Abstract Preview - Step 3/4

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Session: OS-2 Interdisciplinary research on sea-ice biogeochemistry and associated ecosystems

Polar program: None

Title: PIPERS: Role of polynyas on the atmospheric budget of methane and carbon dioxide

Author(s): Célia Sapart[1,2] (csapart@ulb.ac.be), Brett Thornton[3], Patrick Crill[3], Caroline Jacques[1], Bruno Delille[4], Thanos Gkritzalis[5], Thomas Röckmann[2], Carina van der Veen[2], Elena Popa[2], Sharon Stammerjohn[6], Stephen Ackley[7], Brice Loose[8], Sam Gartzman[8], Peter Guest[9], Jean-Louis Tison[1]

Institute(s): [1]Laboratoire de glaciologie/Université Libre de Bruxelles, Brussels, Belgium, [2]Institute for Marine and Atmospheric research Utrecht (IMAU), Utrecht, Netherlands, [3]Stockholm University, Stockholm, Sweden, [4]Université de Liège, Liège, Belgium, [5]Vlaams Institute voor de Zee, Ostend, Belgium, [6]Lamont-Doherty Earth Observatory of Columbia University, Boulder, United States, [7]The University of Texas at San Antonio, San Antonio, United States, [8]University of Rhode Island, Rhode Island, United States, [9]Naval Postgraduate School, Monterey, United States

Text: Coastal polynyas are areas of anomalous open water and thin ice in regions that are otherwise covered by sea ice. They frequently occur around the Antarctic continent in response to strong offshore katabatic wind stresses. The loss of heat from the open ocean to the cold atmosphere can enormously enhance rates of ice production. In polynya areas, the coupling between the atmosphere, sea ice and ocean is complex, and the role of ice formation on the budget of the main climate forcing carbon gases remains unknown. During the PIPERS expedition on the N.B. Palmer from April to June 2017, we performed continuous measurements of methane and carbon dioxide concentrations in the atmosphere and in the surface water from New Zealand to the polynyas of the Ross Sea. Discrete sampling was carried out in parallel to calibrate the continuous systems and to later measure the stable isotope ratios of both gases in the water and in the air. The stable isotope data enable unravelling the pathways involved in gas formation and removal. While the concentrations of both gases were relatively low in the surface waters of polynyas, the preliminary atmospheric data show higher methane and carbon dioxide levels in the atmosphere at locations where sea ice formation was most intense. These data together with the isotopic ratios of both gases and with meteorological data will be discussed to better understand the role of sea ice formation on the exchange of climate forcing gases.

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