

## **Authors' answer to the interactive comment of A. Galli on paper Heymann et al., Atmos. Meas. Tech. Discuss., 5, 2887-2931, 2012**

We thank you for your interest in our paper and your helpful comments and questions. Below we give answers to your questions.

*A. Galli: "How come the (spatial and temporal) correlation of the XCO<sub>2</sub> differences with COD is stronger, and also more significant, in the Southern hemisphere? Do you have any (quantitative or intuitive) explanation? Or is this hemispheric discrepancy not significant at all?"*

**Authors:** As one can see in Fig. 5, thin clouds often occur in the tropics. Therefore, one would expect the largest impact of scattering by thin clouds on our retrievals over tropical regions and especially over the Southern Hemisphere because most of the landmasses of the Southern Hemisphere are in the tropics. This is confirmed by the results of the correlation analysis. The XCO<sub>2</sub> differences for the southern hemispheric regions (Southern America, Southern Africa and Australia) are temporally and also often spatially correlated with eCOD. The only northern hemispheric region with temporal correlation is India, which is also in the tropics. These correlations provide evidence that thin clouds affect the SCIAMACHY WFM-DOAS XCO<sub>2</sub> data product not only but more distinctive over the Southern Hemisphere. We will aim at better discuss this point in the revised version.

*A. Galli: "And is it justified to interpret Table 5 as an evidence that aerosols have a weaker impact on the retrieved XCO<sub>2</sub> than clouds?"*

**Authors:** Yes, a key result of our analysis is that aerosols appear to have a weaker impact on the retrieved XCO<sub>2</sub> than clouds. This corroborates the results of the simulations done by Schneising et al. (2008). They found retrieval errors due to scattering by aerosols of up to 1 % for realistic aerosol scenarios but much larger errors due to scattering by thin clouds.

*A. Galli: "I'm a little confused why (since on regional scales the correlation with COD is stronger) on a global scale the only significant correlation is the temporal correlation with aerosol OT."*

**Authors:** The intention also showing the results of the correlation analysis for the global and the hemispheric scale in Tab. 5 was for the sake of completeness. However, we are careful with the interpretation of the results for these very large regions for the following reason:

Our method requires an appropriate size of the regions. The regions should be large enough to reduce the statistical error but not too large, e.g., due to too large spatial variations. Very likely the global and the NH and SH are too large for our method and too difficult to interpret.

Therefore, we will remove the results of the correlation analysis for the global and also for the NH and SH from Tab. 5.

## References

Schneising, O., Buchwitz, M., Burrows, J. P., Bovensmann, H., Reuter, M., Notholt, J., Macatangay, R., and Warneke, T.: Three years of greenhouse gas column-averaged dry air mole fractions retrieved from satellite - Part 1: Carbon dioxide, *Atmos. Chem. Phys.*, 8, 3827–3853, 2008.