Answer to Ref #3

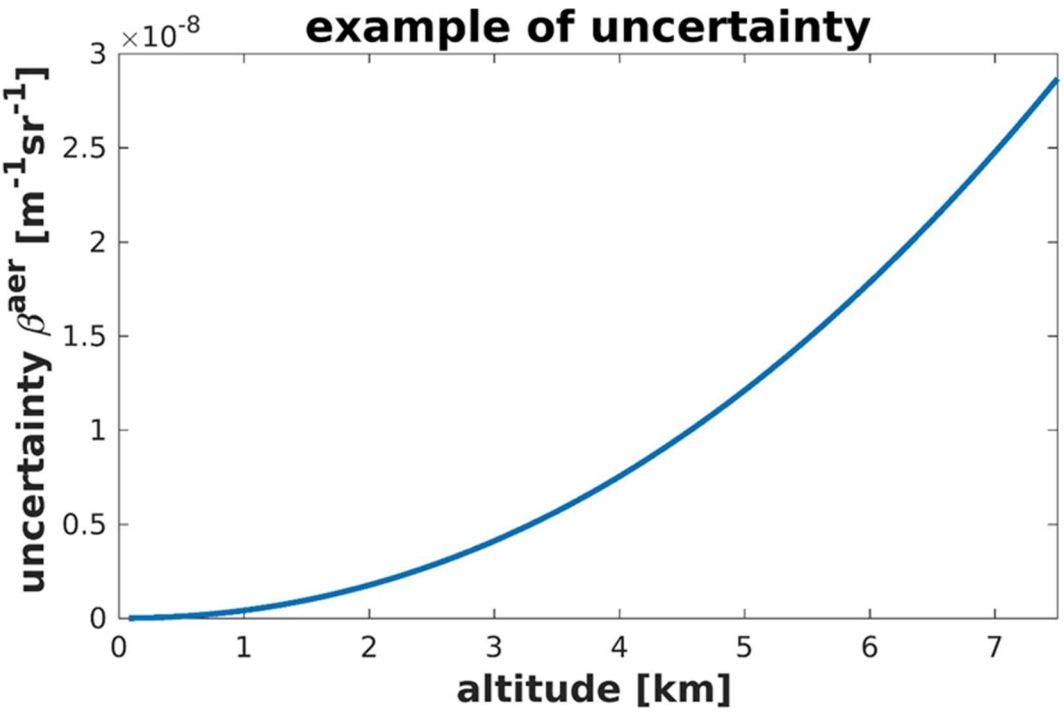
We thank the reviewer for his comments. Please find our answers in red (here and in the manuscript)

While the manuscript provides valuable insights into the influence of electromagnetic interference on lidar-derived aerosol properties, there are a few weak points that could be addressed to improve it:

Limited discussion on the potential impact of RF interference on aerosol property retrieval: The manuscript focuses primarily on the detection and suppression of RF interference but provides limited discussion on how such interference affects the accuracy and precision of aerosol property retrieval. Further exploration of the potential biases or uncertainties introduced by RF interference would enhance the manuscript.

We don't expect a bias, as the RF interference manifests as a (false) oscillatory behaviour of the lidar signal. We will state this in the new version. However, this RF interference increases the uncertainty, as we explained in section 3.2: the uncertainty of beta_aer decreases by a factor of (slightly more than) 2 in our case at 10.5 to 11.5km. For a retrieval of aerosol properties typically uncertainties of beta_aer below or equal 10% are required. The according quotes of Veselovskii et al. and Böckmann are given in the new version of the manuscript. Hence the improvement by RF interference detection is most obvious for weak aerosol layers.

See also our answer to Reviewer # 5. We provide a plot on the uncertainty over altitude.



However, as the uncertainty depends on the meteorologic conditions (the signal strength) no general conclusions can be drawn from that plot.

Böckmann, C. 2001, Appl. Opt. https://opg.optica.org/ao/abstract.cfm?uri=AO-40-9-1329

Veselovskii I. et al. 2002, Appl. Opt. https://opg.optica.org/ao/abstract.cfm?uri=ao-41-18-36852002,

Lack of comparison with other lidar systems: The study primarily focuses on the lidar system used in Ny-Ålesund, Svalbard, but does not provide comparisons or discussions about similar lidar systems in other locations or studies. Including such comparisons would strengthen the significance and generalizability of the findings. Maybe this point can just be indicated as future research.

Thank you for this remark. Indeed, our findings can be generalized to any analog signal. Of course, we are open to any cooperation in the field. In the past even a few intercomparison campaigns have been performed in Ny-Ålesund, even if it is logistically demanding.

Limited exploration of noise reduction techniques: While the manuscript presents an interference suppression method, it does not explore other noise reduction techniques commonly used in lidar data analysis, such as wavelet filtering or advanced denoising algorithms. Discussing the limitations and potential improvements of the proposed interference suppression method in comparison to existing techniques would add depth to the manuscript.

This is a valid point. The importance (and accuracy) by noise reduction is probably a very important topic. However, we would avoid a long discussion here for two reasons: First, we believe that this issue is best done by artificial lidar signals (where the exact solution is known but hidden behind some noise). In this manner the different smoothing / de-noising techniques could be compared best. Second, if someone sees a clear artificial spike in the Fourier space, it is probably best to correct this spike directly. This is what we want to show by our manuscript: regardless of how the lidar evaluation is done, if RF interferences are detected it is worth to correct them directly.

Insufficient discussion on the implications for long-term data records: The manuscript briefly mentions the importance of long-term data recording and quality assurance. However, further discussion on the implications of RF interference on long-term data records, including the potential biases or uncertainties introduced over time, would provide valuable insights for researchers relying on lidar data for climatological studies.

Thanks. We will mention the quotes Böckmann 2001 and Veselovskii et al. 2002 who state that the optical coefficients are required with less than 10% uncertainty for trustful inversion

of microphysical aerosol properties. See also below (answer to Rev 5.) We add an additional plot on how the uncertainty decreases for our case on 16 Feb. However, the uncertainty reduction depends on the strength of the lidar signal and hence on the meteorologic conditions. Therefore, there is no easy answer and this additional plot is only an example which may not be included in the final manuscript.