

Interactive comment on “A modelling study of eddy-splitting by an Island/Seamount” by Shengmu Yang et al.

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General comments

The manuscript is very interesting, and adds to the literature on interactions between eddies and topography. By introducing two non-dimensional parameters for island size and submergence depth, they identify no splitting, weak splitting, and splitting regimes. To my knowledge, this is new. Therefore, the paper should be published.

However, when reading this some questions/issues came up and the manuscript will benefit from a revision before being published, taking the comments, small and more major, into account.

Firstly, they use the MITgcm with $DX = 2.5$ km and $DX = 50$ m near the surface in their

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study. They state correctly that MITgcm is non-hydrostatic. Have they used it in non-hydrostatic mode? They do not have the resolution to capture non-hydrostatic effects, and these effects may be important in the boundary layer towards the island/seamount as the eddy start to interact. There will be an upstream blocking effect and transfer of energy to smaller scales in this area. I noticed fairly large values of heat diffusion coefficients and vertical eddy viscosity. Are these necessary to avoid instabilities around the island. It would be interesting to see figures of the temperature, vorticity, and/or flow field in the near field around the island. Are the overall rules of thumb given robust to model choices, grid size, and parameterizations?

Secondly, for uniform flow against an obstruction there will be eddies generated and oscillations. Non-hyd. pressure in the boundary layer plays a crucial role. With a sequence of eddies hitting an island, will the next eddy be shed in the same way as the first? I would think that the first eddy leaves a vorticity field behind around the island, and this will affect the next?

Thirdly, in the experiments, the island/seamount is placed in the middle of the trajectory of the eddy. Do they always hit spot on? Can it be splitting if they hit more to one side of the island?

It will be too much to address these issues in the present paper, but they may include some discussions of this.

Specific Comments

Page 7: We believe that the secondary eddy comes from eddy-splitting rather than being formed independently. Remark: This can be checked by using a tracer, and will give added value, see second remark above.

Page 8 line 10: which positive vorticity has increases Remark: Fig 6 is a snapshot after 50 days. How can we see that PV has increased?

In the interaction with seamount studies only warm eddies are used. Are the warm and

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cold eddy cases symmetric?

Technical Corrections

Page 1 line 15: And the scale ... > The scale ...

Page 2 line 22: Chang et al. (Chang et al.,2012) > Chang et al.(2012) Similar remark on Kersale et al. below

Page 4 around Eq. 1: Remove . before the equation and change Where to where.

Page 4 around Eq. 2 and 3: Remove : and Where to where

Page 4 line 19: compoment > component

Page 6 line 7: warm eddy and cold eddy > the warm eddy and the cold eddy

Page 6 lines 20 and 21: But the cold eddy > However, the cold eddy

Page 7 line 7: mirror symmetry > mirror symmetric

Page 7 line 11: Diameter > The diameter

Page 8 line 3: generation > the generation

Page 8 line 4: to eddy generation > to the eddy generation

Page 8 line 4: shows the cyclone > shows that the cyclone

Page 9 line 1: Different > different

Page 9 line 3: "has the similar behavior" : Please, reformulate.

Page 9 line 6: Start the sentence: In the study, we define two ..

Page 9 line 12: shows when > shows that when

Page 11 line 10: eddy-splitting not > eddy-splitting is not

Page 11 line 18: This is reason > This is the reason

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Page 11 line 21: main settings of experiments > the main settings of the experiments

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