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Ocean Science
Discussions

Interactive comment on "The analysis of large-scale turbulence characteristics in the Indonesian seas derived from a regional model based on the Princeton Ocean Model" *by* K. O'Driscoll and V. Kamenkovich

Anonymous Referee #1

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The authors take the results of a modeling study of the Indonesian Seas and estimate large scale turbulence from them.

I have reviewed this manuscript previously. The editor and I thought it was unsuitable for publication in that journal and could not think of any it was suitable for.

A major objection I have is they clarify what turbulence they are characterizing or simulating. I would have liked to see a good discussion of what the turbulence they are getting out of the model; otherwise it is just mystery turbulence. So the question is

what turbulence does the model represent either through simulation or parameterization Horizontally, at this scale, they will simulate large eddies and shear flow around topographic features, like islands. They won't be able to simulate small eddies or the filaments coming off eddies. Vertically, they will get a boundary layer. They could get a surface mixed layer, if they put it in. But they won't get internal waves or lee waves. Will they get mixing induced by flow over sills? Probably. Are there other sources of mixing. Yes, lots. And many of them are local and some are episodic or periodic. So although they say they will not do lee waves and only turbulence scales of 100 km or more, I think they need a clear discussion of which turbulent processes they intend to include in their simulation and which are excluded.

At their scales, they are averaging out turbulence. By it's nature turbulence fluctuates and occurs at sub-grid scales. So their estimates will be averages that don't actually represent what is occuring. Again they need to clearly state what they are expecting to cover and what they aren't. And before doing the Indonesian seas, it would be good if they could point to a place and say our model's estimate of turbulence matches what was observed. Then move to another spot and you will know your estimate is likely to be correct, if the same processes are occurring.

Another objection is that the model uses Mellor Yamada 2.5 vertical mixing to estimate the vertical turblence. This only acts in the boundary layer. Vertical mixing occurs at other depths in the real ocean and this is neglected.

I don't think that the Indonesian Seas is a good place to study mixing at a scale of 100 km or so. This is an area of extremely complex topography and currents, with strong currents flowing through narrow straits. It is likely that topographic features generate much of the mixing and influence the scales at which it occurs.

Minor comments: p. 4 - assuming KM and KH are reasonable because currents and T & S are reasonable is dangerous.

p. 5 - the part about eq 8 is confusing. This equation is what Mellor-Yamada is founded

on so if it is unfounded, so is your mixing scheme, ... and your turbulence, ... and this paper. I would remove this seciont until you have better arguments for or against it.

p. 6 - How can the model recommend anything?

p. 6 - I don't think 29 levels will resolve the vertical well enough for turbulence.

p. 7 - What are the POM recommended boundary conditions?

p. 7 - Nudging of T & S to maintain climatology. Doesn't this artifically add a fake unknown mixing into your simulations and estimates.

p. 8 - Using a background diffusivity of 10x-5 m2/s. How can you say KH and KM are scaled with all these additions?

p. 8&9 - These validations of Mellor Yamada are for boundary layer mixing. So you only have boundary layer mixing too.

p. 13 - How good is the agreement? Some numbers would be good here. Numbers are given for Van Aken, but not for the model or for the difference between the model and observations.

p. 16-18 - This discussion and these plots confirm my understanding that this is benthic boundary layer mixing only.

Conclusions - Much of the conclusions appears to be from a previous version or another paper. There is material here is not covered in the paper.

Plots - I am not convinced that all these profiles are needed. Possibly these figures could be combined as panels on one or two plots. And some might be removed.

Interactive comment on Ocean Sci. Discuss., 9, 63, 2012.