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Interactive comment on “Overview and sample applications of SMILES and Odin-SMR retrievals of upper tropospheric humidity and cloud ice mass” by P. Eriksson et al.

Anonymous Referee #1

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This paper presents estimates of cloud ice mass and humidity from two millimeter limb sounders and compares the results to other available estimates from other satellites and from climate models. This is a relevant and timely effort, in the framework of the preparation for up coming millimeter instruments on board operational meteorological platforms (MetOp-NG). The manuscript is well written, and the results are rather convincing. Nevertheless, following are some issues that should be clarified before this paper can be published.

The method to handle the beam filling effect should be better described. The role of the CloudSat observation is very ambiguous. How does it provide the 3D structure?

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The CloudSat observations are not coincident with the limb sounder measurements. Can you explain how the CloudSat observations are used to describe the statistics of the 3D cloud structure? Statements such as I10-11 p 20954 should be explained. It is specified that CloudSat retrievals are not involved, but I 21 to 27 p 20954 look like the description of a retrieval, although rather simple. This needs clarification.

Section 3.6.2 presents an error analysis of the partial IWP. A reference is given but a few sentences on the way these errors are estimated would help. The errors are given in percentage. Can you specify what you mean?

The diurnal variations of the two variables are presented in section 4.3. Only one season is observed with SMILES. Do you expect changes in the diurnal cycle between seasons? I assume the model outputs are also only considered for the same season. Can you confirm? Could you briefly check the differences in diurnal cycle between the seasons from the models?

The differences between the satellite estimates are very large (Figure 7). It is difficult to agree that there is a general good agreement in the spatial distribution. The spatial distribution as well as the magnitude of the ice contents are very different. Can you elaborate on these differences?

The satellite retrievals presented in this study have little sensitivity to particles smaller than 100microns (I 24 p 20970). Ice clouds in models are often assumed to have radius of the order of 30 microns in climate models, and as mentioned I10-11 p 20972, the ice from the model only considers the small ice particles. So how can those two values (model and satellite) be compared? Can you clarify?

The main drawback of the SMILES retrieval is said to be the limited spatial coverage (I25 p 20973). However, in section 2.1, it is specified that SMILES covers up to 65°N. Why is the retrieval limited to 30°N?

Minor comments: - what is the nature of Figure 1? Are these measurements or ob-

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servations (see comment | 17 p 20955). - p. 20948 | 15: 'these retrievals change character'. What do you mean?? - p. 20948 | 29: An instantaneous (no a instantaneous) - A unique (not an unique) through out the paper. - l1 p 20973. 'The later... data'. No verb. - l18-19 p 20973. Sentence to be rephrased.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 20945, 2014.

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