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Ocean Science Discussions

Interactive comment on "A simple predictive model for the eddy propagation trajectory in the South China Sea" *by* Jiaxun Li et al.

Anonymous Referee #1

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Accurately forecasting the eddy propagation is a major challenge not only to consider the classes of response to atmospheric forcing but also considering the relative impact of the atmospheric forcing, updated boundary data and different ocean data types. The article of "A simple predictive model for the eddy propagationtrajectory in the South China Sea" tries to build a predictive model using the multiple linear regression to predict the positions of the long-lifetime eddy tracks in the SCS. Here, I disagree the reliability of this method applied to forecast the actual eddy track in the SCS because there are two main points:

1) The MCC method although more objective, still includes the assumption that displacements are translational and negate rotational and deformational motions, although Kamachi (1989) modified the MCC to include rotational effects.

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As they said these eight predictors: those from climatology and persistence and those "synoptic predictors" are geostrophic flows. Just like they found: "The synoptic predictors contribute less to the forecast equations comparing with persistence and climatology.", which means it mostly depends on the persistent inputs. It could be more accurate to regard this model as a diagnosing or corrected persistent forecasting.

2) The currently results miss the independent validation.

Page 4 Line 82-84: "To forecast the eddy trajectory 1-4 weeks in advance using the last position of the eddy, only eddies with a lifetime of 5 weeks or longer are retained in this study". It clearly shows the eddy tracks in 2009-2013 used for evaluation here have been artificially filtered, and results the underestimation of the related failure events.

Consequently, this model cannot be regarded as a successfully predictive model and it is loss of enough values to be published on OS.

Specific comments: 1) Before applying the MCC analysis to the images prepared, certain parameters describing the statistical method needed to be set like subwindow size, search window size as well as cross-correlation coefficient. What about their sensibilities? And finally what about the setting?

2) Here all SLA data and eddy dataset have a time resolution of 7 days. In fact, the new version based on the DT-2014 daily "two-sat merged" sea level anomaly (MSLA) fields (formerly referred to as the REF dataset) posted online by AVISO for the 22-year period January 1993–April 2015. So using the daily dataset could be more interesting, and some new knowledge can be expected.

3) Chen et al. (2011) also find that "Eddy propagation in the western basin to the east of Vietnam is quite random, with no uniform propagate direction". Are there some effects or comments to that?

4) The right panels of Fig. 2 showing the differences which should keep the nan areas as in (a) and (d).

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5) Page 9, Line 217: “there are a total of 8 regression equations”? Could you provide the related formal or equations to clearly distinguish the explanatory variables, the response variables, and the input regression data sources?

6) Figure 5 only shows one trajectory. Could you replaced by all trajectories in the SCS during the same time periods, which could be more objectively to explore the credibility of this method.

7) The predictive equation should explicitly presented in text. Although the effects of planetary ïĄć and mean flow advection are highlighted many times, the quantitative effect on the inputs or the predictive equations still are not clear.

8) Page 5, Line 99: whether the cross-correlations have been normalized by the variances of the two time series?

9) Page 6, Figure 2 only show at north of 12ïĆřN. Does it mean this study only investigate the eddy tracks in the northern SCS. If right, the concerned statement and title should be replaced by the northern SCS.

10) Page 9 Line 198: Are the climatological eddy motions divided into 12 months or only annual mean?

11) Based on the 17 years (1992-2009) of satellite altimeter data, Chen et al. (2011) identified 827 eddy (lifetime >=28 days) tracks in the SCS. However, here uses 1981 eddy trajectories during 1992-2008. Why there are so big gap between them?

12) The eddy forecast error has been discussed by Hurlburt et al. (2008). Related to the previous evaluation, it is valuable to comment.

E. Hurlburt, Harley Chassignet, Eric A. Cummings, James Birol Kara, A Metzger, E F. Shriver, Jay Smedstad, Ole J. Wallcraft, Alan N. Barron, Charlie. (2008). Eddy-Resolving Global Ocean Prediction. Washington DC American Geophysical Union Geophysical Monograph Series. 353-381. 10.1029/177GM21.

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Table 2: Eddy center location errors in ocean prediction models compared to ocean color from SeaWiFS in the northwestern Arabian Sea and Gulf of Oman

13) In this study, the distance errors are presented by degree or km only. The relative error considering the eddy radius is more important to directly understanding the uncertainty.

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Ocean Color Eddy ID#	A or C	Ocean Color Eddy Center Location		1/16° NLOM	1/32° NLOM	1/8° NCOM	1/12° HYCOM	1/32° NLOMr No Assim
		°N	°E	Eddy Center Position Error, km				
1	C	23.55	60.2	35	18	80	48	NP
2	A	18.3	62.0	103	28	66	48	NP
3	A	21.15	60.25	44	58	48	37	NP
4	C	19.65	60.4	43	12	15	59	45
5	C	16.8	55.65	35	42	75	72	31
6	C	17.0	58.9	42	17	38	68	NP
7	C	16.7	57.9	53	79	NP	97	NP
8	A	18.0	57.6	NP	40	36	68	NP
9	C	25.1	57.6	NP	39	91	76	NP
10	A	24.7	62.5	30	35	NP	NP	NP
11	C	23.7	62.3	*	22	37	52	42
12	C	19.3	58.8	30	30	50	65	NP
13	A	19.225	59.35	35	11	NP	26	NP
14	A	25.3	58.55	36	33	NP	28	30
15	C	24.1	61.75	55	NP	NP	NP	47
16	C	22.25	62.7	14	*	NP	48	*
17	C	23.1	62.55	NP	13	NP	44	NP
18	A	22.5	62.85	18	51	47	NP	44
19	C	22.05	62.05	NP	23	NP	NP	26
20	C	22.2	59.95	NP	12	NP	22	NP
				% of Eddies Present in the Model				
	All eddies			70	90	55	80	35
	Large eddies, 1–10			80	100	80	90	20
	Small eddies, 11–20			60	80	30	70	50
				Median Eddy Center Position Error, km				
	All eddies			35.5	29	48	50	42
	Large eddies			42.5	37	57	68	38
	Small eddies			32.5	22.5	47	44	42
				% of eddies With Most Accurate Position				
	All eddies			22.5	52.5	5	10	10
	Large eddies			20	50	10	10	10
	Small eddies			25	55	0	10	10

Fig. 1. Table 2

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