DESCRIPTION FOR THE GENERAL PUBLIC

The Southern Ocean encompasses about only one-third of the total ocean area, however it absorbs more than two-thirds of ocean anthropogenic heat and half of the total ocean anthropogenic carbon. Rising CO_2 levels directly alter the Southern Ocean salinity, temperature, oxygen, pH therefore chemistry of this system. Increasing CO_2 and decreasing pH lower $CaCO_3$ saturation state challenging survival of many marine Antarctic organisms especially those building shells and skeletons. It has been reported that undersaturation of $CaCO_3$ caused by elevated CO_2 is reducing the growth of calcium carbonate skeletons, and modify the carbonate mineralogy in a variety of different marine taxa. It is also recognized to have a biotic impact at various levels, from cells to entire ecosystems. Yet we still do not fully understand carbonates / $CaCO_3$ saturation states variability over temporal and spatial scale in the Southern Ocean in spite of recent scientific effort in this part of the world. Also surprisingly little is understood about impact of carbonates / $CaCO_3$ saturation states variability on marine biota in the Antarctica. And Antarctic biodiversity is unique as its extreme conditions and geological history have led to distinctive blend of life in the sea which endemism range from 35 to 90% among different groups. Therefore the project except large physicochemical environmental part, will also investigate the control of ocean carbonate chemistry on biogenic carbonates and carbonate producers. Proposed project is aiming to tackle the global question of how increased ocean CO_2 and the loss / fluctuations of carbonate ions will influence biodiversity of marine invertebrates. By using contrasting environments with variable physicochemical parameters therefore varying $CaCO_3$ saturation states as an analogue of future conditions (fluctuations of carbonate ions) it will enable us to understand the effect of varying degrees of $CaCO_3$ saturation on species at different level of their existence including especially hidden effect of environmental changes such as rate of calcification or geochemical composition of skeletons. One of the key questions in biomineralogy is the extent of organismal vs environmental control on the structure and composition of mineralized skeletons. Through specifically designed sampling protocol along naturally occurring analogues of carbonate variability (e.g. polar night versus polar day, kelp forest versus outside kelp forest, depth gradient), and accurate chemical and mineralogical analysis we will be able to determine whether organisms are capable to control properties of their skeletons. Also the data obtained from our study will enable us to investigate environmental correlations with skeletal mineralogy and composition, adding to our understanding of the extent to which the composition of the skeleton depends on the environment. The data obtained by the proposed project will show the present state of the environment of the Antarctic. Understanding the factors shaping mineralogy and chemical composition of the skeletons will allow us to recognize threats to marine associations both within the Antarctic but also at other location of the world ocean. Last but not least the proposed project will increase our knowledge about the ecology of many marine organisms.