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Nonlinear Processes in Geophysics
Discussions
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Interactive comment on "Instabilities within Rotating mode-2 Internal Waves" *by* David Deepwell et al.

Anonymous Referee #1

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The paper reports a series of numerical experiments on evolution of second mode ISWs propagated in a laboratory-scale wave tank. The focus of this study is on the effect of rotation that converts the propagated ISW into a series of Kelvin and Poincare internal waves. The wave dynamics described here is entirely expected, although to my knowledge the model results considered here are novel and look realistic, so in my opinion they ought to be presented to wider audience. There are also a few points where the paper can be strengthen, and they are as follows:

Page 3, Line 11: I do not think the authors conducted DNS as they claim in line 11. For such kind of simulations the grid step should be at the level of the Kolmogorov's scale, but there are no details on both in the text. And what about numerical viscosity? With quite a coarse grid it can be several order higher than the molecular viscosity, 2*10ˆ-6

mˆ2/sec, as claimed in the paper.

Page 4, line 8: The authors take the first-mode phase speed as the velocity scale, although the whole model set-up is for the 2-nd mode experiments. Does this make sense?

I'm not sure I understand the meaning of two concepts, cw and aw. They are introduced in line 2 on page 4 in a very general way, without clear explanation how do they relate to the model set-up. However, they appear in table 2 as input parameters. What is the link of these values with the tank experiment parameters (size scales, stratification parameters, rotation, etc)? And why the wave speed, as it is introduced on page 4, is larger than the fastest mode 1 wave speed C0? It seems to me the authors did not pay much attention how their paper will be accepted by the readers.

Relatively minor, but important: The presented on page 5 system is not the NS-system as stated. Please, be careful defining the total water density and its perturbations. Secondly, the temperature, salinity and the EoS are the constituents of the NS-type system, but not the density perturbation (find also a mistake in the first eqn.)

I'm not sure why do the author change the Sc number? They call it the Schmidt number (why not the Prandtl number?, but never mind) and vary it from 1 to 10. This does not make any sense if the authors conduct their experiments for the laminar-size grid. The viscosity and diffusivity coefficients are constant at the Kolmogorov scale level (laminar!!), so why the authors considered their ten times variation (Table 2)? What is the idea behind that? Finally, what is the spatial grid resolution after all? Looking at Table 3 I can see it is at the level of 10-3 m (i.e. 1mm), which is small, but does not tell me whether this is small enough for replication of the laboratory-scale experiments and the background mixing. Maybe yes, but the text in its present state is not convincing enough for me.

No details are provided how the initial ISW was created. Figure 1 does show the initial installation, and I can believe that in the vertically symmetrical case the leading ISW is a second mode wave, but it really takes time to form in the front of the wave field. Is 6.4m tank long enough to form it? When the rotation has been switched on? Right in the beginning of the experiment? What is the idea of all these experiments? I would accept the method of initial wave formation and initiation of the rotation after that to learn the effect of rotation, but all the details must be explained. I'm really confused without the correct setting of the experiment conditions. Lines 15-25 on page 6 do not bring any clearance on this point.

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