We thank Referee#3 for the helpful comments. These comments helped to substantially improve the manuscript. Below we give detailed answers to the individual reviewer comments in blue.

This is a well written description of a photoacoustic spectrometer and few examples of laboratory and ambient measurements, but there are a few issues that could be discussed in more detail.

1) A detailed discussion of accuracy. I expected to see discussion of possible systematic biases and overall determination of accuracy at high signal to noise.

The determination of the characteristics of a prototype instrument in terms of accuracy, systematic biases, and detection limit is an ongoing process and needs the comparison of the instrument with other more established measurement methods and instruments. This is still ongoing work, along with further instrument modifications and improvements.

All information on the instrument characteristics that we could gather so far are already compiled in the paper. There was only one occasion to validate our instrument against the established single wavelength photoacoustic instrument (DRI-PAS), originally developed by Pat Arnott from the Desert Research Institute. An intercomparison study to test the accuracy of our prototype instrument (at 532 nm) was performed with CAST soot aerosol. The result is shown in Figure 4 of the manuscript.

We have planned further studies in this respect, e.g. by comparing our instrument with the extinction minus scattering method established at the World Calibration Center for Aerosol Physics (WCCAP) in Leipzig, Germany. Furthermore, we will validate our NO_2 calibration method by a simultaneous extinction measurement across the acoustic resonator length (in this way being insensitive to any variations in laser and NO_2 spectral properties). The results of all these activities will be the subject of forthcoming publications.

2) How is the resonant frequency determined? Calculated based on the cell geometry? Is it set such that there is 90 deg. Phase between the light and mic signal? What is the acoustic amplification, Q, of the cell?

The resonance frequency was determined each day by a scan in the applied frequency range. The Q-factor of the cell is about 25.

3) What is the level of the bkg in units of absorption? How stable is the background? Is the background due to absorption in the windows? Or scattered light absorbed in the cell walls?

The LOD is given in units of absorption coefficient.
The background is generated due to interaction of windows and cell wall with scattered laser light resulting in a background noise. This noise also depends from the surrounding area.

4) Absorption of PAS light by NO2 will convert some for the NO2 to NO. This effect will bias the calibration. Could the authors quantify the magnitude of this effect? It is important?

For the shortest wavelength we used in this study, i.e. 445 nm, we didn't find any indications for photo dissociation of NO2. This is in agreement with literature data of NO2 quantum yields (e.g. by Roehl et al., 1994). However, we agree that this is an important aspect for our calibration procedure in conjunction with future setups using even shorter wavelengths.
(Roehl et al., J. Phys. Chem., 98, 7837-7843, 1994)

5) Can you describe the lock in amplifier gain in a more meaningful manner? Settings 6 and 7 do not mean much to the reader.

These numbers correspond to sensitivity setting for full scale (= 10 V) output. The settings in the ultra-stable mode of 6 and 7 correspond to sensitivities of 1mV/10nA and 300µV/3nA, respectively.