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Atmospheric Measurement Techniques Discussions

Interactive comment on "Profiling of CH_4 background mixing ratio in the lower troposphere with Raman lidar: a feasibility experiment" *by* Igor Veselovskii et al.

Anonymous Referee #2

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General remark

Dr. Sergey Bobrovnikov (see his review in the discussion section) already wrote an almost exhausting review. Because Dr. Bobrovnikov is a pioneer in the field of Raman lidar applications and observations of trace gases and temperature (since the late 1970ies) I have only minor points to add.

The paper is well written and successfully combines experimental work with modelling results. The shown cases studies are promising and convincing.

The paper can be regarded as a highlight of AMT.

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Discussion paper

Minor revisions may further improve the paper.

Detailed points:

Abstract: would be nice to mention the wavelengths 395.4 nm (CH4) and the reference channel (N2, 387 nm) already in the abstract.

P2, L36: Ansmann 1998, I did not find. . .

P3, L77: One should mention, ...somewhere in the introduction...., the MERLIN project (ESA's mission on spaceborne methane lidar observations, with DIAL, but column-integrated. . .) to corroborate how important methane observations are. ESA has nice handbooks with nice introductories.

One could then mention that such CH4 Raman lidar observations in Lille could be used for ground truth activities. The launch of MERLIN is planned for 2024.

Result section:

P6, L175-176: Please do some HYSPLIT computations, provide information about the source region of the detected layers.

P7, L185-188: Again provide some information about the origin of the air masses detected.

P7. L195: Note that the apparent lidar ratio in water clouds should be 10-15sr (instead of 18.2sr) because of multiple scattering effects.

P8, L217-218: Again, information on the origin of the found air masses would be helpful.

Enhanced depolarization can be caused by dust and by dry smoke. Are radiosonde RH profiles available. Smoke may become nonsphercial when RH is below 30%.

P9, L239: Again, would be nice to have some RH information.

P10: At the end, mention again the MERLIN mission, and that ground-based Raman

lidars are good for ground truth activities.

Figs. 3 and 4: There are layers, and the reader wants to know: what is the source?

Fig 4. Why not a temporal order: b,c,d,e,f,a?

Fig 5: Are RH profiles available (radiosonde)? Is the lofted layer dry (. . .then non-spherical particles) or wet (more spherical particles)? Further point: Origin of the lofted layer...?

Fig. 6: Depolarization ratios of 15-18%! Is that caused by dust or by dry smoke particles? Origin of the aerosol ....

Fig. 7: Maybe the smoke was picked up in North America ?

All in all: A nice paper!

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