

## ***Interactive comment on “Pan-Arctic measurements of wintertime water vapour column using a satellite-borne microwave radiometer” by Christopher Perro et al.***

**Patrick Eriksson (Editor)**

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Dear Christopher Perro and co-authors,

After a new reading of the manuscript, I have decided to follow the advice of referee 2 to reject the manuscript. Referee 1 raises similar concerns and suggests a major revision. That is, it is clear that there are important issues to fix in the manuscript and I find myself to agree more with referee 2 in the weight to put on the issues. In addition, I don't see any clear suggestions in the replies to the referees how the main problems shall be removed. When it comes to details, I mainly refer to the referee reports but I will make some comments.

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A main problem is that this manuscript relies strongly on another submitted manuscript. You have now emailed me this manuscript, but it can not be expected that the referees of this manuscript also shall review that one. I don't see any other solution than to wait until the other review is finished. In this manuscript, the other manuscript is referred to as Perro et al (2018) and I missed in my initial reading that it was only submitted. If I have noticed that, I would have rejected this manuscript at submission.

The links to the other manuscript are especially problematic as the retrievals presented here show a clear dependence to incidence angle. In response to the referees, some reasons are suggested, but I don't find them highly convincing. At least, I find it as likely that the angle-dependent bias originates in the treatment of the surface, that makes it critical to see if the results in the other manuscript will pass review or not.

I understand that perfect, final retrievals cannot be expected at this stage. On the other hand, there can not be too many articles on the way to a final version. Anyhow, it is hard to judge what progress this manuscript actually provides, when large correction factors are still needed and several critical issues are left for future studies (such as the impact of clouds).

Some extra remarks, not raised by the referees:

- \* Two stations provide a weak basis for validation. You can also use GRUAN stations.
- \* Today with fast computers, I don't understand why Eq 1 is used instead of a full treatment of the radiative transfer.
- \* At some point you need to present a rigorous error analysis, i.e. to estimate the retrieval uncertainty separately for each error source. For this reason, I would suggest switching to "optimal estimation" (a.k.a. 1DVAR) following Rodgers. I don't see any fundamental reason why that should not be possible.

Kind regards,

Patrick Eriksson

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