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

Anonymous Referee #1

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This manuscript explores the relative contribution of Ekman transport and Ekman pumping to upwelling along the coast of Chile, including how the relative contribution changes annually. Overall the topic is interesting and relevant, but there are a some major comments that need to be addressed before this could be considered for publication. While the writing is understandable, there are various places where it could be improved, but this is not a big issue. To help, some of these places are highlighted in the supplement to this comment.

Major revisions are recommended, but these corrections might take more time than typically given.

1. Influence of Diurnal Cycle There is a substantial change in the wind stress and wind stress curl diurnally. Does this impact the relative contribution from month to month? It was never clearly stated, but what is the "daily output" (3014, line 26)? Is the wind field averaged over every hour? What happens to the relative contribution if just the 0 or 12 UTC is used for each month? Are the results in spring dominated by the intense late afternoon coastal jet? This is an important aspect for interpreting the seasonal variation.

2. Interpretation of coastal wind/drop-off zone. This is a major issue and needs to be corrected/improved. Starting at the end of page 3018-3020, the interpretation of coastal wind is based off of primarily Renault et al. (2015). There is a lot of literature on coastal wind that is much more complete. Some of the earlier works are Beardsley et al. 1987 (cf. Section 3, JGR), Burk and Thompson (1996, Mon. Wea. Rev.), Haack et al. (2001, Mon. Wea. Rev.), and many, many more. Archer and Jacobson (2005 Mon. Wea. Rev.) do a much more complete treatment of vorticity generation than Renault et al. (2015).

Page 3020, line 5: It says that the cool SST stabilizes the air column and results in a shallower marine boundary layer. This is not correct.

Page 3020, line 26: Perhaps leave speculation of the atmospheric forcing mechanisms out of this.

3. Model issues: Section 2.1 has some vague parts. Was the WRF initialized just once and ran from 2007-2012? Why does the outer domain extend all the way to 10N (Fig. 1)?

It was stated that at least six different parameters (cumulus, PBL, soil, SST forcing, land surface, and topography [how/why was that changed?]) were evaluated (3010, line 25). This means that there are a lot of different 5-year runs at 36/12/4 km that were done. Was it really just a subset that was evaluated? There is no need to show all of these runs if that is really the case, but don't oversell the evaluation of model sensitivity.

Specific model issues: Page 3010, line 7: Increasing resolution does not always translate to greater skill, and there are other issues to consider. (see Ranjha et al. 2015, Meteorol. Atmos. Phys.)

Page 3010, line 13: Half of the model levels are below 1.5 km? Keep in mind that a good rule of thumb is that the lowest full level should be 0.990 or 0.995 if a PBL scheme is used.

Page 3011, line 1: What does it mean to simulate at hourly intervals? I don't think that is the time step since the integration would be unstable. Does that mean that the output is saved every hour?

Page 3011: Include the range of dates for WRF in all of the figure captions. Some are 2007-2012 and others are 2007-2009. It has to be clearly stated.

Other specific comments: Page 3012, line 15: Assume that it goes to zero right at the coast?

Page 3012, line 20: Onshore wind? This discussion has been about the decline of the meridional wind. Is that what is meant?

Page 3013, line 3: In the previous paragraph, several assumptions were made. Here, is this using the assumption of a constant gradient and that it goes to zero at the coast, or is this the actual curl computed from the model grid?

Page 3014, line 16/Fig 3d: Since Fig. 3e only goes out to 200 km, perhaps only extend the Fig. 3d out to ~500 km. This will also make it easier to see the detail near the shore in the model. Also, caption should be "Distance from the coast (km)"

Page 3017, line 6: On average…not every day has equatorward wind, especially in

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winter.

Page 3017, line 25: What do you mean by integrate? It looks like these are just average values in 0.25 degree bins. What wind measurement closest to the coast is it? From QuikSCAT? Is it from the WRF (not a measurement. . .)? This needs to be much clearer since it is central to your main conclusions.

Page 3018, line 18: The meridional variation of the relative contribution between pumping and transport is important, but is the actual ocean response dominated by processes like upwelling shadows in the Coquimbo Bay?

Page 3021, line 14: QuickSCAT is only twice a day at most, which can also impact the average.

Page 3024, line 17: Since pumping is also correlated to transport, wouldn't that also be highly correlated? It would be good to include that to not oversell the pumping-only relationship.

Fig. 7: Would the ratio of transport to pumping make a better comparison?

Fig. 9: Dec. in the upper left panel.

Please also note the supplement to this comment:
http://www.ocean-sci-discuss.net/12/C1373/2015/osd-12-C1373-2015-supplement.pdf

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Interactive comment on Ocean Sci. Discuss., 12, 3003, 2015.