**Geoscientific
Model Development
Discussions**

Interactive comment on "The efficient global primitive equation climate model SPEEDO" *by* C. A. Severijns and W. Hazeleger

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We thank the referee for his comments. Our responses to the referee's comments are given below.

– Specific Comments

Model description

We have added information to section 2 on the main parameterizations used in the atmosphere and ocean models used in SPEEDO. We also added information on the tuning of the vertical mixing coefficient in CLIO that was necessary to increase the strength of the Atlantic meridional overturning in the model. Attempts to use the isopycnal ocean model that was used in Hazeleger et al. (2005) for regionally coupled

experiments, in a globally coupled configuration gave many problems associated with the application of an isopycnal vertical coordinate with a reference density globally. Therefore we are using CLIO now for the globally coupled system.

pg1119, line 25

The component models are all single CPU applications. Line 12 on page 1119 has been modified from ".... SPEEDO exchange ..." to ".... SPEEDO run each on a single CPU and exchange ..." to explicitly state this.

pg1121, line 5

This and the following sentence have been reformulated and the fact that the 2000 years spinup was a continuation of 4000 years of test runs has been added at line 4 of pg1120. A figure, Figure 1, showing a time series of the global mean ocean temperature has been added as well.

pg1123, line 20

We have extended the paragraph on page 1119, lines 3 to 6 with information on the tuning that we performed on the CLIO ocean model.

pg1124, line 1

The reanalysis data of Trenberth and Caron (2001) was added to the figures and a comparison with SPEEDO was added to the text.

pg1127, line 5

The goal of this study was to determine the climate sensitivity of the SPEEDO model and to demonstrate that the AMOC decreases but remains larger than zero under $2xCO_2$ conditions. A study on multiple equilibria is in preparation First results show that the model is in a monostable state (A. Cimatoribus, private communication).

– Technical Corrections

pg1122, line 13

The text at page 1122, lines 13 to 16 has been modified and now includes a comparison of the wind speed in the southern jet and the Indian monsoon with the NCEP-NCAR Reanalysis data.

pg1122, line 20 (intended pg1123, line 20)

The unit "Sv" is introduced on page 1123, line 20 and used in the remainder of the paper.

pg1123, line 18

The sentence was rephrased to explicitly mention the period from 1960 to 2000 that was introduced on pg1121, line 21-23.

pg1124, line 1

See the related comment on pg1124, line 1 above under Specific Comments.

pg1124, line 15

This sentence has been modified to clarify that the global mean warming in the SST as the result of increasing CO_2 levels was removed using the ensemble mean SST. Computing the anomalies using an SST climatology would not remove this trend.

pg1125, line 18

The AR(1) estimate and 95% confidence interval were added to the plot. A discussion was added to the text at this location.

Fig. 3

A colorbar was added.

Fig. 5

A colorbar was added.

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Fig. 5

The global MOC was added. The southern most part of the global MOC is the Southern Ocean MOC. A discussion was added on page 1123, line 24.

Fig. 6

The Indopacific heat transport was added to the figure. See also the related comment about pg1124, line 1 above under Specific Comments.