

## ***Interactive comment on “Formulation of an ocean model for global climate simulations” by S. M. Griffies et al.***

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### 1.1 Judging Climate Models

The construction of good climate models is not easy and the problem becomes particularly difficult when developing models suitable for the long climate change runs. The main limitation is due to computer power and this effectively constrains model resolution in both space and time.

However people have to do what they can. Within the constraints we need models which can reproduce the current climate system as accurately as possible. At the same time the perturbation response of the model also needs to be accurate, so that the effects of long term changes in the forcing are clearly seen.

Tests of how well the models reproduce the current climate are relatively straightfor-

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ward. This is especially true for the atmosphere because of the large amount of data that is available. It is more difficult for the ocean - there is less data and the scales of the major features are much smaller. However in both cases useful comparisons can be made and these should show if and how the models are improving from one IPCC report to the next.

The question of the perturbation response is more difficult. In the case of the ocean any climate change signal, due say to the atmospheric radiation field, is too small to be used as a test of the model. Many of the key processes will be the same ones that determine the current climate so one might hope that if the current climate is reproduced well then the perturbation response will also be good. Unfortunately this is not necessarily true because model errors in one process may compensate for errors in another. Instead, for the perturbation response, all we can really do is to identify the key processes and ensure that they are represented within the model as realistically as possible.

## 1.2 The GFDL Ocean Model

So how should we judge the GFDL model? One problem with the present paper is that although it is a useful description and shows that a lot of thought has gone into the model, it does not really show that the model has improved from the one used by GFDL in the last IPCC report. Hopefully it has done so, but if this paper is going to really contribute to the next IPCC assessment as the authors hope then I think that we need more comparisons with the previous model.

The problem is highlighted if we compare the present paper with another paper currently under discussion concerned with a model of the Persian Gulf (Kampf and Sadri-nasab, [www.ocean-science.net/osd/2/129](http://www.ocean-science.net/osd/2/129)). For the Persian Gulf paper a description of the model is not enough, the paper sinks or swims on whether it produces a better description of the flow than previous models or whether it gives new insights into the processes occurring within the region.

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In the case of the present paper we are generally referred elsewhere for such comparisons. This would not normally be allowed with the Persian Gulf paper and I do not see why it should be allowed here.

[For reasons of space, detailed comments are contained in a following note.]

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Interactive comment on Ocean Science Discussions, 2, 165, 2005.

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