Introduction

About 35 years ago ice core-based records have first revealed the dramatic glacial-to-interglacial changes in the atmospheric CO_2 content. In view of the modern men-made rise in atmospheric CO_2 these natural changes ever more belong to the hottest topics in the study of the Earth's carbon cycle. Since the 1980s an enormous and rapidly ever growing wealth of scientific findings and models has been published, that uncover the role of carbon exchange between the largest reservoir on Earth, the global ocean, and those in the atmosphere and on land, studies that clearly urge for an overview and broad synthesis.

The present symposium on "Deglacial Ocean Dynamics and Atmospheric CO_2" has brought together a global community of almost 50 leading scientists and 20 early-career scientists, which provide a platform capable of identifying limitations in the representation of key carbon-cycle processes in models, that control the carbon exchange amongst the four major carbon pools of the Earth's surface, the ocean, atmosphere, terrestrial biosphere, and soils. As listed in the program the symposium evaluates empiric and model-based findings on changing past carbon inventories as well as on past modes, locations, and rates of carbon transfer. In particular, the carbon transfer for modern, that is 'pre-industrial', times is compared with two distinct past climate states, the Last Glacial Maximum (LGM) and deglacial times. In turn, past natural changes in carbon flux may be compared with potential man-made changes today.

A calculated transfer of ~530 Gt of ^{14}C depleted carbon is required to produce the deglacial coeval rise of carbon in the atmosphere and terrestrial biosphere and in soils. While a number of key processes underlying this transfer have been identified, Earth-system models are still unable to fully reproduce it. Most likely, this transfer was linked to changes in the ventilation of the deep ocean, the largest carbon pool on the Earth's surface. Accordingly, the failure to correctly represent the carbon transfer in complex models raises several **important scientific questions**, in particular, (*i*) whether deep-ocean ventilation was significantly reduced during the last glacial period, (*ii*) how and where to trace empirical evidence for a deglacial carbon release from the ocean, (*iii*) how to reconcile the carbon release with major shifts in atmospheric radiocarbon contents, and (*iv*) how to test the various alternative carbon sources and mechanisms that may have controlled the last-glacial-to-interglacial shifts in $\Delta^{14}C$ and CO_2, the most prominent short-term change in carbon pools over the last 100,000 years.

The present volume contains almost 70 extended abstracts on the latest state of the art in the outlined fields of CO_2 research. Most abstracts provide some figures and key references that may help the interested reader to enter more deeply the fields of research in question. The abstracts of oral and poster presentations are printed in alphabetic order. With regards to contents the abstract titles of oral contributions are linked to the various carbon archives in polar ice sheets, the ocean, and on land, and to various, largely overlapping scientific approaches and objectives as listed in the Conference Program at the beginning of this volume.

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