

# Preface

‘Global change’ is a frequently used, collective description of a number of processes and symptoms, largely caused by anthropogenic activity, that affect the Earth’s ecosystems and endanger mankind. Global change is likely to exert changes in the environment to an extent that has not been witnessed historically.

Climate Warming is one of the global change processes that are certain to strongly affect the environment in the nearest future. There are several factors, often referred to as forcings, that cause the increase of the Earth’s atmosphere average temperature. The most important one, responsible for some 60% of the increase, is the growing concentration of carbon dioxide in the atmosphere. This is, usually, attributed to the so-called anthropogenic emissions of carbon dioxide (CO<sub>2</sub>) to the atmosphere. The emissions are a direct result of fossil fuels burning, which is due to increasing demand for energy, necessary to maintain or increase civilization standards of mankind. Thus, it is difficult to imagine that, in the nearest future, the atmospheric concentration increase rate of CO<sub>2</sub> might change. Since there is a direct link between the Climate Warming and CO<sub>2</sub> concentration in the atmosphere, all model studies, aimed at assessing the extent of the warming, need to be based on future concentrations of CO<sub>2</sub> in the atmosphere. That is why the quantification of factors determining carbon dioxide concentration in the atmosphere is of interest to and a challenge for contemporary science.

Therefore, investigations are necessary to quantify, as accurately as possible, CO<sub>2</sub> sinks and sources to the atmosphere.

The global ocean is believed to absorb some 40% of the anthropogenic CO<sub>2</sub> emissions. This is an effect of the CO<sub>2</sub> uptake by both the open ocean and shelf seas. Without quantification of both sinks it is impossible to improve the ocean CO<sub>2</sub> absorption estimates, and future CO<sub>2</sub> concentration changes. The quantification requires a major effort on the part of researchers engaged in investigating carbon cycling in the marine environment.

This book provides results of the research on CO<sub>2</sub> cycling in the Baltic Sea that has been carried out within the last few years. The Baltic—a land locked sea located in the temperate climate, has been a subject of oceanographic, biological, physical and chemical investigations for a hundred years or so. The results of the

studies combined with our own data gathered with the aim of characterizing carbon reservoirs and fluxes in the sea, have been used to define carbon cycling in the Baltic. The cycling, quantified separately for inorganic carbon and organic carbon, is influenced primarily by carbon discharged to the sea with river run-off, exchange with the North Sea, deposition to- and return flux from- the bottom sediments, and exchange of carbon with the atmosphere. The last component determines the sea trophic status. The outcome of the studies classifies the Baltic as an area of slightly heterotrophic (degassing  $\text{CO}_2$ ) to neutral (neither degassing nor absorbing  $\text{CO}_2$ ) status.

The authors believe that the book contents, apart from clarifying the Baltic carbon trophic status, will improve understanding of the role shelf seas play in ocean carbon cycling, and the mechanisms of boundary processes responsible for carbon budgets in the shelf seas.

Carbon Cycling in the Baltic Sea

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