

Interactive comment on “Arctic Ocean geostrophic circulation 2003-2014” by Thomas W. K. Armitage et al.

Anonymous Referee #2

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This paper presents estimates of the surface geostrophic circulation over much of the low-latitude Arctic Ocean and Nordic Seas derived from satellite SSH. The focus is on seasonal and interannual variability from 2003 through 2014. It is shown that the Beaufort Gyre changed in strength and location on roughly pentadal time scales. It is suggested that these changes were forced by changes in wind stress and ice cover. I am of mixed feelings with this paper. There is nothing wrong with the analysis, but it is very descriptive and I did not feel that I learned very much from it. It is useful to document these types of observations, however, so I am in favor of publication subject to some relatively minor revisions as outlined below.

Title: Should really be "...surface geostrophic circulation 2003-2014"

Abstract: State what data is used to derive the velocity estimates.

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Figure 1: Poor choice of color scale, can this be made easier to read?

(page 3, line 4) Water and ice are not transported from the BG into the Chukchi Sea, it is the other way around.

(4,1) Why can you do seasonal and interannual analysis while previous studies were limited to long term means?

(4,28) The authors are correct that the ocean and ice coupling can go both ways, unfortunately they do not attempt to decompose which is driving the other in their analysis.

(5,11) The Manley and Hunkins eddies are very small, $O(10 \text{ km})$, and thus not detectable in the present filtered satellite data. This is a very important distinction. The EKE estimated here is more likely dominated by the gyre instability, which has been linked to wind stress and freshwater content by Manucharyn and Spall (2015 GRL) and Manucharyan et al. (2016 JPO).

(9,2) Looks more like the speed increased from 2008-2009.

(9,26) Is the direction difference partially explained by Ekman dynamics?

Figure 3: The vectors are very difficult to interpret (too small). I suggest contouring DOT together with the color plot of the velocity magnitude.

(11,1) I find the "gate" approach ambiguous. How much of the changes are due to changes in magnitude versus changes in gyre location?

(11,14) Does the BG extend over the Northwind Ridge when its centroid is located to the extreme NW? This is a little surprising to me.

(12,1) Figs 3a, b look nearly the same to me. I would guess if one were to put error bars on these they would be the same.

(12,13) In what way does the present study corroborate Bulczak et al?

(12) The numerous features of EKE that are mentioned are difficult to locate on the

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figure. Maybe some geographic indicators would help the reader. Again, the EKE found here is probably not the small Manley and Hunkins eddies generated from the shelf break. It would be interesting to try to connect the magnitude of this EKE to that predicted by Manucharyan's work.

(13,6) I do not see any trackiness in the figure.

Discusson: The discussion is really a summary of other people findings and a recap of the present results connected by some speculation. I don't think it contributes much to the paper as is.

(17,14) Fram Strait

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