Response to Referee Comment (RC2) on “Sensitivity of Aeolus HLOS winds to temperature and pressure specification in the L2B processor”

We are grateful for the comments and suggestions.

General Comment:

This manuscript presents a study on the sensitivity of Aeolus HLOS wind retrieval to temperature and pressure in NWP models used in the L2B processor. This is an interesting study because it is important to have a good characterization of uncertainties in observations to assimilate them in NWP systems. In order to estimate correctly the HLOS sensitivity in the Rayleigh-Brillouin channel, it is necessary to know the temperature and the pressure. These quantities are estimated using the information provided by NWP models. The study confirms that in more than 99% of the cases, the impact of temperature and pressure errors have a negligeable impact on HLOS wind retrieval taking into account the relatively large errors of Aeolus HLOS data. However, it will be necessary to better estimate this impact for Aeolus follow-on mission where the expected quality of the observations will be hopefully improved. The originality of the approach is to estimate the errors in NWP temperature and pressure fields from the difference between two NWP models IFS and ARPEGE. However it is not obvious that the difference between two NWP models is really representative of the model errors. This assumption needs to be discussed in the manuscript.

I agree to anonymous reviewer #1 to consider that some technical details in section 3.1 and 3.2 could be removed to render the paper easier to read for non-specialists of NWP data assimilation.

Despite these remarks, I consider that the paper brings new and useful information on characterization of Aeolus HLOS wind retrieval.

We thank reviewer for this comment. We believe that a clear description of the experiment is crucial for the reproducibility. In this paper we introduced a methodology that is not following the operational production of AUX_MET files since we considered a different data assimilation system. We think that some details of this production must be kept in the paper for any other NWP group that would be interested in running their own L2B processing and AUX_MET production. As well, a clear description is necessary to be able to introduce all error sources affecting the sensitivity study described afterwards. Therefore, we removed some unnecessary details and rather add some additional explanation on error sources arising from the chosen experimental set-up.

We are aware of limitations regarding the estimation of uncertainties from two NWP forecasts. This has been discussed in a greater detail in lines 56-63 of the Introduction section in the revised version. The main reason for using 2 NWP forecasts is the ability to study (fairly economically) the spatial-temporal variability in forecast errors (although due to problems mentioned in lines 56-63 we have been finally forced to study zonally-averaged patterns of uncertainties) which is currently not taken into account in the operational L2B processor. This study was found important especially for future missions for which a statement is given in the conclusion of our study. A better experimental set-up would be to consider the forecast error information from an operational ensemble of forecasts, however, this has not been implemented.

Specific comments:

C1: *Line 36: I do not understand the comment on the deviation of Rayleigh-Brillouin deviation from the Gaussian spectrum. Is it not due to acoustic waves rather than atmospheric stratification?*

We agree that this sentence was poorly written. This deviation is due to the increased collision between molecules and the induced acoustic waves. It is corrected in the revised text.

C2: *Lines 217: Please explain what is the median absolute difference (difference between percentiles 75 and 25). This quantity is not so frequently used in the atmospheric community.*

Clarification is added on the use of mad instead of std.