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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 Xavier,

thank you for this very interesting study. I find your approach to regard and express scene inhomogeneity as a function of turbulence strength for this type of sensor very innovative and fascinating.

There are a couple of things that I do not understand, and perhaps expanding more on them will help also others.

First of all, mathematically, in Equation 3, should there perhaps be cross terms also in

the second derivative ($/(dR_i dR_j)$), basically the Hessian matrix?

The second point I'm confused about is the humidity offset δR. It would be nice if you could show whether you can also achieve a reasonable fit with just the offset alone, without assuming any turbulence, as a null-hypothesis. Would that require unreasonable offset values?

From the second derivatives in Figure 3, I get the impression that the effect of turbulence is only to increase the brightness temperature. Is this correct, or am I misunderstanding something? So turbulence could help reduce the discrepancy between observations and model close to the line center, but, without the additional humidity offset, would increase the discrepancy in the wings?

I think the discussion would be clearer if in Figure 4 you would include curves where there is only turbulence, no humidity offset, or add an additional figure for this. So that one can better judge the size of radiative effect that follows from reasonable assumptions on turbulence alone. The additional humidity offset makes it much harder to interpret the results, since already a modest offset creates a big radiative bias, which is hard to disentangle from the effect of turbulence that is your main subject.

Kind regards, and thank you for opening up this interesting topic.

Stefan

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