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Atmospheric Measurement Techniques Discussions

Interactive comment on "Simulation of sub-millimetre atmospheric spectra for characterizing potential ground-based remote sensing observations" *by* Emma C. Turner et al.

Anonymous Referee #1

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This manuscript investigates the possibility to perform ground-based measurements of HOBr, HBr, HO2 and N2O at frequencies up to 2 THz. Considering the importance (and the expected increase) of bromine and N2O for atmospheric chemistry the aim of the manuscript is justified and it fits very well with the scope of AMT. Exploring the possibilities of ground-based measurements is especially important in the light of the expected lack of limb sounding measurements.

Radio astronomy makes use of recent technology development to obtain low receiver noise temperatures and the same technology can be applied for ground-based atmospheric sounding. The manuscript explores this option, and assess the best frequency window to use for each species, for different atmospheric conditions. My main con-

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cern with the analysis is that only thermal noise is considered, all other error sources are ignored. This is particularly problematic as some of the measurements require a spectral accuracy of about 10 uK. Is it really possible to maintain a spectral purity of that level over weeks/months? Very small external disturbances could easily ruin the measurements. Could not even interference from astronomical sources be a problem (notice that stronger nearby transitions can be red- or blue-shifted, and end up on top of the target frequencies)? How should various disturbances be handled when averaging spectra?

It should be possible to make a rough characterisation of some additional error sources. Maybe most important is to check the interference of species giving stronger spectral features. I don't see anything in the analysis that catches if the target transitions are on top of e.g. ozone isotopologue transitions. If this is the case, variation in both overall ozone concentration and isotopologue fractioning could interfere strongly with the measurement, or even lead to false "detection".

Some error sources, such as reflections inside the receiver system, are hard to characterise in a general manner, but they should at least be commented. Could any such error source even be a "showstopper"?

The manuscript text is very well written. In fact I have no detailed comments worth mention.

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