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# ***Interactive comment on “Seasonal variability of the Ekman transport and pumping in the upwelling system off central-northern Chile ( $\sim 30$ S) based on a high-resolution atmospheric regional model (WRF)” by L. Bravo et al.***

**C. Aguirre (Referee)**

catalina@dgf.uchile.cl

Received and published: 14 March 2016

## General comments

This paper used a high resolution atmospheric simulation to evaluate the seasonal variability of the Ekman transport and Ekman pumping, and their relative contribution to the vertical transport off central-northern Chile. This matter has been studied in other upwelling regions, due its relevance to understand the climate dynamics of the eastern boundary systems. I recommend that this paper be published after minor revisions,

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mainly due this research is a contribution to the knowledge of the Humboldt upwelling system. Overall, the manuscript is well written and the results are clearly presented, but lacks of a final section with the summary of the major findings and conclusions.

### Specific comments

1. Something that perturbs me is the use of the term “coastal divergence” exclusively for the Ekman Transport. Ekman transport occurs due the divergence caused by the presence of the coast, Ekman pumping occurs due the divergence in the coastal region caused by the spatial variability of the wind field. Thus, both physical processes are finally due to coastal divergence.
2. In the abstract and results, authors mention that both alongshore wind stress and wind curl show a clear seasonal variability with a marked semiannual component. Could authors propose a mechanism that produces that semiannual component?
3. In the article, the potential role of Ekman pumping on the spatial structure of sea surface temperature is also discussed. It is not clear to me why authors used one data set to force the atmospheric model (OSTIA) and another to analyze the role of Ekman pumping on SST (MUR). Please clarify.
4. Page 3008, line 1-5 say: "Additionally, local high frequency forcing in the region is associated with atmospheric coastal jets with period less than 25 (Garreaud and Muñoz, 2005; Muñoz and Garreaud, 2005) that are related to the variability of the South Pacific Anticyclone and play a major role in coastal upwelling (Renault et al., 2009; Aguirre et al., 2010)". I am not agree. The atmospheric coastal jets are related to synoptic dynamics of the mid-latitudes pressure perturbations (in this case high pressures) that migrate toward the east, as demonstrated by Muñoz and Garreaud, 2005 and after by Rahn and Garreaud, 2013.
5. Page 3010 line 15. The reference Garreaud and Muñoz, 2005 is not correct here, due that study does not involve simulations. The correct reference should be Muñoz

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and Garreaud 2005, due this study involves simulations with MM5.

6. Page 3011 line 13 say: “. . .the results indicate a better fit in diurnal variability when model if forced with SST (OSTIA)”. I wondering why you get a better fit in diurnal variability when force the model with OSTIA, if this data set lacks of a diurnal cycle, due it have daily temporal resolution as mentioned in page 3010 line 22.

7. I suggest that a final section with the summary of the major findings and conclusions should be included.

#### Technical comments

Figure 3e. Due the seasonal variability of the wind stress and wind curl, it should be useful add the date of the measurements in the legend to know which line correspond to dates mention in page 3014 line 18.

Figure 6a. The choice of the colorbar is not adequate. Usually the drastic differentiation between reds and blues is used to distinguish between positive and negative values as in figure 6b. But the use of this colorbar in figure 6a could be confused.

Page 3013 line 11 say: (due upwelling). It should be (producing upwelling ) ?

Page 3019, line 4. Maybe the letter M is not the best choice for the Meandering index as it was used previously as Ekman transport.

Page 3023, line 28. There is a reference to the “horizontal SST gradients”. It is not clear how those SST gradients were calculated. Are zonal SST gradients? Are cross-shore SST gradients? Are the maximum SST horizontal gradients? Please clarify.

Page 3016 line 4 say: by astraighter coastline . . . it should be . . . by a straighter coast-line

Page 3027 line 12. Reference say Jacox and Edwards, 2002. Should be Jacox and Edwards, 2012.

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