

## ***Interactive comment on “Diurnal cycle of short-term fluctuations of integrated water vapour above Switzerland” by Klemens Hocke et al.***

**Anonymous Referee #3**

Received and published: 17 July 2019

The paper describes the short term fluctuations in the integrated water vapour (IWV) column over Bern observed by the ground based TROWARA radiometer. Three different methods to calculate amplitude spectra of these fluctuations are presented. The main result of this work is an analysis of the diurnal cycle of short fluctuations and how this varies with season. During summer, the authors conclude through the similarities of this diurnal cycles to the one of the short term fluctuations of specific kinetic energy, that the observed short term fluctuations of the integrated water vapour column are caused by turbulence associated with convective heating.

The manuscript represent a substantial contribution to scientific progress within the scope of this journal because it provides a detailed analyses of the seasonal and diurnal variations of the IWV fluctuations.

C1

### **Major points**

Most critical I see the conclusion, “ that the diurnal cycle of the short-term IWV fluctuations is caused by turbulence associated with large convective heating during daytime in summer” from the comparison in this work, because:

- The diurnal cycles are not very similar (e.g. for JJA Figure 5 shows the maximum between 12 and 14h, Figure 6 after 16h.)
- I would expect a more detailed analysis of this connection, looking into more detail than the seasonal mean of the diurnal cycle. How is the correlation between them (for single days and/or do days with strong (week) short-term IWV fluctuations show also strong (weak) fluctuations of the specific kinetic energy)?
- What about spring and autumn?
- How large is the variability of the diurnal cycles shown in Figure 5 and 6?

I agree, that the convective heating could have a large influence on the diurnal cycle of the IWV short term fluctuations, but from the results presented I cannot see why it is the only/main cause?

### **Other major points**

The results and discussion part is rather short and should be extended.

Why is the method of the moving standard deviation chosen to analyse the diurnal cycle, what is its advantage compared to the band pass filter?

What are the potential benefits for modelling studies from these measurements? In the introduction more literature concerning this topic should be mentioned.

### **Minor points**

Page 2, line 33: “...height of the atmospheric boundary layer” instead of “...height level of the atmospheric boundary layer”?

Page 4, line 19: 11 seconds or 10 seconds as mentioned at page 2 line 1?

C2

The link between the short term fluctuations of the specific kinetic energy and the turbulent kinetic energy could be explained in more detail.

Why does Figure 7 use the climatology and not the 2010 data as the rest of the paper?

---

Interactive comment on *Atmos. Chem. Phys. Discuss.*, <https://doi.org/10.5194/acp-2019-129>, 2019.

C3