ABSTRACT

ATM-0447804

SGER: Model Intercomparison: Thermohaline Circulation and Its Relation to Surface Fluxes

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Three climate modeling centers in the U.S. (CCSM (NCAR), GFDL and GISS) will be releasing in September 2004, model simulations of the global climates of the late 19th and 20th centuries. These will be available as input to the next Intergovernmental Panel on Climate Change (IPCC) Assessment Report and also for general studies by climate scientists. The is a research project to use these model data sets, along with the best available observations of the past climate, to analyze the ability of global climate models to simulate the climate of the late 19th and 20th centuries.

The thermohaline circulation (THC) in the Atlantic plays an important rol

e in regulating climate by accounting for nearly half of the poleward heat transport. However, there is a dearth of analytic tools for displaying quantitative details of the THC in a model. The PI will extract regional details of the 3-D circulation in potential density space (i.e., isopycnal as well as diapycnal mass flux components) from the archives of the models, using the method he has already developed. The PI has gained considerable experience in applying the same technique to output from z coordinate models. In other words, well-tested algorithms are available today for converting z coordinate model fields to isopycnal coordinates in a manner allowing isopycnal and diapycnal mass fluxes to be extracted. His study aims to shed light on the role of THC fluctuations in mediating atmosphere-ocean interactions on decadal time scales in the various coupled models. He will also investigate decadal variability linked to anthropogenic forcings in the past century, hoping to provide a stepping stone for follow-up studies of mechanisms which in the Third IPCC Assessment led to the large fluctuations in THC strength in greenhouse gas-forced simulations.

Broader Impacts: The Ocean's THC circulation strongly influences the climate of the North Atlantic and Western Europe. Its stability may be affected by global warming. This research has the potential to improve understanding of the physics that control the strength of the THC and thus, possible large-scale climate changes in the future. This would be important information for better-informed environmental policy decisions.

This is a grant under the U.S. Climate Change Science Program’s CLImate VARiability and Predictability Program (CLIVAR).