

## ***Interactive comment on “A Compact Rayleigh Autonomous Lidar (CORAL) for the middle atmosphere” by Bernd Kaifler and Natalie Kaifler***

**Anonymous Referee #2**

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This study describes a new Rayleigh/Raman lidar dedicated to temperature retrieval. The novelty of the results presented here concern the fully automatized mode for lidar operation that is presented for the first time. The manuscript is well written and the results about the lidar autonomy is fully demonstrated by the temperature series presented and will be for sure for the future other systems a reference. For this reason, the publication of this manuscript in AMT is valuable. However, I have several restrictions in the present form and I consider that this manuscript requires some critical improvements. The first one concerns the missing references for many aspects while a lot of works has already been done by the research community. Auto-citing needs to be balanced by work performed by the international research community. The second one concerns the technical choices. no alternatives are presented and this is missing to

C1

convinced readers that the choices performed by authors are the results of an optimum scientific choice and to avoid part of the manuscript being a technical note rather than a scientific contribution. Finally, the capabilities of the lidar need to be discuss and mainly regarding the automatization issues. How this mode does not perturb nominal capabilities, and what are the proxy used to check the temperature retrieval quality. No comparisons with other observations are presented. While operators introduce some uncertainties in the quality of the observations, automatic mode main also introduce some bias. How can we check this issue? I am sure that authors have the response to my questions and I think it will be valuable to further document the missing information. For my point of view this manuscript requires significative revisions that can be quickly handle.

Detailed suggestions

Line 24 page 1 The comment about the fact that lidar only operate during campaigns is a wrong statement while within the NDACC network routine measurements are performed over many sites around the world. The longest data based is obtained at Observatory of Haute-Provence with more than 40 year of continuous observations. Many publications are related to these long commitments. The only thing true is that these systems do not have fully automatic mode for their operations (some of them have semi-automatic mode with possibility to stop when rain and cloud are coming) and require operators for turning them on and ensuring alignment. For data analyses some NDACC partners have automatic software's to process the data real-time including automatic data cleaning. This statement needs to be modified and a section about the associated works need to be provided while many climatologic works have been performed including trends that were published in international reports for IPCC, ozone assessment or SPARC-WCRP.

Page 2 line 26 Many gravity waves climatology were already performed that need to be cited. One of the first I think was performed by Wilson et al. in late 1980's and early 1990's.

C2

Page 2 line 58 Operators are also required for safety reasons and air traffic control. These issues need to be introduced here and information about the capabilities of CORAL can be discuss and documented later on the manuscript. The issue is; how authorities can have confidence of such system?

Section 2 about lidar description The description here requires some arguments about the choice rather in referencing to past work of the team, to work performed by other teams or in providing evidences through graphic or capability comparisons when technical choices are different from what the scientific community has performed.

Page 6 section about automatic tracking of the laser beam This section is well described and critical for lidar automatization. It requires an introduction explaining the technical choices compare to other methods and also the sinusoidal exploration was not explained. Final capabilities need to be demonstrated. Figure 7 is not so clear for me. Also, the time speed for correct alignment need to be discussed according the sky conditions. This is a critical point while human have a exploration mode that is sometime more efficient while less quantitative. Also the geometry here is coaxial. Is it a requirement or the development described here can be apply to bi-axial systems?

Page 15 section example In this section comparisons with other observations are required. No additional observations will fully validate the full profile except radiosondes. Also, many comparisons between other Rayleigh lidars and satellite instruments have been performed, is CORAL found similar deviations. Authors mentioned MLS and SABER, recent comparisons were published and can used as comparisons. The main point will be about the demonstration that such alignment does not introduce any bias. Comparison with radiosonde and temperature retrieval right after alignment will be a first demonstration.

Within NDACC, lidars ensure their qualification by comparison with a mobile system running by NASA. Many publications have reported about these comparisons. It is out of the scope of this studies but collocated measurements with other lidars will allow to

C3

convinced the scientific community about the data quality.

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C4