Reply to anonymous referee #2

The manuscript presents a very good summary of important work carried on the feasibility of retrieving the height of aerosol layers (ALH) from observations in the Oxygen-A band by the soon-to-be-launched TROPOMI sensor. The manuscript is well written and offers a detailed description of two basic approaches of using O2-A band observations. The main deficiency of the manuscript is the handling of the sensitivity analysis of the suggested methods of ALH retrieval to aerosol properties. Their simplified approach using the outdated Henyei-Greenstein phase function approach, offers no real insight into how the proposed aerosol layer height retrieval depends on the fundamental aerosol properties: particle size distribution and complex refractive index. The current analysis on response to changes of an H-Y asymmetry parameter does not address the issue on how the suggested approach would work in the presence of desert dust and volcanic ash (large size, non-spherical, non-absorbing) particles and carbonaceous (much smaller, strongly absorbing) aerosols. Desert dust, volcanic ash and carbonaceous particulate are the most likely aerosol types to be found in the free troposphere. Accurate radiative transfer calculations fully accounting for particle scattering and absorption effects are routinely done thanks to today's fast computing capabilities. The authors should, at least, establish a clear connection between their simplified modelling and actual aerosol properties (particle size and complex refractive index) they are supposed to represent.

We thank the reviewer for the positive feedback on the manuscript. The main issue concerns the sensitivity of retrieved aerosol height for realistic aerosol types to the aerosol model assumed in the retrieval (here: a HG phase function). In the revised manuscript, a section (section 3) has been added presenting a more detailed simulation study on the effect of errors in aerosol optical properties. Sensitivities are presented for a desert dust, carbonaceous aerosol and volcanic ash aerosol model. We remark that the fact that we have used the HG phase function for the retrievals presented in this paper does not imply that we are explicitly arguing in favor of using this phase function. At a later stage, we may very well further optimize the retrieval also with respect to the aerosol model when this proves necessary or when we have gotten other, larger error sources under control.