

## ***Interactive comment on “Quasi 18-hour wave activity in ground-based observed mesospheric H<sub>2</sub>O over Bern, Switzerland” by Martin Lainer et al.***

### **Anonymous Referee #3**

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Review of Lainer et al

I should first note that I have deliberately not read the other review. So if my comments seem in any way duplicative, consider them to be independent opinions.

#### Major comment

Their result seems interesting, is broadly plausible and certainly suitable for ACP. My main question, and it's a serious one, is how can they actually observe this kind of oscillation in their H<sub>2</sub>O data? Any wave in a conserved tracer field should only be manifest if the vertical gradient of the tracer is small enough relative to the vertical displacement. The oscillations seen in their data (i.e. Figure 1) seem very large for what is supposedly only a 6 km vertical wavelength. And further, their vertical resolution seems insufficient to capture a 6 km wave. I am comfortable with a limb viewer such

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as MLS seeing this wave, but a vertical sounder seems less likely. On page 4, line 20, they give their vertical resolution as 11-14 km, but then say the 18 hour wave has 6 km vertical wavelength. If that is the case, then how can they see it? At a minimum, they need to present some simulations showing this. For example, the gravity wave community has spent considerable time and effort illustrating how waves are seen differently in limb vs. nadir sounders. Here, some sort of test case with an idealized wave is called for in order to be truly convincing, in my opinion. Or perhaps taking the WACCM fields and convolve them with the microwave averaging kernels. I'm worried that something else with a period of 18 hours is contaminating their retrieval and thus they are not actually seeing H<sub>2</sub>O oscillations. The authors jump too quickly to spectral analysis without first presenting more raw data and showing how it varies. The same question applies to their wind data which has stated resolution of 10-16 km

#### Minor comments

1. What is their integration time? On page 4, line 24, they say 3 hours. On page 5, line 22 they say 6.

2. If their measurement is only valid to 0.02 hpa (e.g. page 3), then they should cut off their plots at that level (e.g. Figures 1, 3, 6)

Grammar. In general, while their English is order of magnitudes better than my German, the grammar should be improved. An incomplete list follows.

End of abstract and beginning of Intro: They use “manifold” in adjacent sentences which seems awkward.

Page 2, line 2: “Latter analyzed”... ?

Page 2, line 23 – either “a” or use plural

Line 1 on page 3- what is this supposed to mean?

Line 24-25 on page 4: again, a poorly expressed thought: I think I understand why

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the winter data are more usable- due to lower tropospheric humidity. But this sentence implies something else. Do they mean that the measurement response in winter is sufficiently high that they can use a time integration as short as 3 hours (as opposed to say, a day?). If so they need to express that more clearly.

Page 5,line 10: "To our knowledge and made efforts," ? "made efforts" is poor English.

Page 12, line 25 "is capable of resolving"

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Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-1050, 2017.