

***Interactive comment on* “Measurement of the tropical UTLS composition in presence of clouds using millimetre-wave heterodyne spectroscopy” by B. M. Dinelli et al.**

**B. M. Dinelli et al.**

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We have repeated part of the comments and introduced our answers below.

Referee: .....The analysis of the measurements and results achieved appear technically sound and the authors have demonstrated that MARSCHALS can make reasonable if not accurate measurements in the presence of clouds. I say reasonable because the only validation presented was a comparison with a single MIPAS-STR profile obtained in clear sky. The main problem I have with this paper is that it reads like a proposal or a grant renewal report rather than a journal paper. For example, much of the introduction is spent highlighting the inadequacies of existing measurement systems. There is considerable discussion about operational challenges, retrieval details and measurement

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science capabilities. In the present form I don't feel this paper is suitable for publication in ACP because I don't see how it contributes toward atmospheric science or even provide substantial amount of new data with an assessment of its accuracy (ie validation) which may later be used in scientific investigations. To be more suitable for publication, the paper needs to be considerably shortened. I would eliminate the discussion of inadequacies of existing instrumentation.

Answer: OK, this can be easily done. But referee 1 wants more details....

Referee: I would also abbreviate the discussion about flight operations and issues that prevented the instrument from working (these are issues that instrument teams and program managers care about but not the more broad readership of ACP).

Answer: We have shortened part of it, but some has been retained to show why we have one flight only and one band only. See answers to reviewer 1

Referee: I would considerably shorten the discussions on retrieval details and measurement science characteristics and consolidate the measurement presentation into three figures.

Answer: We don't see why we should eliminate some of the retrieval details that to a lot of scientist in the field can be helpful in understanding the results. In fact reviewer 1 asks for more details

Referee: One figure could contain four panels (T, H<sub>2</sub>O, O<sub>3</sub>, HNO<sub>3</sub>) showing the measurements with two black lines showing the vertical range where the instrument contributes (eliminate the error and information content panels). I would also crop the vertical axis so as to mostly show the high information content region.

Answer: Errors and information content are used to show the measurements capabilities of MARSCHALS. Doesn't the reviewer care which is the error affecting the measurements?

Referee: Another figure shows the averaging kernel (ie fig 16 which also shows the

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measurement uncertainty) and the MIPAS comparison on figure 17. I would probably consider eliminating figures 1-3, 7-9, and 15. Much of this technical material (basically this manuscript) can be made available on the web.

Answer: We have removed figure 2, grouped figs 7-8, but retained the others to show the performances of the new instrument

Referee: It would be interesting to see more comparisons with other instruments. I know that UARS HALOE, Odin, Aura MLS, ACE-FTS, MIPAS (envisat) SAGE, and probably others were operating. There are usually balloon based ozone sondes, frost-point hygrometers and standard radiosondes supporting the campaign.

Answer: Validation with in situ instruments has been performed and reported in the final report of the ESA contract. We have changed the title of the section into 'Inter-comparison with MIPAS-STR' and added a sentence referring to the final report of ESA (Dinelli at al. 2007) for the other comparisons. See answer R41 to reviewer 1 For the validation with satellite instruments, a part from the fact that we have to find a satellite that measured the same quantities at the same geolocation and time, that is not trivial, we also have to use an instrument that is not blinded by the clouds. I checked MIPAS/ENVISAT measurements and I found out that they were all affected by clouds at altitudes below 20 km, and therefore not useful!

Referee: On the science front, presenting the relative humidity of the measurements would be interesting because there is uncertainty as to the extent of supersaturation that coexists in clouds in the TTL.

Answer: The only way we are aware of for computing the relative humidity is using the Goff Gratch equation for the saturation vapour pressure of water. This equation is reliable for temperatures from 220 K to 375K. Our temperatures are always below this value, so we do not think that we can give reliable results.

Minor Issues: I would give a listing of all the atmospheric constituents that

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MARSCHALS can be expected to measure when all its spectrometers are operational.

Answer: OK! Introduced the list in section 5.4

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Interactive comment on Atmos. Chem. Phys. Discuss., 8, 14169, 2008.

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