Ocean Sci. Discuss.,
doi:10.5194/os-2016-70-AC2, 2016

Ocean Science Discussions

Interactive comment on "Synoptic fluctuation of the Taiwan Warm Current in winter on the East China Sea shelf" *by* Jiliang Xuan et al.

Jiliang Xuan et al.

xuanjl@sio.org.cn

Received and published: 22 October 2016

Dear Referee,

Thank you very much for your comments on our joint manuscript. According to these comments, we have made corrections which hopefully could clarify the points brought up by you. We responded to these comments one by one in the attachment.

Best regards,

Jiliang Xuan, Daji Huang, Thomas Pohlmann, Jian Su, Bernhard Mayer, Ruibin Ding, Feng Zhou October 22, 2016

Response to referee

Comments: 1. The title '... in winter on the East China Sea Shelf'. In fact only results

from the winter (Feb) 2009 were analyzed and presented in the paper and no attempt was made to extend to other winters. I, therefore, suggest that the title to be changed to '. . .in the winter of 2009. . .', or similar.

Author's response: We have now analyzed the TWC structures in other winters, i.e., of the years 2010 to 2013, and added a "Figure 14" to the manuscript. Results show that the general TWC structures in the other winters were similar to that in winter 2009. Therefore, we have kept the original title "... in winter on the East China Sea Shelf".

Author's changes in manuscript: Line 896-901: A "Figure 14" was added to show the mean currents and synoptic fluctuations in the winters of the years 2010 to 2013. Line 416-421: The following discussion was added: "The simulated results in the winters of the years 2010 to 2013 (Fig. 14) show that general structures of the TWC in the other winters were similar to that in winter 2009 (Fig. 5 and Fig. 9), which indicates that the results from the winter 2009 can be regarded as representative for the winter situation. The two TWC branches and the two areas of strong fluctuations were present in all the winters from of 2009 to 2013, although their strength showed a certain inter- annual variability in accordance with the changing surface forcing and boundary fluxes.".

Comments: 2. Line 133-135, on the model, 'the river discharge of the Changjiang and Huanghe. . .'. In the immediate region of the study, there are other important rivers, e.g., Qiantang, etc.; did the authors include them; if not, why not.

Author's response: Other rivers were not included in this study, because the discharges for the other rivers are very small compared to the Changjiang and Huanghe discharge.

Author's changes in manuscript: Line 134-137: We added the statement explaining why other rivers were not included: "Other rivers were not included because of their small discharge rates, e.g., the Qiantang River, with the largest runoff from the Zhejiang coast, has a climatological mean discharge rate in winter of about 230 m3/s, which is nearly negligible compared to the Changjiang winter discharge of about 11500 m3/s.".

Comments: 3. Validation of the model. The model results were validated in the coastal regional of the East China Sea shelf and good agreements between measurements and model were obtained. However this is limited to the shallow coastal region. It is well known that the FVCOM uses a sigma co-ordinate and prone to errors in the region of steep topography. Therefore authors should at least caution readers that in the slope region, such as the Kuroshio intrusion (line 465-470), model results are less reliable unless a good validation is provided.

Author's response: We agree that our results in the region of steep topography may not have the same accuracy because of the sigma co-ordinates used in FVCOM, in particular at in the shelf break area where Kuroshio intrusion occurs. However, the synoptic fluctuations, which we focus on, are mainly located on the shelf, where results could be nicely validated. Nevertheless the validation for the offshore area could not be performed properly. Therefore, we added a statement regarding the simulation results in the slope region.

Author's changes in manuscript: Line 485-488: we added the following statement: "However, because FVCOM uses sigma co-ordinates in the vertical which are prone to errors in regions of steep topography, our results may underestimate the fluctuations at the shelf break, in particular to the northeast of Taiwan where Kuroshio intrusion occurs.".

Comments: 4. Line 264. '. . . in wintertime, both branches flowed on the isobaths, which is fully in accordance with the conservation of potential vorticity'. It implies 'cross isobaths flow is not following the pv conservation law', which is not correct. btw, 'on the isobaths' - >'along the isobaths'.

Author's response: We agree that our statement ". . . is fully in accordance with the conservation of potential vorticity" is wrong.

Author's changes in manuscript: Line 265-267: We made the following change: "In wintertime, both branches flowed on the isobaths, which is fully in accordance with the

conservation of potential vorticity" is changed to "In wintertime, both branches flowed along the isobaths, which is in accordance with the conservation of potential vorticity under frictionless conditions and for flows with a minor meridional extension".

Please also note the supplement to this comment:
http://www.ocean-sci-discuss.net/os-2016-70/os-2016-70-AC2-supplement.pdf

---

Interactive comment on Ocean Sci. Discuss., doi:10.5194/os-2016-70, 2016.

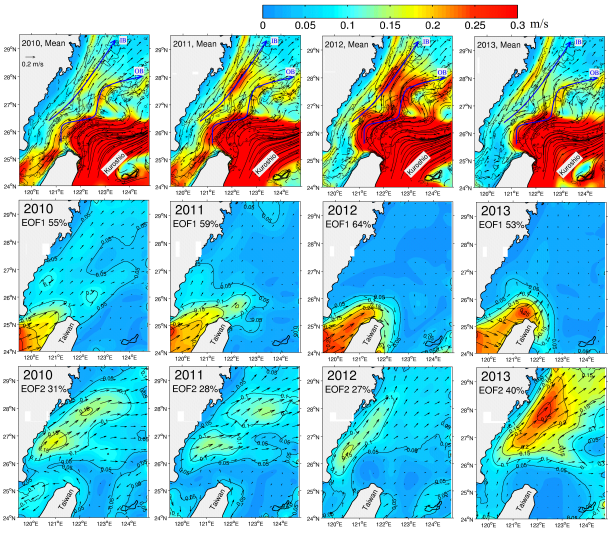
0 0.05 0.1 0.15 0.2 0.25 0.3 m/s
2010, Mean
2011, Mean
2012, Mean
2013, Mean
0.2 m/s
Kuroshio
2010
EOF1 55%
2011
EOF1 59%
2012
EOF1 64%
2013
EOF1 53%
2010
EOF2 31%
2011
EOF2 28%
2012
EOF2 27%
2013
EOF2 40%
Taiwan

Fig. 1. Fig. 14