

Atmos. Meas. Tech. Discuss., referee comment RC3
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Comment on amt-2021-33

Anonymous Referee #3

Referee comment on "VAHCOLI, a new concept for lidars: technical setup, science applications, and first measurements" by Franz-Josef Lübken and Josef Höffner, Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2021-33-RC3>, 2021

General Comments

The paper presents the development and first implementation of a lidar system that has the potential to transform observations of the middle atmosphere. The development of these compact and robust wind solid-state wind-temperature capable lidars is a significant technical achievement in itself. Combining precision resonance lidar techniques with Rayleigh and Mie techniques to yield winds and temperature in the troposphere, stratosphere, mesosphere, and lower thermosphere. The fact that these instruments are field deployable as compact units (1 m) allows deployments of distributed arrays of profilers that will support a variety of new investigations of the middle atmosphere. The paper provides a technical description of the instrument as well as a discussion of investigations that will be supported (e.g. waves versus large scale turbulence).

Specific Technical Comments

Overall the paper is well-written, informative, and accessible. However, there are places where more information would be useful, particularly if this paper is to serve as foundation reference for the VAHCOLI class of lidars.

1) The paper would benefit if some of the technical details were explained in greater detail, particularly in terms of the determination of the frequency stability of the seed laser and the confocal etalon using the Doppler-free spectroscopy (Figure 5). Does the locking use the Pound-Drever-Hall technique combined with the Doppler-free spectroscopy? What are the fundamental limitations of the tuning accuracy and precision based on the Doppler-free spectroscopy. How was the stability of the confocal resonator determined relative to that of the seed laser?

2) The diagram of the lidar system could be presented in more detail as the schematic of record.

3) There are places where the the writing could be polished and made more concise.

Minor point.

The authors note that the lasers were trucked from Aachen to Kuhlüingsborn (~600 km) without significant misalignment. Can they determine the relative contribution of the laser design, the driving skills of the shippers, and the quality of the autobahn conditions to this result?