Atmos. Chem. Phys. Discuss., 9, S2475–S2480, 2009
www.atmos-chem-phys-discuss.net/9/S2475/2009/

Atmospheric Chemistry and Physics Discussions

ACPD
9, S2475–S2480, 2009

Interactive Comment

Interactive comment on "First steps towards the assimilation of IASI ozone data into the MOCAGE-PALM system" *by* S. Massart et al.

S. Massart et al.

Received and published: 12 June 2009

First of all we would like to thank the reviewer for his comments, which helped us clarifying some points and improving our manuscript. Here are our responses to the different comments.

Reply to Referee #3 general comment

The referee regrets the absence of averaging kernels information for SCIAMACHY and IASI data. Concerning the IASI data that are obtained by a neural network, the computation of the averaging kernel has a non neglecting computational cost since they have to be derived using a perturbation method (Turquety et al. 2004). As it is time consuming, the real-time processing of the IASI data does not allow to derive both the column and the averaging kernels on the global scale, for the period we are dealing with. Another paper in this special issue (Boynard et al., 2009) reports on IASI O3 profiles and associated averaging kernels, but only for specific location for validation purposes. Few sentences have been added in Section 2.1.1 of the revised version to explain this. Concerning the SCIAMACHY averaging kernels, even if these products are important for the interpretation of the observations, we did not have any access to this information.

Figure 6 shows that the model underestimates the tropospheric ozone in the equatorial region and overestimates it in the South Polar Region (SPR). Assuming that the assimilation of MLS constrains mainly the stratosphere without bias, the MLS analysis would underestimates the total ozone in the equatorial region and overestimates it in the SPR. However, Fig. 3 shows the opposite. The difference between SCIAMACHY and MLS showed by this figure come probably by the fact that the SCIAMACHY averaging kernels were neglected. Section 3.3 has been modified to explain that the difference between SCIAMACHY and MLS could come both from a tropospheric bias in the model and/or the neglect of the averaging kernel information. Section 4.1 and the conclusion now discuss this point.

Reply to Referee #3 specific comment

Referee: *Please clarify whether the bias corrections for the SCIAMACHY and IASI data varies with latitude or just time.*

Concerning the SCIAMACHY data, we assumed that the correction is latitude and time dependent, with a timestep of one month. Section 3.3 has been modified to make it clear.

Concerning the IASI data, the correction is latitude, longitude and time dependent, with a timestep of one month as well. It is now specified in Section 5.3.

ACPD

9, S2475–S2480, 2009

Interactive Comment

Referee: *Please clarify whether the SCIAMACHY and IASI data is cloud cleared prior to assimilation and if not, what impacts this may have on the resulting tropospheric ozone analysis.*

The IASI data are cloud cleared as recalled in the first sentence of Section 2.1.1. The TOSOMI algorithm provides SCIAMACHY ozone data corrected for cloudy pixel.

Referee: *With regard to the discussion of Figure 11. Why does the MLS plus IASI assimilation show a mean bias with respect to the MLS plus SCIAMACHY assimilation if the IASI data has been bias corrected?*

This is due to the distribution of the observations. SCIAMACHY does not provide data during the night. As a consequence, during August over the SPR, there are only IASI measurements as showed by Fig. 1 of this commentary paper. Therefore, the assimilation of the IASI data provides information on the troposphere (the stratosphere is mainly controlled by the assimilation of MLS data) while the troposphere is not constrained by the assimilation of SCIAMACHY. The phenomenon is similar over the North Polar Region in winter (see Fig. 2 of this commentary paper). This explains why we found differences between the two assimilations. This explanation is given in section 5.3 of the revised paper.

Referee: *Please comment on whether the approach for bias adjustment and observational error covariance estimates compensates for not accounting for the IASI apriori and averaging kernals in the observation operator.*

The fact the averaging kernel information is not used while using the total ozone column data certainly generates a bias. The bias adjustment can partly compensate this. For the IASI data, the averaging kernels depend on the surface temperature and thermal contrast (Clerbaux et al. , 2009), that implies a time variation of the averaging kernels for a given location. This suggests that a part of the estimated standard deviation can come for the absence of averaging kernel information. But this has less impact on the standard deviation estimation than the difficulty for the neural network algorithm to

ACPD

9, S2475–S2480, 2009

Interactive Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

account for changing ground emissivity over sandy regions. Equally, the large weight that the neural network gives to mean climatological ozone profiles over polar regions impacts the standard deviation in thos regions.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 6691, 2009.

ACPD

9, S2475–S2480, 2009

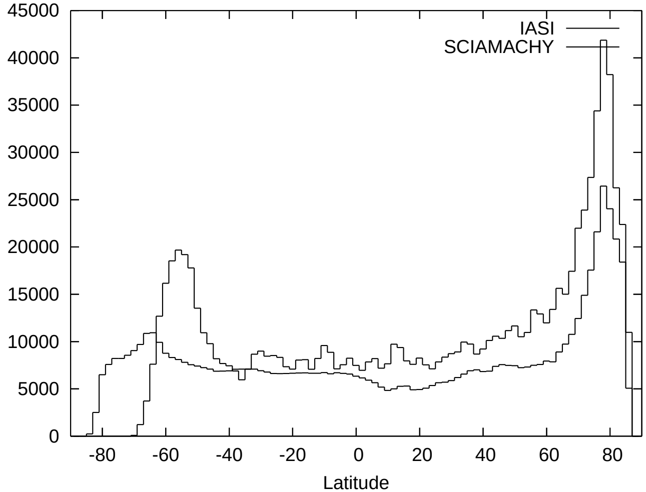

Fig. 1. Number of monthly IASI (black line) and SCIAMACHY (dotted line) super-observations for August 2007 as a function of latitude.

ACPD
9, S2475–S2480, 2009

Interactive Comment

ACPD

9, S2475–S2480, 2009

Interactive Comment

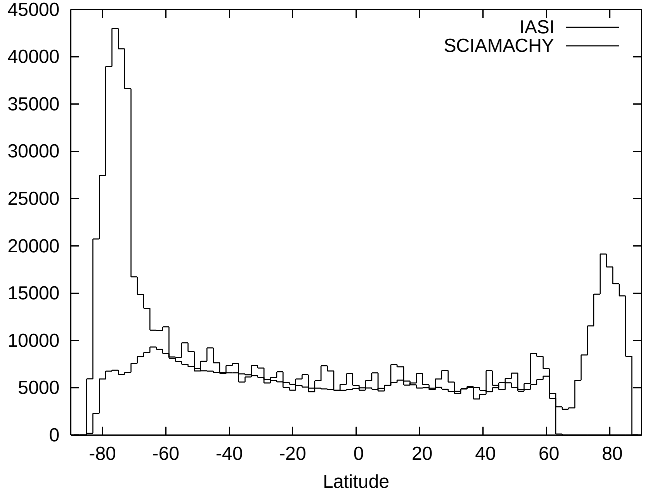

Fig. 2. Number of monthly IASI (black line) and SCIAMACHY (dotted line) super-observations for December 2007 as a function of latitude.