

Improvements to the retrieval of tropospheric NO₂ from satellite – stratospheric correction using SCIAMACHY limb/nadir matching and comparison to Oslo CTM2 simulations:

Supplementary material

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Abstract. This document contains supplementary material to the manuscript *Improvements to the retrieval of tropospheric NO₂ from satellite – stratospheric correction using SCIAMACHY limb/nadir matching and comparison to Oslo CTM2 simulations* (Hilboll et al., 2013).

actual stratospheric NO₂ load, i.e. limb measurements and model simulations are adjusted to the level of the nadir measurements over the Pacific Ocean, and all three datasets are subsequently corrected for a tropospheric influence on the nadir measurements in that meridional band. Details can be found in Sec. 4.1.4 of the main manuscript.

1 Climatological comparison SCIAMACHY limb / Oslo CTM2

Expanding on Fig. 9 from Hilboll et al. (2013), we show the climatological comparison between SCIAMACHY limb measurements and Oslo CTM2 simulations for the years 2003–2007 for all months in Fig. 1.

To be able to compare to SCIAMACHY nadir measurements, we additionally show the climatological differences between $VCD'_{\text{strat}}^{\text{nadir}}$ and the stratospheric columns from SCIAMACHY limb and Oslo CTM2 in Figs. 2 and 3, respectively. The large positive values in these two Figures can be associated with tropospheric pollution.

2 Daily maps of SCD_{trop} NO₂

Expanding on Fig. 20 from Hilboll et al. (2013), we show global maps of daily SCD_{trop}NO₂ for the additional days already shown by Beirle et al. (2010) in Fig. 4.

3 Zonal variability of stratospheric NO₂

Expanding on Figs. 10–14 from Hilboll et al. (2013), we show the zonal variation of stratospheric NO₂ for all global 5° latitude bands for Jan and Aug 2006 in Figs. 5 and 6, respectively. As in the main manuscript, the plots show the

References

- Beirle, S., Kühl, S., Pukite, J., and Wagner, T.: Retrieval of tropospheric column densities of NO₂ from combined SCIAMACHY nadir/limb measurements, *Atmos. Meas. Tech.*, 3, 283–299, doi:10.5194/amt-3-283-2010, 2010.
- Hilboll, A., Richter, A., Rozanov, A., Hodnebrog, Ø., Heckel, A., Solberg, S., Stordal, F., and Burrows, J. P.: Improvements to the retrieval of tropospheric NO₂ from satellite – stratospheric correction using SCIAMACHY limb/nadir matching and comparison to Oslo CTM2 simulations, *Atmos. Meas. Tech.*, 6, 565–584, doi:10.5194/amt-6-565-2013, 2013.

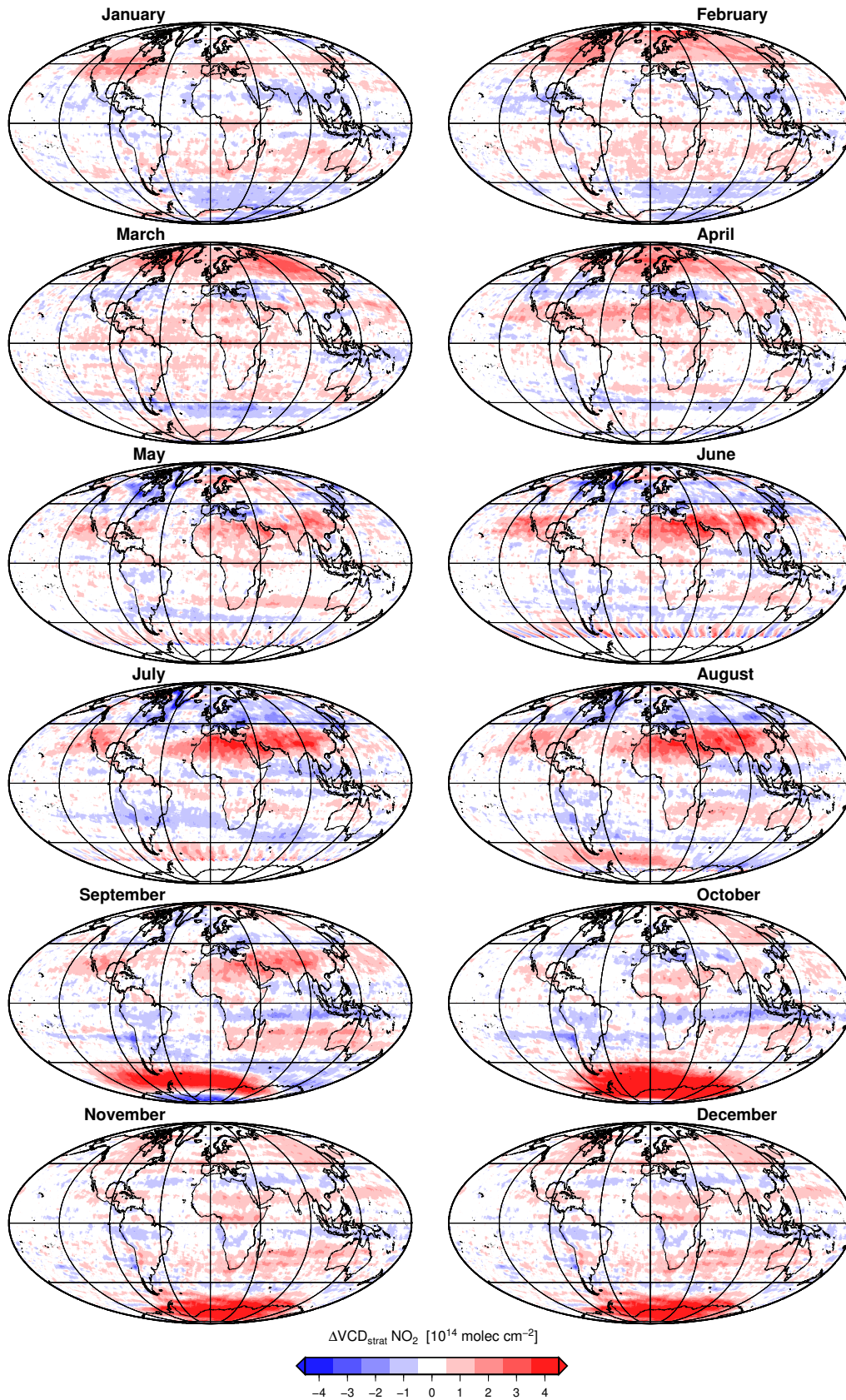


Fig. 1. Climatological differences $\text{VCD}_{\text{strat}}^{\text{limb}} - \text{VCD}_{\text{strat}}^{\text{mod}}$ between SCIAMACHY limb measurements and Oslo CTM2 simulations, for the years 2003–2007, offset to vanish over the Pacific Ocean.

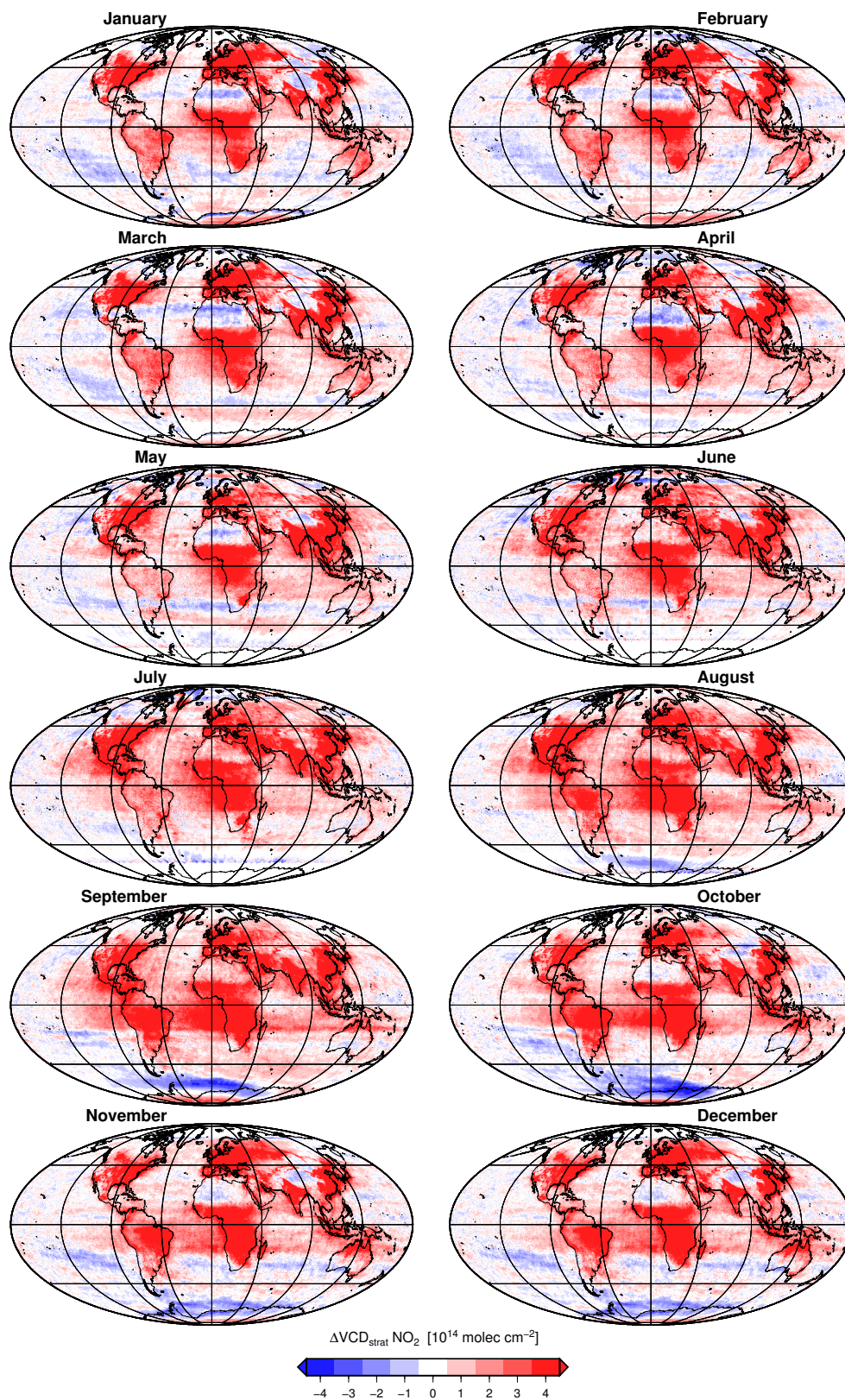


Fig. 2. Climatological differences $VCD_{strat}^{nadir} - VCD_{strat}^{limb}$ between stratospheric NO₂ columns from SCIAMACHY nadir and limb measurements, for the years 2003-2007.

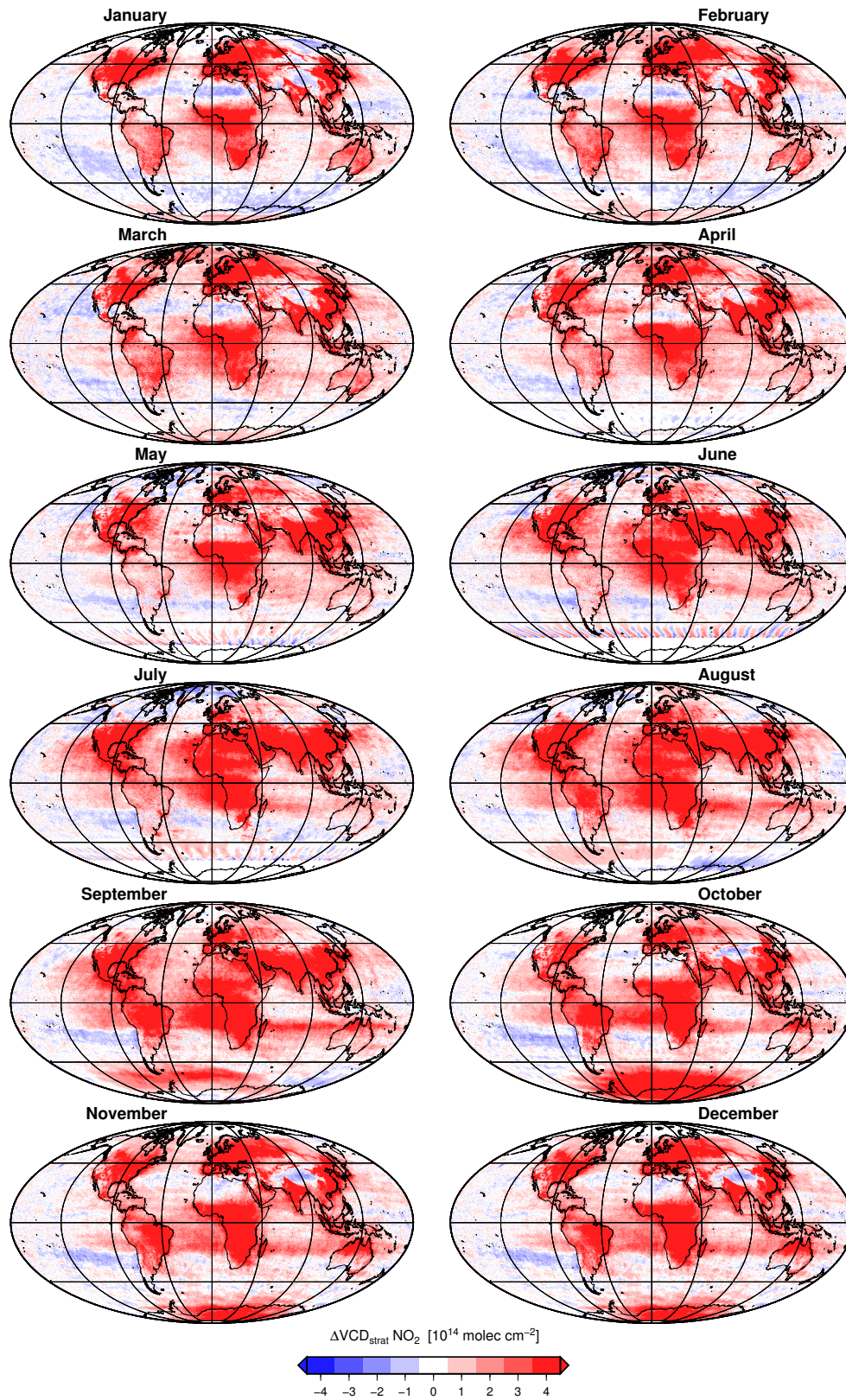


Fig. 3. Climatological differences $VCD_{\text{strat}}^{\text{nadir}} - VCD_{\text{strat}}^{\text{mod}}$ between stratospheric NO₂ columns from SCIAMACHY nadir measurements and Oslo CTM2 simulations, for the years 2003-2007.

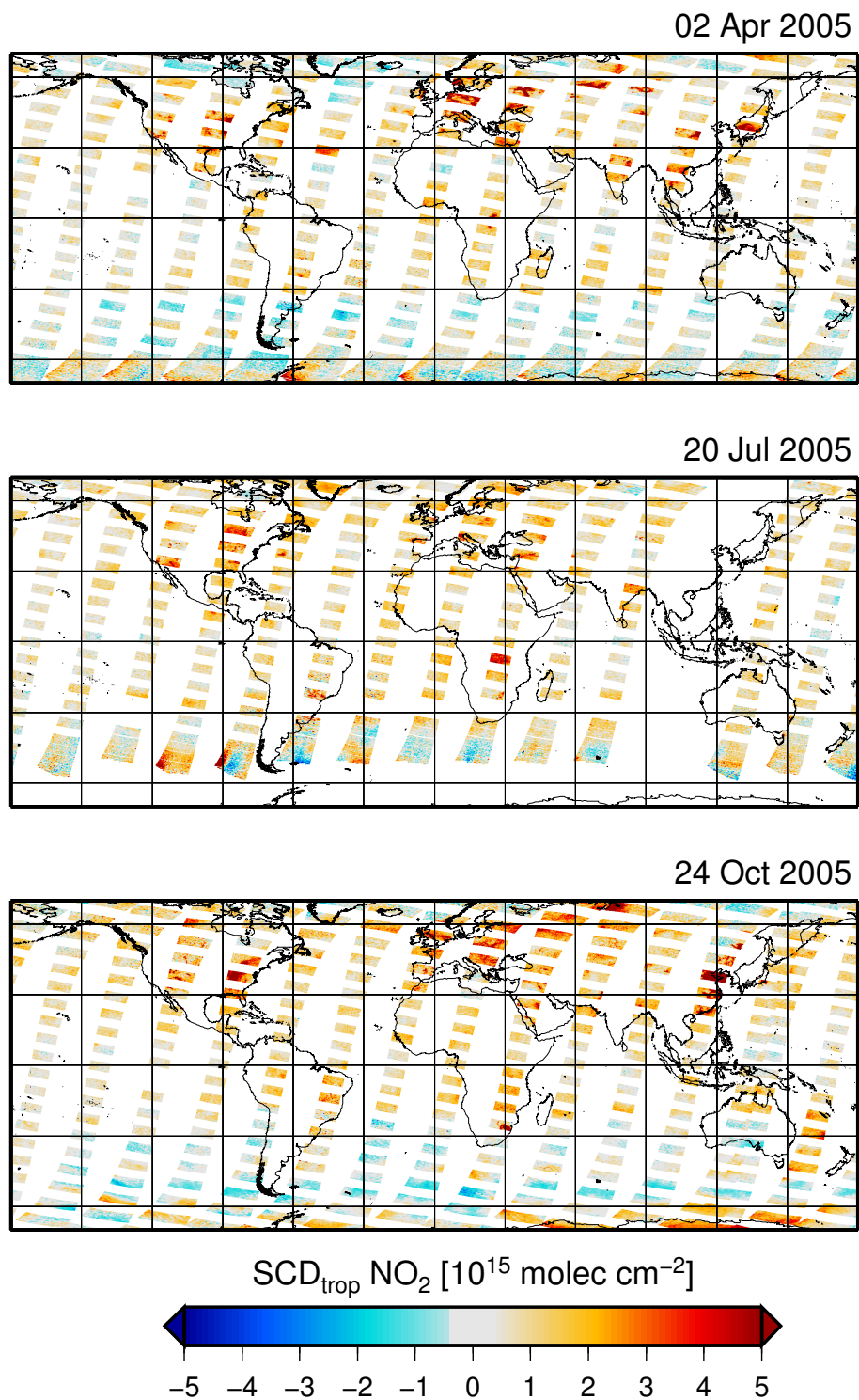


Fig. 4. SCD_{trop} NO₂ for the three days 02 Apr 2005 (top), 20 Jul 2005 (centre), and 24 Oct 2005 (bottom). These are the days which are shown in Beirle et al. (2010).

VCD_{strat} zonal variability: January 2006



Fig. 5. Zonal variation of stratospheric NO₂ columns from SCIAMACHY nadir (black), SCIAMACHY limb (red), and Oslo CTM2 (blue) for Jan 2006.

VCD_{strat} zonal variability: August 2006

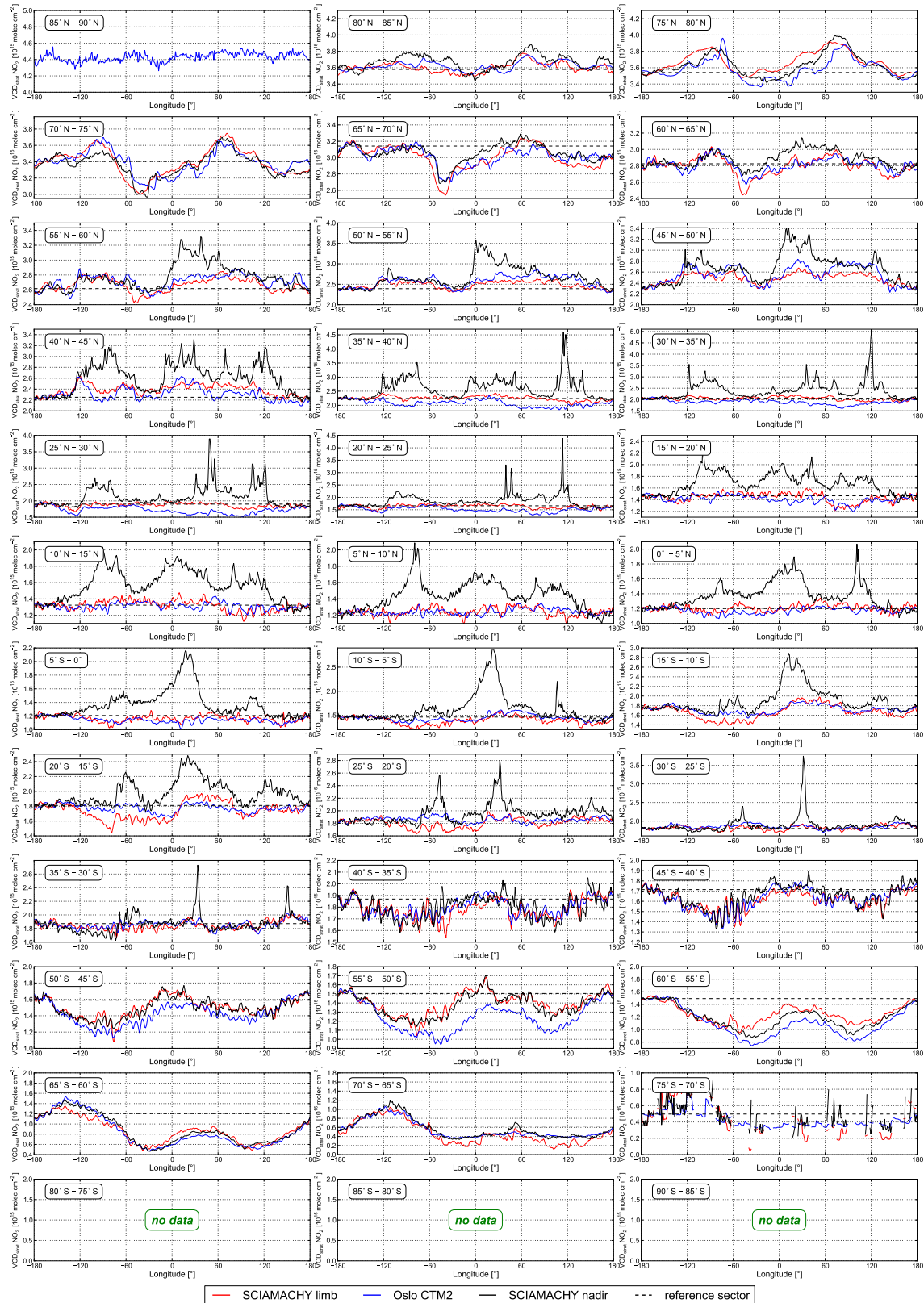


Fig. 6. Zonal variation of stratospheric NO₂ columns from SCIAMACHY nadir (black), SCIAMACHY limb (red), and Oslo CTM2 (blue) for Jan 2006.