PREFACE

The four papers in this special section describe new global coupled ocean–atmosphere models recently developed at NOAA's Geophysical Fluid Dynamics Laboratory (GFDL) for use in climate variability and change studies. The use of numerical models for the study of weather and climate has been a central focus of GFDL's research activities since the establishment of the Laboratory in 1955. Many pioneering models have been developed at GFDL, including global coupled ocean–atmosphere models, the Modular Ocean Model code, hurricane models for research and operational prediction, and seasonal forecasting systems.

In the late 1990s, scientists at GFDL made a decision to consolidate and modernize their numerical modeling activities through the development of the Flexible Modeling System (http://www.gfdl.noaa.gov/~fms). The modernization effort fostered the development of new computer codes that took advantage of developments in numerical algorithms, modern coding procedures, massively parallel computer architectures, and newly developed physical parameterizations. The consolidation created a common modeling infrastructure that supports diverse research activities, from weather to seasonal prediction to anthropogenic climate change, and fostered an environment in which common modeling and diagnostic tools are in use across the Laboratory.

This multiyear effort translated into the development of two new global coupled ocean–atmosphere models, described in the four papers in this special section. As described in these papers, we feel that these models have strengths that make them a valuable addition to the world's repertoire of climate models. One notable outcome of this effort is that the same model is now used at GFDL for both experimental seasonal forecasting and the study of anthropogenic climate change. GFDL scientists used these models to conduct an extensive suite of climate change integrations in support of the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). Model output is freely available online at http://nomads.gfdl.noaa.gov.

The four papers in this special section describe 1) the model formulation and simulation characteristics, 2) the ocean component of the coupled models, 3) the simulation of ENSO, and 4) the response of the model to idealized climate change forcings. Additional details of the atmosphere–land component of these models have previously been documented.[1] Many additional studies of the climate system are currently underway using these models, and those results will appear individually through the normal publication process.

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[1] GFDL Global Atmospheric Model Development Team, 2004: The new GFDL global atmosphere and land model AM2/LM2: Evaluation with prescribed SST simulations. *J. Climate*, **17**, 4641–4673.