Atmos. Chem. Phys. Discuss., 11, C12162–C12164, 2011
www.atmos-chem-phys-discuss.net/11/C12162/2011/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Advances and limitations of atmospheric boundary layer observations with GPS occultation over Southeast Pacific Ocean" *by* F. Xie et al.

Anonymous Referee #2

Received and published: 21 November 2011

Review of "Advances and limitations of GPS occulatation for ABL observations" by Xie et al.

This is an interesting "instrumental" work in which the authors compare several low-tropospheric variables derived from GPS radio occultation against radiosonde data over the SE Pacific acquired during VOCALS-REx (October-November 2008) and high-resolution ECEMWF analysis. The SE Pacific exhibits the typical features of the eastern boundaries subtropical oceans: a nearly-well mixed marine boundary layer (MBL) capped by a strong, sharp temperature inversion and often topped by stratocumulus clouds.

The authors took advantage of the strong temperature and moisture gradient within the temperature inversion, leading to a strong refractivity gradient, to infer the MBL height from GPS-RO data. The discrepancy between the GPS-RO derived MBL height and observations is actually similar or even less than the model (ECMWF) bias. Thus, GPS-RO MBL height seems a quite good addition to the list of proxies that can supplement the small number of direct (radiosonde) observations over the SE Pacific and other remote oceanic areas.

The paper is well written and informative, the conclusions are sound and the figures are clear. I consider this manuscript can be accepted for publication subject to addressing the following minor points.

1. The authors should provide more information of the availability of the GPS-RO data used in this work. For instance, in which period is the data available (beyond the VOCALS period)? What determine the spatial density of these observations? Given a 1°x1° box over the SE Pacific, what is the average time between one GPS-RO and the next? Is there a seasonal cycle in the data availability?

2. The authors discuss that N-bias is quite frequent over the SE Pacific –given the strong gradient in refractivity- but this not affect the estimation of the MBL height. What meteorological information are we missing due to the N-bias?

3. An important finding in VOCALS-REx was the difference in MBL characteristics between the near-shore (between the coast and about 75°W) and offshore. In the near-shore region, the MBL is thin (1 km) and very stable. Offshore the MBL deepens, sometimes decoupled and become more variable. (Refs: Southeast Pacific atmospheric composition and variability sampled along 20° S during VOCALS-REx, Atmos. Chem. Phys. Discuss., 11, 2873-2929, 2011; Marine boundary layer over the subtropical southeast Pacific during VOCALS-REx – Part 1: Mean structure and diurnal cycle, Atmos. Chem. Phys. Discuss., 9, 26029-26062, 2009). Most of this longitudinal dependence is readily seen in the different transects along 20°S. I strongly suggest the

ACPD
11, C12162–C12164, 2011

authors construct such a transect of MBL height (including errors bars) to be compared with the transect in the above mentioned articles. It will be a nice complement to figs. 7-8.

4. Connected with the previous points, most numerical weather models severely underestimate the MBL height near the shore at 20°S (observations indicate 1 km but most models calculate 500 m). It seems that, by the contrary, GPS-RO data overestimate this height. Any comments on this?

5. Some minor typos: Page 2277, line 20: range, not rage. Two lines below, you refer to Fig. 3c but this figure has only two panels.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 22857, 2011.