**Atmospheric
Measurement
Techniques
Discussions**

Interactive comment on "HCl and ClO in activated Arctic air; first retrieved vertical profiles from TELIS submillimetre limb spectra" *by* A. de Lange et al.

Anonymous Referee #1

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The manuscript shows "first light" results from the TELIS tunable submillimetre superconducting integrated receiver instrument (there are two other instruments briefly mentioned that make up the TELIS package). The paper describes the instrument characteristics, radiometric calibration, and retrieval methodology. It also provides error estimates for some of the instrument calibration and characterization features (e.g. side band fraction). The paper focusses on HCl and ClO measurements only (the instrument apparently measures more species like HOCl and O_3). It provides some basic validation material. First they give an estimate of the expected accuracy based on mapping instrument and spectroscopic uncertainties onto retrieved parameter quanti-

ties. Then they perform closest coincident comparisons with Aura-MLS. The TELIS-SIR is a new instrument having impressive signal to noise capability. A paper describing this instrument with results is appropriate for publication in AMT. My opinion is that this paper is suitable for publication with consideration to the following minor comments.

I would like to see concentrations expressed as ppbv rather than ppb to avoid confusion between mass or volume mixing ratios.

To give an idea of how sensitive the instrument is could you mention the system noise specification (for SMILES which uses similar technology it is $\sim$300K SSB).

On page 6500 line 29 I would say precise rather than accurate.

On page 6507 where you discuss how you set the regularisation parameter (gamma). A similar thing is done in a paper by Schimpf and Schreier (JGR, 102, 16055, 1997). You might want to reference that paper? Here they plot the least squares norm against the constraint norm for different values of gamma and as you say choose the value at the corner of the L shape. What you have done seems different in that you plot the norm of the solution (x in eq 3) against the least squares constraint. This might be virtually the same thing, I am not sure, but the left hand side of eq3 should read $||x||^2$ to show the result is a scalar quantity (as stated in the text).

Page 6510 line 3, I would replace completely with accurately.

Page 6511 line 22. What is shot noise?

Page 6514 line 3. I would say all errors steeply increase for H37Cl, surpassing those of H35Cl. As stated it makes it sound like H37Cl is more accurate than H35Cl.

A general comment. The MLS vertical resolution for HCl and ClO can never be better than 2.7 km (the retrieval grid). Therefore it really does not make sense to apply the TELIS SIR AK ($\sim$2 km) to the MLS data. I assume this made no difference in the comparisons. If anything you probably should apply the MLS AK to the TELIS data but I think that for this kind of work it is acceptable to just directly compare the raw

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retrievals.

On page 6517 paragraph at line 19. Another factor that might delay the rise of ClO in sunlight may be caused by the time it takes to illuminate the limb path which is several hundred kilometers. This consideration depends on how the instrument line of sight is aligned with the rising sun.

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Interactive comment on Atmos. Meas. Tech. Discuss., 4, 6497, 2011.

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