

Biochemistry and Gas Exchanges in the Labrador Sea

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The Labrador Sea, located between the Labrador Peninsula and Greenland, is one of the few places in the world's ocean where the atmosphere, surface ocean and deep ocean interact directly. In the Labrador Sea during winter surface waters sink to depths greater than 2000 m, a process called deep convection. During deep convection oxygen and carbon dioxide are exported from the surface to the depths of the ocean. This process contributes to reduce atmospheric carbon dioxide and to oxygenate the deep ocean. In addition, biological activity in the surface layers of the ocean can affect the rate at which carbon dioxide dissolves in seawater: whereby high productivity creates a deficit of carbon at the surface which increases the dissolution rate of atmospheric carbon dioxide. However, at the same time that more carbon dioxide is dissolved, the pH of the surface waters decreases. This affects biological activity, and thus can influence the rate of gas uptake by the ocean. Another aspect of the carbon cycle is the sinking of planktonic cells after a bloom, a process that also contributes to store excess carbon at depth. To understand the complexity and interconnection between these processes in the Labrador Sea I use an ocean-sea ice-biogeochemical model. The general objective is to develop a better understanding of these processes and the role of the Labrador Sea in our climate. I will present preliminary results showing the role of biological activity in the carbon and oxygen cycles in the Labrador Sea, and present the experimental design for the future experiments.