Abstract View

Volume 16, Issue 1 (January 1986)

Journal of Physical Oceanography
Article: pp. 3–10 | Abstract | PDF (671K)

Computational Efficiency and Accuracy of Methods for Asynchronously Coupling Atmosphere–Ocean Climate Models. Part I: Testing with a Mean Annual Model

S.H. Schneider and L.D.D. Harvey

National Center for Atmospheric Research, Boulder, CO 80307

(Manuscript received December 17, 1984, in final form July 5, 1985)

DOI: 10.1175/1520-0485(1986)016<0003:CEAAOM>2.0.CO;2

ABSTRACT

Using the mean annual, globally-averaged, coupled atmosphere–ocean energy balance model of Harvey and Schneider, the effect on the transient climate response to a step function solar constant increase using a variety of asynchronous coupling methods is investigated. In asychronous coupling, the atmosphere is integrated with fixed ocean temperature for a period τ_a, and the ocean is integrated for a longer period τ_0 with one of several possible atmospheric assumptions. The process is repeated until equilibrium occurs. The assumption of fixed atmospheric temperature during ocean integrations, used in some atmosphere–ocean GCMs, leads to a large energy conservation error and a very slow transient response compared to the synchronously coupled response. Assuming fixed heat fluxes or a fixed atmosphere–ocean temperature difference greatly improves the asychronous transient response, but large errors still remain. Assuming fixed turbulent fluxes subject to a time lag, or extrapolating the trend in the atmosphere–ocean temperature difference with a variable τ_0 gives very good globally-averaged results, but the former method is of questionable utility in a nonglobally-averaged model as it involves large compensating errors in individual heat flux terms.

top

Headquarters: 45 Beacon Street Boston, MA 02108-3693
DC Office: 1120 G Street, NW, Suite 800 Washington DC, 20005-3826
amsinfo@ametsoc.org Phone: 617-227-2425 Fax: 617-742-8718
Allen Press, Inc. assists in the online publication of *AMS* journals.