The biogenic silica cycle in relation with hydrodynamics in the area of interaction between the Antarctic Polar Front and the Kerguelen Plateau (KEOPS 2)

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Iron availability limits primary production in HNLC waters of the Southern Ocean. In some circumstances, recurrent seasonal blooms of phytoplankton are however observed in areas characterized by strong hydrodynamics, especially where the geostrophic fronts interact with large bathymetric discontinuities, such as ridges, islands and plateaux. In the Indian sector, the interaction between the Kerguelen Plateau and the Antarctic Polar Front (APF) generates a mechanism for iron enrichment that allows the development of large populations of diatoms. This can be seen on the ocean color composite images of the northeast of Kerguelen revealing the spatial extension of a phytoplankton-rich plume whose structure is strongly influenced by mesoscale activity. During the KEOPS 2 cruise (October-November 2011) the temporal evolution of biogenic silica production by diatoms was investigated in this area by using the isotope Si-30. The development of the bloom has been followed downstream of the area of interaction between the APF and the bathymetry. Preliminary results show that silica production fluxes are among the highest reported so far in the Southern Ocean (from 4.065 ± 0.005 to 51.249 ± 0.121 mmol.m^{-2}.d^{-1}). Comparison with a reference station (west of Kerguelen) located in deep waters and not influenced by the APF, confirms that the enrichment process is responsible for the spatial shift of the biogeochemical regime downstream of Kerguelen. Although significant, silica dissolution rates are generally much lower than production rates (6.261 ± 0.008 mmol.m^{-2}.d^{-1} in average). A budget of silicon in the core of the bloom enables identifying the roles of physical and chemical factors, and their interactions in maintaining the bloom throughout the summer season. These new data will be discussed in the general framework of Southern Ocean bloom dynamics related to natural iron fertilization.