, Pichincha, EC
[3] Marine biology Laboratory, Free university of Brussels, Avenue FD Roosevelt, 50, Building U, Door C, 5th floor, 1050 Brussels
[4] Institut de Ciences del Mar, Pg. Marítim de la Barceloneta, 37, Ciutat Vella, 08003 Barcelona, Spain
[5] Glaciology laboratory, Free university of Brussels, Avenue F.D. Roosevelt, 50, Bat D,1050 Bruxelles
[6] Chemical Oceanography Unit, Université de Liège, Allée du 6 août, 19, Bat B5A, 4000 Liège

During the late Austral summers of 2023 and 2024, several campaigns took place in the West Antarctic Penisula (WAP) from Horseshoe Island (67° 514 south) to the northern tip of the Peninsula to document the distribution of CH4 in surface waters in coastal areas. We observed a supersaturation of the surface water in the WAP (mean of 250% saturation). This shows a general methane supersaturation in the coastal water of the WAP. We observed a striking feature at several stations, where the methane saturation rises to 2000%. The presence of a marine-terminating glacier characterized these stations.

Our main hypothesis is that this supersaturation is linked to meltwater from the glacier on the island, which acts as a source of methane in the water column. This hypothesis is supported by vertical profiles of CH_4 concentration, field observations of sub-glacial water flowing to the surface of the water column, and variations in salinity showing a freshwater inflow. This phenomenon has already been suggested in the Arctic (Lamarche-Gagnon *et al.*, 2019) but has not yet been demonstrated in the Antarctic.

Keywords
West Antarctic Peninsula; Methane; Glacier; Gas