Interactive comment on “SO$_2$ Retrieval from SCIAMACHY using the Weighting Function DOAS (WFDOAS) Technique: comparison with Standard DOAS retrieval” by C. Lee et al.

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In the paper, we have focused on removing constant and latitudinal offsets in the retrieved SO$_2$ slant columns, which could be due to imperfect correction for the varying ozone dependence of the Ring effect. To account for the temperature dependence of the ozone absorption cross sections in the retrieval, we have used ozone climatology of ozone and temperature profiles. We have not created the global climatology of SO$_2$ profiles for the SO$_2$ weighting function, which could produce the vertical columns of SO$_2$ through the fit.

The offset in the slant column of SO$_2$ is dependent on the Ring spectrum which is used in the fit. For Figure 2 and 3, we used the same Ring spectrum in the WFDOAS as
that of the SDOAS when adopting a single Ring spectrum. Ring spectrum in online
Ring spectrum calculation (ORSC) is calculated as a function of total ozone column
including ozone profile shape, solar zenith angle, surface albedo, altitude, and satellite
viewing geometries, as described in section

Slant column fitting errors in WFDOAS retrieval are at level similar to those in SDOAS
retrievals. The fitting error is associated with low radiances measured by SCIAMACHY
at shorter wavelengths and/or high ozone (or high solar zenith angle). The measurement
of low radiances leads to the uncertainties in SO2 retrievals. The error due to low
radiance measurement is at level higher than the typical signals from anthropogenic
SO2 pollutions, and is higher at higher ozone amounts and solar zenith angles, which
are typical at the high latitude regions.

In the revised manuscript,"Slant column fitting errors (about 100 - 200% relative errors)
in WFDOAS retrieval are at level similar to those in SDOAS retrievals and could be
associated with the intrinsic measurement noise of SCIAMACHY. The fitting errors are
related with low radiances measured by SCIAMACHY at shorter wavelengths and high
solar zenith angle (or high ozone). The measurement of low radiances leads to the
uncertainties in SO2 retrievals." has been added in section of Conclusions.

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