

## ***Interactive comment on “Validation of SCIAMACHY O<sub>2</sub> A band cloud heights using Cloudnet radar/lidar measurements” by P. Wang and P. Stammes***

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Received and published: 24 January 2014

We are grateful to L. Lelli for his helpful comments and suggestions.

We have checked the cloud flag in the ESA level 2 data. Only the data which are flagged as ‘no convergence’ and ‘no retrieval’ are removed from the analysis. This means that all the cloud heights between 1 and 17 km are included in the analysis. It is written in the SCIAMACHY L2 data specification (Meringer, 2010) that the full convergence cases have a smaller cloud top height error (0.25 km) than the other convergence cases (0.5 km). Since the results are provided in the ESA L2 data and

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the error is not too large, we think it is reasonable to use them in the comparison. Furthermore, we would like to evaluate the global ESA L2 cloud height product, and not only the best cases. As has already been shown in your figure of the ESA L2 cloud flags, if we only use flags 2 and 5, we may lose half of the data. In the single-layer cloud cases, we got 67 cases with full convergence, 31 cases with cloud top constraint, 55 cases with cloud bottom constraint, 18 cases with layer size constraint and 6 cases with number of iterations exceeded. Most cloud top constraint cases were low clouds and the cloud top heights were set at 1.1 km, which is a rather good assumption for the low clouds at Cabauw and Lindenberg.

The following text is included in sect. 3 to explain the cloud flags.

“ The ESA L2 cloud product provides flags in bits for the quality of the SACURA retrievals, which can be interpreted in the following categories: 1) full convergence, 2) number of iterations exceeded, 3) cloud layer size set to constraint, 4) cloud bottom height set to constraint, 5) cloud top height set to constraint and, 6) no convergence. If the algorithm does not converge, the cloud top height is a filled value (-99.9). If the ESA L2 cloud fraction is 0, the cloud top height is also 0. For the retrievals having flags 1-5, the cloud top heights are provided in a range of 1-17 km. The full convergence retrievals have an error of 0.25 km for cloud top height, while the retrievals with constraints have an error of 0.5 km (Meringer, 2010). Because we would like to evaluate the quality of the complete cloud top height product, we use all the ESA L2 cloud top heights between 1 and 17 km which means that the data having flags 1-5 are used. “

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Interactive comment on Atmos. Meas. Tech. Discuss., 6, 8603, 2013.

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