PREFACE

The Center for Global Environmental Research (CGER) of the Environment Agency of Japan's National Institute for Environmental Studies (NIES) provides research support facilities such as a supercomputer and databases for global environmental research activities.

CGER's supercomputer is open to researchers internationally for any global environmental research applications. Users need to be authorized for such usage every fiscal year. CGER is responsible for efficient allocation of supercomputer resources for each research subject, such as CPU time and memory, sufficient for the research plans recommended by the Supercomputer Steering Committee, comprised of scientists.

NIES's Environmental Information Center (EIC) manages routine operations of the supercomputer system. This system is operated with close and cordial communications between users and the managing staff including daily consultation by the system engineers.

This monograph is the first publication to report on research progress achieved by frequent user of the supercomputer facilities set up by CGER. It presents the result of research into turbulence structure and the mechanism of CO_2 transfer at the air-sea interface. Some of the results have already been released as papers in the Journal of Fluid Mechanics and others. This monograph report includes estimates and assessments using precise numerical analysis of the rate of CO_2 transfer across the air-sea interface, using direct numerical simulations (DNSs) of time-dependent three-dimensional Navier-Strokes (NS) equations.

Great uncertainty still remains on the distribution and destination of carbon dioxide, although the Intergovernmental Panel on Climate Change (IPCC) 1994 report "Radiative Forcing of Climate Change" indicates the resolution of the "missing sink" problem. The majority of scientists still feel uncertainty about the missing CO_2 sink even after the announcement by IPCC Working Group I of its Summary for Policy Makers in the Second Assessment Report. This monograph draws a clear picture of this key issue in quantifying the size of the oceanic CO_2 sink, and can be expected to contribute to future quantitative analysis of air-sea CO_2 exchange.

We hope this publication contributes to further progress in global change research and efforts for global environmental conservation.

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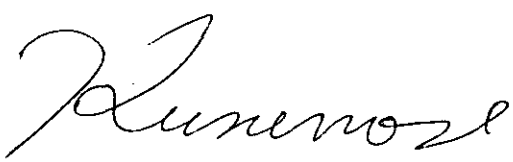

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