

Interactive comment on “First retrieval of global water vapour column amounts from SCIAMACHY measurements” by S. Noël et al.

Anonymous Referee #2

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1. Water vapour is one of the most important species in atmospheric physics and chemistry. Its retrieval from space based instruments, in this case SCIAMACHY, is therefore highly relevant. The high variability of water vapour requires the simultaneous retrieval of water vapour with other species residing in the same air mass. Sampling by other sensors at (slightly) different time or location may yield the wrong physics or chemistry results. It is therefore laudable that the feasibility of water vapour retrieval from SCIAMACHY data is investigated in this paper. 2. To my knowledge the priority claim of the first water vapour retrieval results from SCIAMACHY data is correct. 3. Results of only one day (27 January 2003) are presented. This is a rather small basis for feasibility/demonstration paper to rely on. 4. The quality of the calibrated radiances from where retrieval departs is not good enough as authors state. It is argued that the DOAS retrieval method is rather insensitive to this problem. However, effects of

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absorption line saturation, assumptions on the water vapour vertical distribution and the convolution of the fine structured spectrum with the coarse instrument slit function all call for the modelling of absolute (i.e. calibrated) radiances. This aspect would need some further discussion. 5. Two DOAS retrieval methods, the AMC- and the WFM-DOAS are being applied. This raises the question as to the theoretical basis of both methods. The best fit not always leads to the best retrieval result as the fitting algorithm may home-in on spurious spectral features (point 4). For example, in Figure 2, the AMC method shows large residuals at 688.5 and 698 nm. On the other hand, in Figure 3, the WFM method shows residuals at 687 and 693 nm. This seems inconsistent with the fact that both methods rely on the same spectral data (HITRAN) and the same radiation transport model (SCIATRAN) for fitting the same measurement. 6. A single model atmosphere has been defined for aerosol. This assumption does not take into account biomass burning or air pollution events. It is difficult to assess the significance of this simplification with only one day measurements at hand (see point 3). 7. A similar question mark applies to the assumption of a fixed albedo of 0.1 for the entire Earth surface. Here, the authors promise further investigation of this problem. Similarly, the validity of a tropical atmosphere applied to higher latitudes would seem to require more investigation/sophistication. 8. Table 1 shows large deviations with SSM/I and ECMWF data below 2g/cm² and above 5g/cm² water vapour content. Is the retrieval tuned to agree with average values (see point 4).

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