Response to second interactive comment on "Marine boundary layer over the subtropical southeast Pacific during VOCALS-REx – Part 1: Mean structure and diurnal cycle" by D. A. Rahn and R. D. Garreaud.

We wish to thank the reviewer for their comments and address the individual comments below:

G1. We recognize the tremendous effort of all involved in the field campaign. We contacted the group leaders of all the data sets that we used and include their suggested references and inserted their statements that they sent to us into the more complete acknowledgements.

G2. We have included model cross-sections created in the same manner as the observations. Biases/implications are addressed in general comment 3.

G3. We can only speculate on this problem, but now provide pertinent information on differences between observed and simulated structure near the coast that leads us to infer possible reasons why models perform so bad in the near coast region in the north of Chile. Explanation is contained in a new section 3.4 with two additional figures and an additional bullet point in the conclusions. We cite previous work by McNoldy et al. (2004) showing biases between QuikSCAT and reanalysis data (ECMWF and NCEP) along the western coastline of continents. These regions contain too much coastal divergence, which they note is likely from too much onshore flow. We further speculate that the greater coastal divergence thins the MBL and is a result of insufficient mechanical blocking in the models. Why there is insufficient blocking is not known. We have tried several ways to improve blocking of this low-level flow using WRF (some physically reasonable, some unrealistic experiments), but have not been successful. Anomalously high low-level onshore winds continue to manifest in the model solution.

S1. For cloud droplet concentration, the Thompson schemes uses a fixed number of activated droplets in space and time (N_c = 100 cm^{-3}, Thompson et al. 2006). We clarified the radiation schemes: *"…rapid radiative transfer model for the longwave radiation, the Dudhia shortwave radiation scheme,…"*

S2. During this period all of the coastal soundings except Santo Domingo (33.5°S) had an identifiable MBL all the time. Santo Domingo often had a much more complicated structure, but we went through every sounding to make sure that the MBL height was realistic and often had to use other information (mainly humidity profiles) to place the MBL height at the appropriate level. There were 7 of 62 cases at Santo Domingo where either the inversion was less than 100 m or reached the surface, representing 11% of the total. These are considered the no-MBL cases. This is clarified by the inserted text:
"…strong temperature inversion. *An MBL exists at all times north of Santo Domingo. At Santo Domingo 7 of 62 (11%) soundings did not have a clear MBL since the temperature inversion reached the surface.* Distribution of MBL height from the land stations including all 0000 UTC and 1200 UTC soundings is shown in Fig. 5 *(values ≤100 represent no MBL)*, and the values of the mean and standard…"

To elucidate even further, a climatology (1979-2007) of soundings at Antofagasta (23.4°S) by Muñoz, et al. (submitted to J. of Climate) found that during the spring/summer months there was an MBL nearly 100% of the time. Model-derived MBL height was present all the time north of about 27°S (Fig. 2). At Santo Domingo it was defined about 95% of the time.

T1. Replaced 'was' with 'were'.

T2. Parentheses now enclose the lat-lon pairs.

T3. Replaced 'Parameters' with 'Parameterizations'.

T4. Replaced 'When considering' by 'in'.

T5. Inserted 'SST' after 5 C.

T6. Replaced 'Anden' with 'Andean'.

T7. Replaced 'slower than' by 'of'.

T8. The reference to the Winant et al. PreVOCA paper is now updated to the ACPD paper.

T9. Precipitation in Fig. 3d has been converted into units of mm d^{-1} to be consistent with other studies.

References:

McNoldy, B., D., Ciesielski, P. E., Schubert, W. H., and Johnson, R. H.: Surface winds, divergence, and vorticity in stratocumulus regions using QuikSCAT and reanalysis winds. *Geophys. Res. Lett*., **31**, 2004. L08105 doi:10.1029/2004GL019768.

Muñoz, R. C., Zamora, R., and Rutllant, J., 2010: The coastal boundary layer at the eastern margin of the South East Pacific (23.4°S, 70.4°W): cloudiness conditioned climatology, *submitted to J. of Climate*.

Thompson, G., Field, P. R., Hall, W. D., and Rasmussen, R. M: A new bulk microphysical parameterization for WRF (& MM5). *7th WRF Users' Workshop*, Boulder CO, July 2006.