Dear reviewer,

We like to thank you for your helpful comments on our paper titled “Vertical wind retrieved by airborne lidar and analysis of island induced gravity waves in combination with numerical models and in-situ particle measurements”.

The original comments are in bold, followed by our replies.

Reviewer #1

1. **On P5, L9-10, the statement “for the retrieval of vertical wind speed, the LOS vector L_DWL is set pointing approximately in nadir direction”, how is the effect from the airplane movement if the laser beam is not exactly perpendicular to the flight direction?**

   A lidar pointing direction $\vec{\mathbf{L}}$ not perpendicular to the flight direction introduces a projection of the horizontal aircraft speed in the DWL measurement equal to $\vec{\mathbf{L}} \cdot \vec{\mathbf{v}}_{\mathbf{ac}}$ and a projection of the horizontal wind component equal to $\vec{\mathbf{L}} \cdot \vec{\mathbf{V}}\,(\mathbf{R})$. For the case of the aircraft speed projection, a correction based on the aircraft navigation system measurements and the mounting angle of the lidar is applied according to Eq. 2, while for the case of the atmospheric horizontal wind speed, previous DWL horizontal wind speed measurements and dropsonde wind speed profiles can be used to partially compensate this effect (Fig. 2).

   The following clarification was introduced:

   “Corrections to the LOS speed resulting from a non-zero nadir angle are discussed in Sec. 2.3.”

2. **On P11, L15, “Fig. 4” should be Fig. 3b.**

   Fig. 4 was changed to Fig. 3b.

3. **On P12, L22-24, the statement “...lower pressure level. For the upper pressure level the wind changes to easterly direction” is confusing according to Fig. 5. The lower pressure level should be 1000 hPa and the upper pressure level should be 700 hPa.**

Clarification introduced:

According to the reviewer suggestion, "lower" was changed by "1000 hPa" and "upper" by "700 hPa".

4. **On P15, L21, "cone" should be core.**

The terminology related to the wavelet analysis follows the work by Torrence and Compo: "A practical guide to wavelet analysis", included as a reference in this work.

5. **On P16, L15, The phase difference of 90 degrees between the aerosol concentration change and the vertical wind velocity need further explanation.**

The following clarifications were introduced:

"…the CPC measurements show also the effect of the waves in the aerosol distribution, *but with a phase difference to the vertical wind speed of 90°"*

"Because the aerosol vertical flux is determined by the integrated product of the vertical wind speed and the variation of the aerosol concentration with respect to the mean along the flight path, a phase difference of 90 degrees between these two quantities results in a zero net flux. The dust loaded air parcels periodically rise and sink without leading to a net downward or upward dust transport."

6. **On P18, L28-29, the statement "A wave structure can be identified in the boundary between the SAL and the mixed layer at an altitude of 2000 m." It is not obvious, to my opinion, to recognize a wave pattern, especially in Fig 13a. The leg 2 measurement in Fig 13b does show some wave structure.**

The sentence refers to the wave pattern visible in Fig. 13b.

Clarification introduced:

"On the 2nd leg, a wave structure can be identified in the boundary between the SAL and the mixed layer at an altitude of 2000 m on the lee side of Barbados (Fig. 13b)."

7. **Table 2., Some estimated mounting angle has large deviation value in rolling and yaw angle, eg. 0.11° on 18.06.13, -0.04 on 13.07.13, 0.20° and 11.52° on 14.07.13. Does it have any influence on surface distance measurement?**

As can be seen in the geometry of the problem presented in Fig. 1 and in P9 L11-18, deviations in the yaw mounting angle does not have a large influence in the surface distance measurement. For that reason, the yaw mounting angle estimation based on distance measurements (second row of each flight presented in Table 2) give place to an unstable solution. A similar behavior is observed for the roll angle in the case of mounting angle derivations based on speed measurement. A combination of both methods gives place to more stable solutions.