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Ocean Science Discussions

Interactive comment on "Malvinas-slope water intrusions on the northern Patagonia continental shelf" *by* A. R. Piola et al.

Anonymous Referee #2

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*General comments *

The paper describes a possible process for explaining how slope waters could enter the continental shelf off Patagonia. The process would be related to changes in the constant potential vorticity contours close to 41° S. The importance of such a process is related to water mass enrichment and phytoplankton blooms which are common in the Patagonian continental shelf as well as at the shelf break over the Malvinas Current core. The slope water intrusion is documented in the paper from a few, localized /in situ/ CTD data at the vicinity of 41° S (other hydrographic data, although mentioned are not presented) and by indirect estimates of sea surface temperature (SST) anomalies and chlorophyll concentration (CC) computed from satellite time series. Surface drifter trajectories in the region seem to corroborate the idea that the bottom topography may

drive open ocean to continental shelf water intrusions.

I believe the paper is well written with good references and worth publishing. However, I am a bit concerned about linking SST and CC anomalies which are estimated for the sea surface to a process occurring close to the shelf break bottom. The authors lack to present strong evidences linking sub-surface to bottom temperature anomalies to SST anomalies in the study region.

Other evidences of water mass (current) intrusions at the vicinity of 41° S presented by the authors arose from surface drifters trajectories. These last evidences are, to my understanding, weak in pointing out the true nature of the current flowing over the continental shelf. For instance, Fig 10 of the paper presents a clear trajectory of a drifter (showed in red) flowing in the continental shelf. It looks like to me that the Malvinas Current is totally affected by the f/H contour at 41° S but, after a while, turns back towards the shelf break. The trajectory (as well as the others) gives to clue on how long this process was (days?). As seen in all the other trajectories, the current turns back feeing the first meander of the (outer shelf) South Atlantic Current. I wonder if any (possible) SST anomalies carried out by the current to which the (quasi-Lagrangian) drifter is attached would stay over the shelf in a time frame possible to promote nutrient enrichment. Although not directly, SST data collected by a possible temperature sensor attached to this drifter may offer a clue on this subject.

Specific comments

Pages 2942-2943: Data description lacks the temporal frame: hydrographic data is described later in Section 3; Drifter data lacks description of having (or having lost) their drogues as well as measuring SST; SST images are said to be 2 day composites but no mention on how long (and to which period) the series is (related); no mention is made to cloud coverage or to possible (anomaly) errors related to this that can exist close to 41° S; CC images are monthly images but again I cannot see the length of the time series.

Pages 2945-2946: Seasonal cooling at site "A" may be computed yearly from the SST data used by the authors: a plot similar to Fig 6 may be added to this figure showing the SST time series at this site as well as the SST anomaly, all together with the (very nice) plot of Fig 6. May be also prudent to mention sea-air fluxes computed for the vicinity of the study region by Pezzi et al (2009). In Page 2947 the authors also finished the first paragraph concluding that "Thus, it seems unlikely that sea-air heat exchanges can explain the intense temperature drops at site A relative to the surrounding area". New evidences reported by Pezzi et al. (2009) and other (under review at JGR) results of Acevedo et al. (2010) show that the Fairall et al. (1996) parametrization generally used for computing the sea-air fluxes may not apply to the Southwestern Atlantic Ocean.

Page 2946: EOF analysis may be briefly described in methods before showing up in the results section.

Page 2948: 2nd paragraph's reference to 123 CTD stations in Fig 7: the figure needs to be better made for the stations are very difficult to be seen. I think Fig. 7 could also display the 100 m level as to better support Page's 2949 affirmation that "in winter the surface inshore intrusions extend vertically throughout the water column".

Page 2956, last lines of the conclusion: I guess that, although the physical mechanisms leading to the temporal variability of the cold intrusions at 41° S are still unknown, the authors are well aware of the possible presence of shelf-break eddies and small-scale mixing caused by current sheering (in this case the slow Patagonian and the fast Malvinas currents) – good references to this process at lower latitudes at the south American continental break region are stated in the last paragraph of Page 2941. I would like to know why these process was not investigated by the authors using the available 2-day SST image composites or at least why a mention to future work on this subject was not considered.

References

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Interactive comment on Ocean Sci. Discuss., 6, 2939, 2009.