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Foreword

Increasing concentrations of the atmospheric greenhouse gas carbon dioxide (CO_2) constitute a major driver of the current and future warming of the world. Understanding of carbon dioxide as a component of the global carbon cycle and the Earth System has thus become an increasingly important research focus. Although the fundamental functioning of the global carbon cycle is now relatively well understood, there remain still many partly open questions, such as: What happens to the CO_2 emitted into the atmosphere from the burning of fossil fuels and deforestation? Where and how much is taken up by land and oceans, and how have these sinks been changing over time in the past and how will they evolve in the future? How does climate change impact the different carbon reservoirs on land and in the ocean, slowing or accelerating the growth of atmospheric CO_2? How do the direct and indirect human impacts from changes in land use and management modify the global carbon cycle and its dynamics? How can one quantify and monitor regional carbon budgets for the verification of national emission mitigation efforts? And what potential options exist to deliberately enhance sinks or reduce natural sources of CO_2 on a large scale to slow global climate change? Addressing such questions necessitates an approach drawing on all disciplines in Earth System science.

The quadrennial International Carbon Dioxide Conferences, held for the first time in 1981 in Bern, Switzerland, has developed into an authoritative platform for the worldwide scientific community to exchange the latest findings and to foster a better understanding of the global carbon cycle. The conference covers all aspects pertinent to the controls of atmospheric carbon dioxide and its interactions in the global Earth system with a special emphasis on the contemporary anthropogenic perturbation. Although primarily concerned with the natural science aspects, the conference also addresses the science associated with the assessment of direct human impacts on the carbon cycle, carbon sequestration or emission mitigation if relevant on large regional and global scales.

The 8th International Carbon Dioxide Conference took place in Jena, Germany, September 14–18, 2009, and was hosted by the Max-Planck-Institute for Biogeochemistry. It was attended by almost 600 participants from 40 countries and included 115 oral, 9 keynote presentations and 491 posters. Following the tradition of previous CO_2 conferences, authors were invited to publish their conference contributions as refereed scientific papers in a special issue of *Tellus B*. This issue contains 39 papers from the conference, several late contributions will be published in a following issue. The papers are grouped according to the major themes of the conference: I. Past carbon variations including the fate of fossil fuel emissions, II. Processes and regional studies, III. Future changes and carbon management, IV. Methodological advances.

I would like to thank the authors for their contributions, the scientific steering committee for their guidance in establishing the scientific program and the many local helpers to make the conference a remarkable event. The conference was supported by the Max-Planck-Society for the Advancement of Science, the Deutsche Forschungsgemeinschaft, the World Meteorological Society and the Friedrich-Schiller-University of Jena.

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ICDC8 Conference Chair

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