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Atmospheric Measurement Techniques Discussions

Interactive comment on "Can turbulence within the field of view cause significant biases in radiative transfer modelling at the 183 GHz band?" *by* Xavier Calbet et al.

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Dear Stefan,

Many thanks for your comments to the paper, they are really appreciated. I basically agree with your comments. Detailed answers below:

Full Taylor expansion. You are absolutely right about this. I will include, in the next version of the paper, a full Taylor expansion. The reason I have not done this before is twofold. First, the effect of variations coming from turbulence in temperature is very small. I will try to show this in the next version with an additional plot highlighting this.

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Second, when you use cross derivative terms, you need to know the cross-correlation terms, i.e. <dT de>. These terms are unknown to me. Although you could in principle derive them from the measurements, there is no theory (at least that I know of) behind them, so it would be difficult to extrapolate to other turbulence magnitudes. As you shall see, in the next version of the paper, I will approximate <dT de> with <dT><de> just to get some sense of the scale of magnitude. In any case, this cross term contribution seems also to be small, because the temperature is involved.

The purpose of the paper is to show that turbulence has an effect that IS VERY dependent on the frequency, so there is different absorption in the center than in the line wings. This dependence can be a lot bigger than the dependency on the humidity itself (de). Again, I will try to show this with an additional plot.

A new plot will be included to show the effects of dT and de on the absorption profile. The reason to include a de, or dT for that matter, is that turbulence not only changes the shape in the frequency domain, but also generates an offset. This offset has to be removed by either including a opposing non-zero de or dT, such that the curve can overlap the measured biases from Brogniez et al. Note that this has another important implication, if the hypothesis is confirmed it means that we are not measuring the humidity (or temperature) well in this band.

Again, many thanks for your comments, very much appreciated.

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