

Technical note

Impact of the implementation of the Full Covariance Matrix approach on some Level 2 products - version 1.1, M. Guirlet, ACRI-ST, September 2008

Modified from v1.0:

Updated figures of median of NO₂ relative error and NO₃ relative error (wrong handling of undefined values corrected)

References:

- [1] Implementation and testing of the "full covariance matrix" inversion of GOMOS data, J. Vira and V. Sofieva, GOM-FMI-TN-034, v1.0, 10/2007.
- [2] Presentations made by V. Sofieva at QWG#14 and QWG#15.
- [3] GOM-TN-ACR-Impact-fcm-v1: Impact of the implementation of the Full Covariance Matrix approach on some Level 2 products – M. Guirlet, ACRI-ST, July 2008.

Testing datasets

6 sets of star 1 and star 2 occultations, as specified in [1]. Each set includes occultations sampling a specific range of obliquity and of latitude.

GOPR versions:

Name	General description	Date of internal release
7.0ab (ref. version: 60cf)	GOPR modified for the next baseline; includes Full Covariance Matrix approach	08/2008

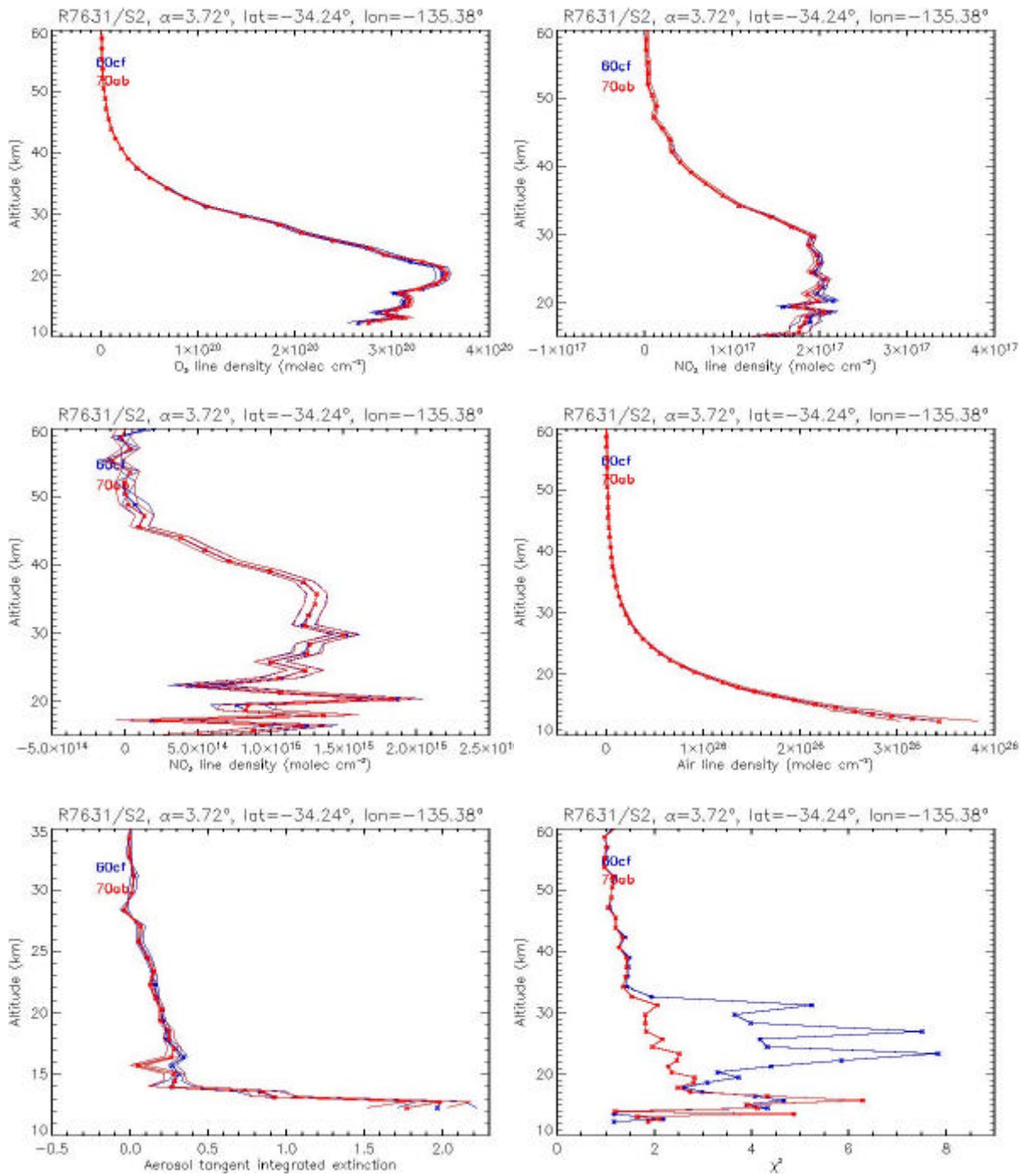
The same conclusions can be drawn as from the comparison of products processed with 6.0cf and the intermediate GOPR version for implementation testing of the full covariance matrix approach (see [3]).

The results are in general consistent with the ones presented in [1] and with expectations: the inclusion of modelling errors by using the full covariance matrix inversion dramatically reduces the values of normalized χ^2 in a large altitude range in the stratosphere (in some cases, even as low as 10km), as seen on the individual profiles and the median for the datasets. This is consistent with an improvement of the error estimation. Negative values of NO₃ vertical profiles of local density are less frequent or of lower amplitude with the modified version (for two of the three individual profiles presented).

The observations made on the median values of the relative error bars from FMI results are different from the ones presented here. The FMI processing uses a much smaller additional error in ozone profiles than GOPR 6.0cf to take into account the incomplete scintillation correction.

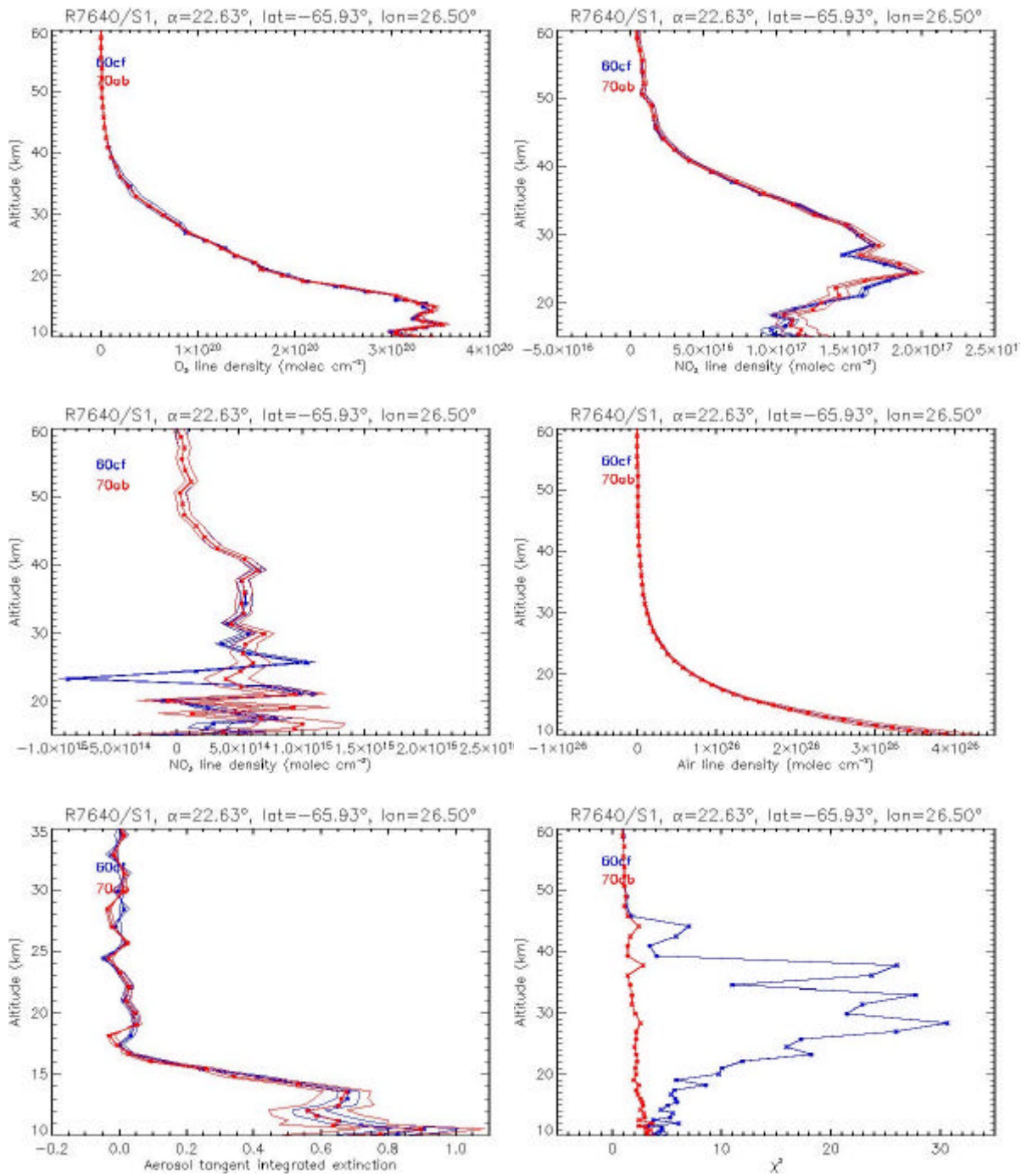
Line density profiles

R7631/S2, $\alpha = 3.72^\circ$, lat = -34.2° , lon = -135.4°



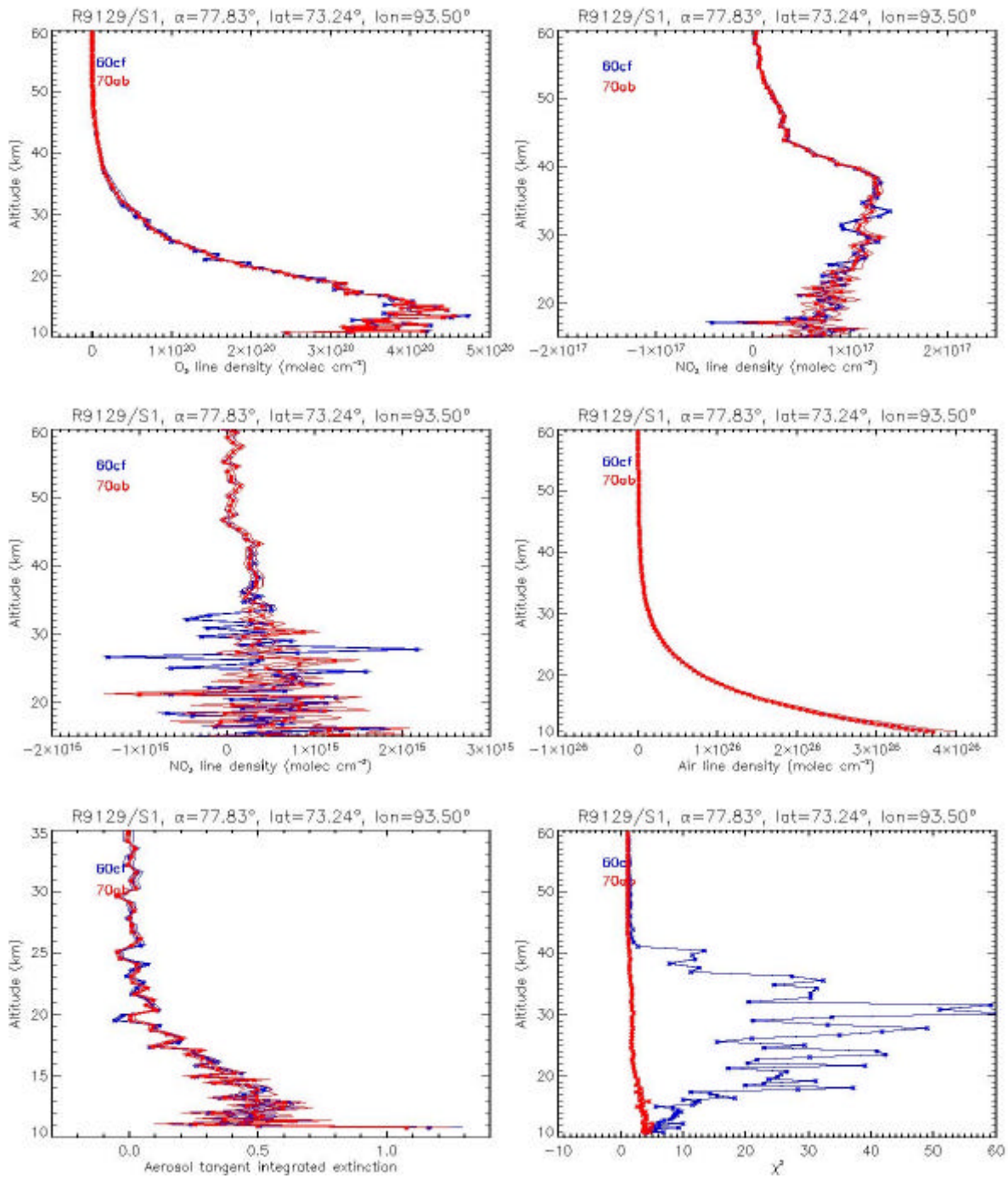
Line density profiles

R7640/S1, $\alpha = 22.63^\circ$, lat = -65.9° , lon = 26.5°



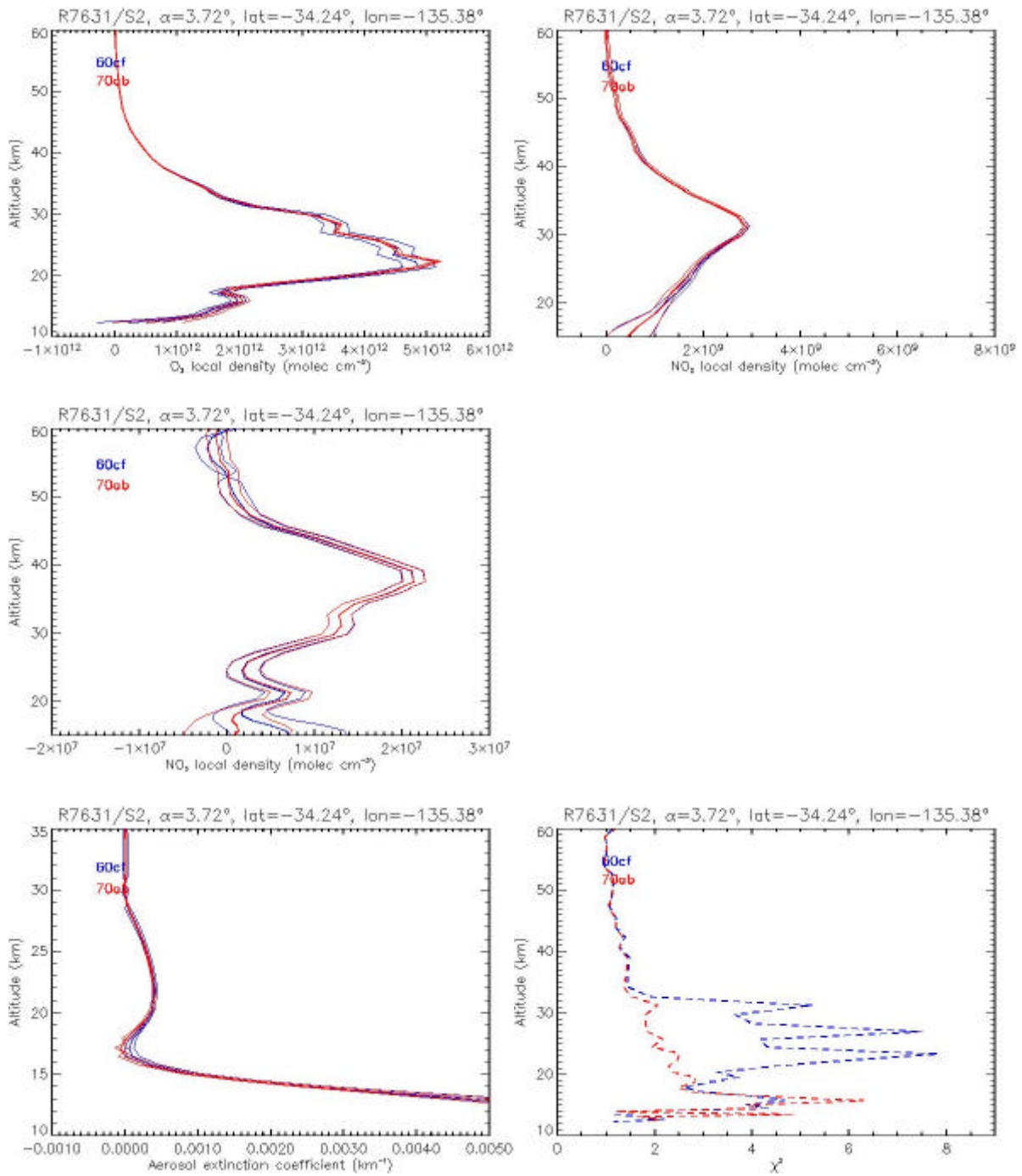
Line density profiles

R9129/S1, $\alpha = 77.8^\circ$, lat = 73.2° , lon = 93.5°



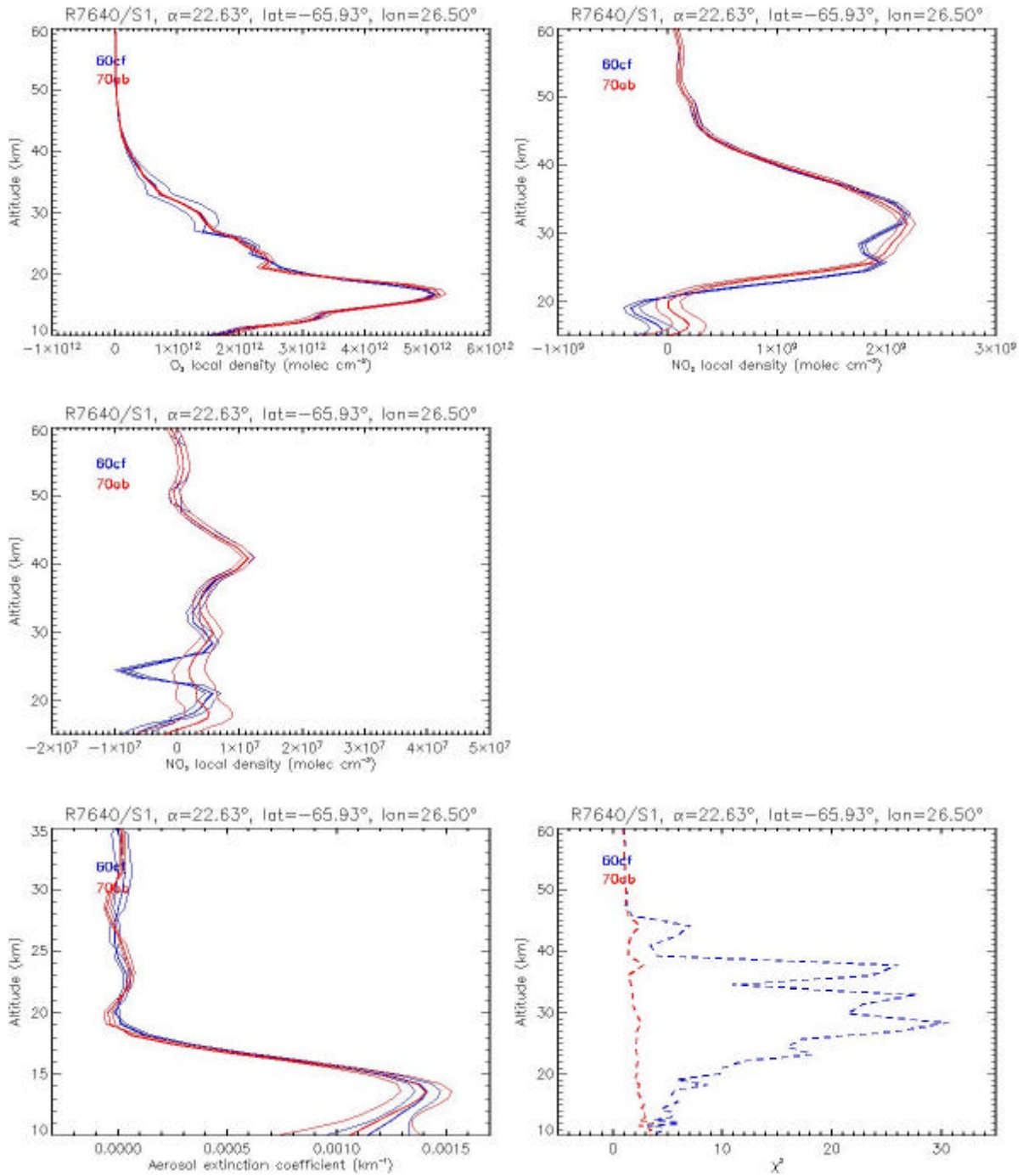
Local density profiles

R7631/S2, $\alpha = 3.72^\circ$, lat = -34.2° , lon = -135.4°



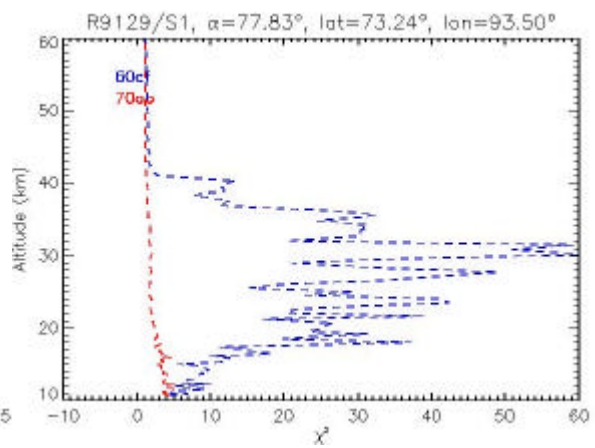
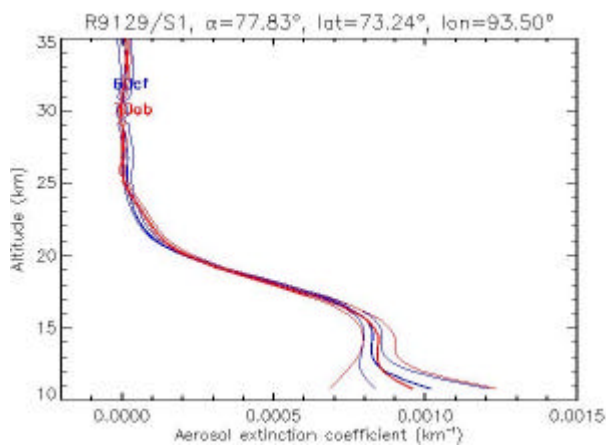
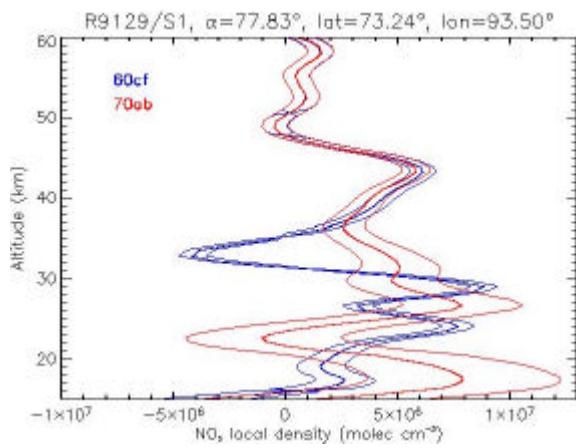
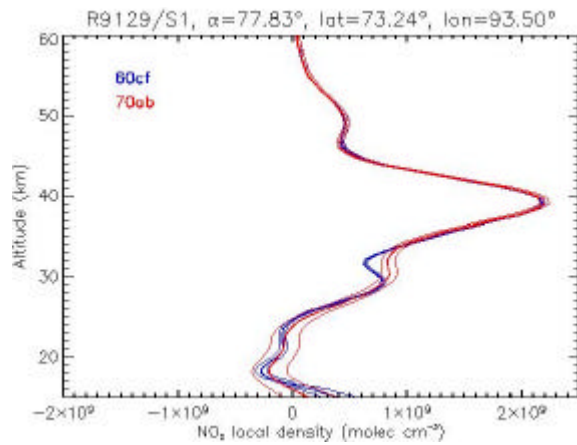
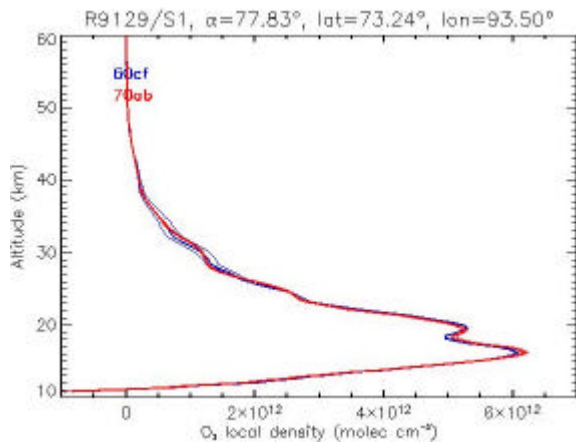
Local density profiles

R7640/S1, $\alpha = 22.63^\circ$, lat = -65.9° , lon = 26.5°



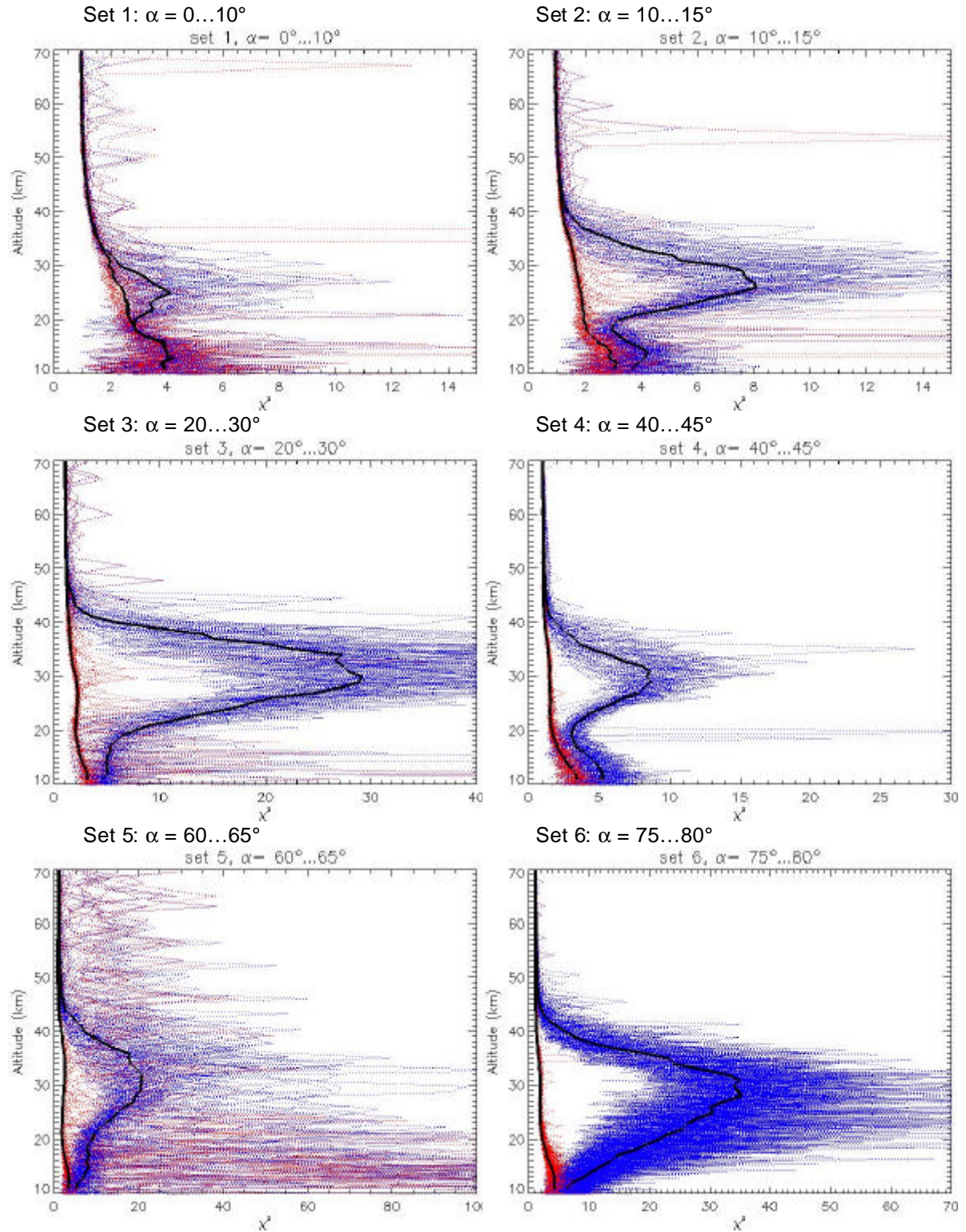
Local density profiles

R9129/S1, $\alpha = 77.8^\circ$, lat = 73.2, lon = 93.5°



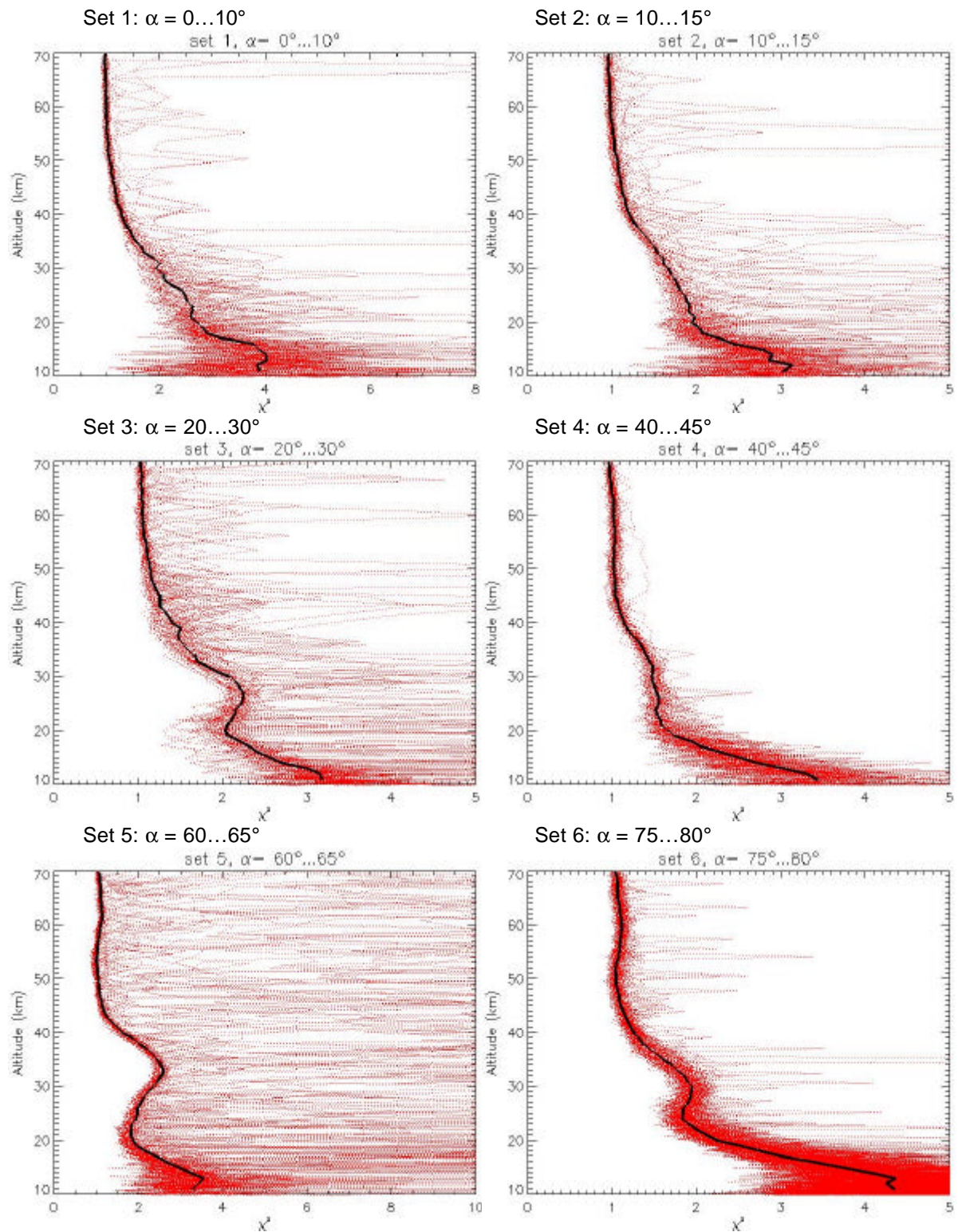
Statistics on c^2

All profiles of each dataset on the same plot; reference version: blue; modified version: red; median profiles for the two versions: black bold lines.

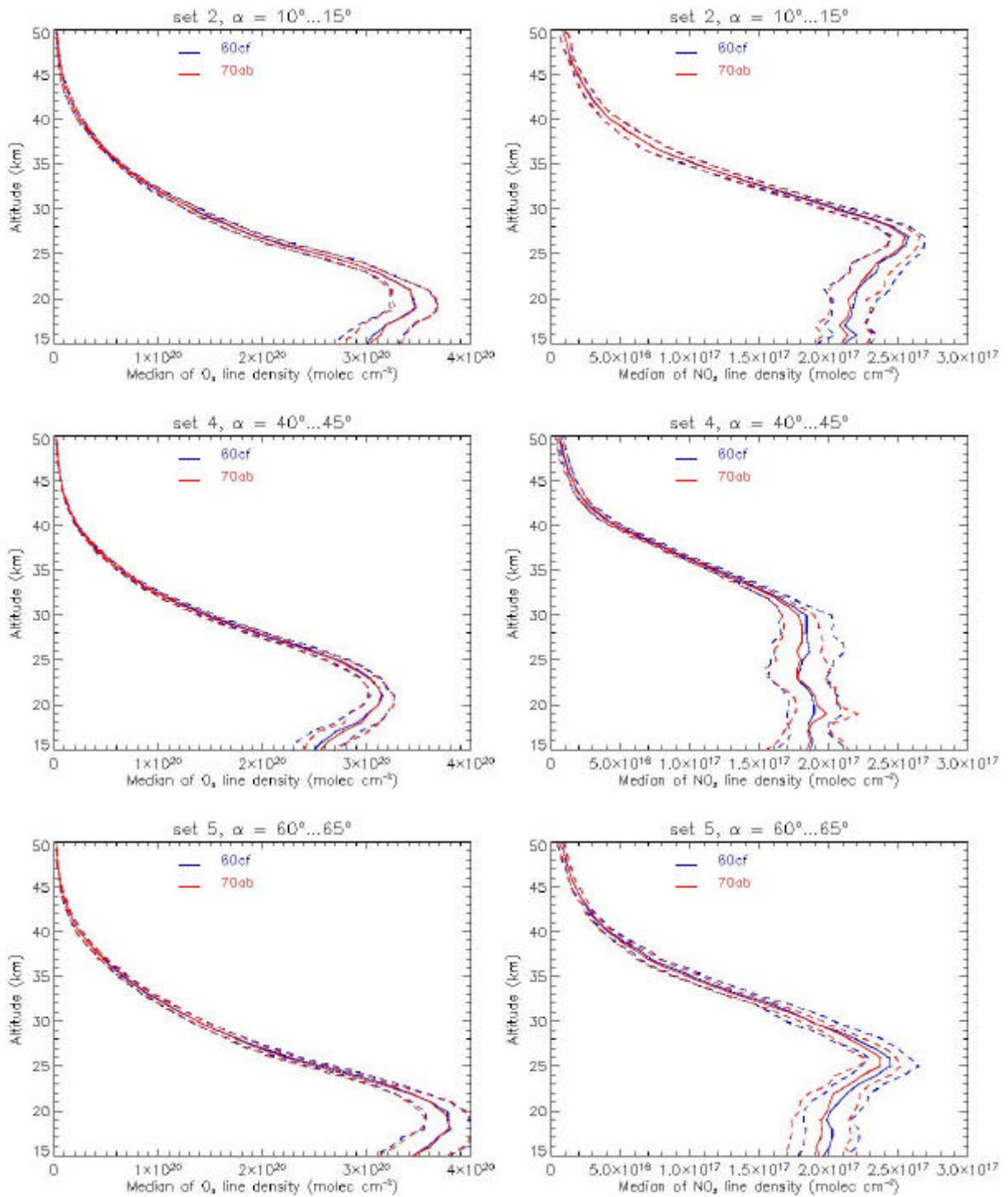


Statistics on c^2

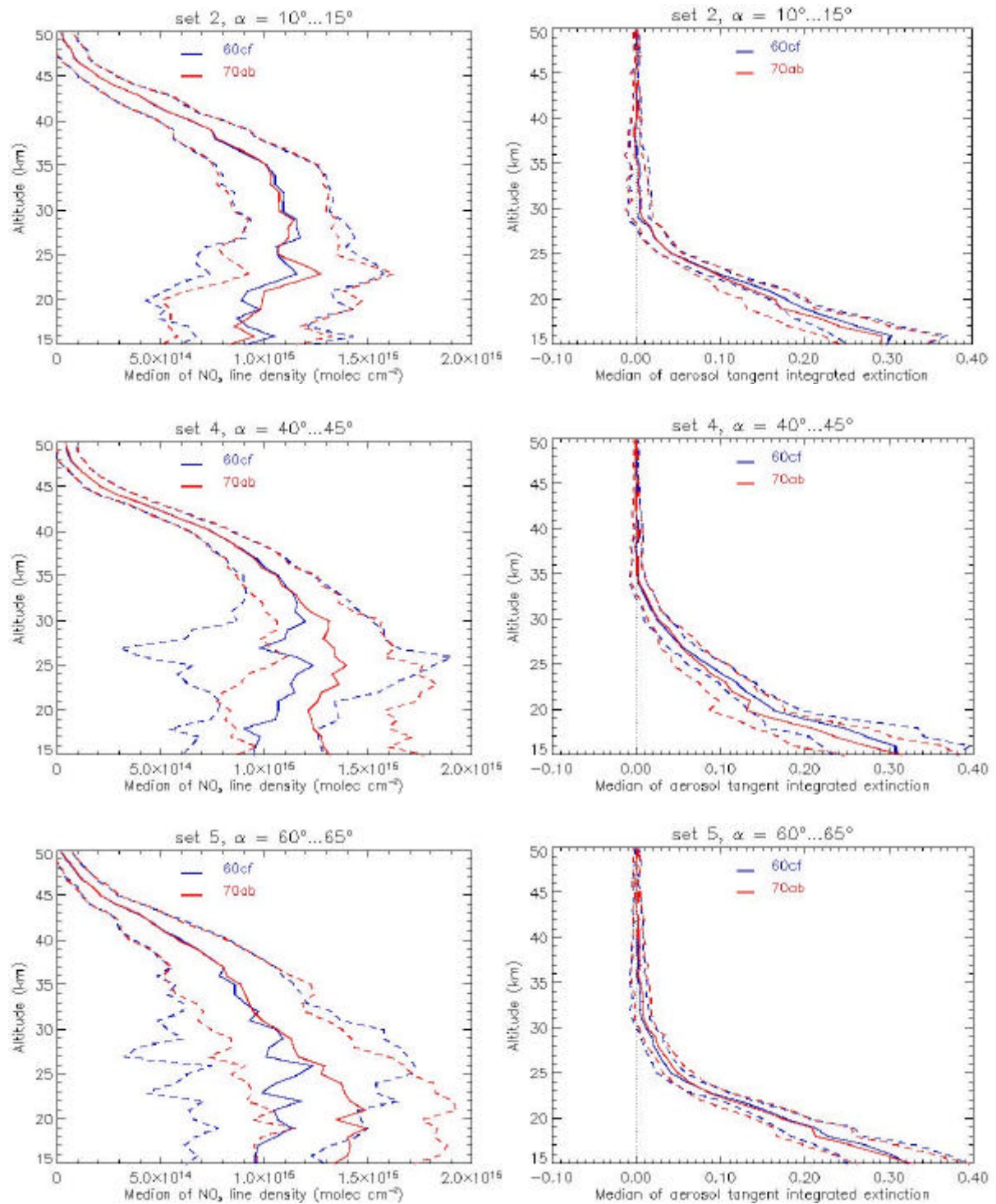
All profiles of each dataset on the same plot; only modified version: individual profiles in red; median profile with the black bold line.



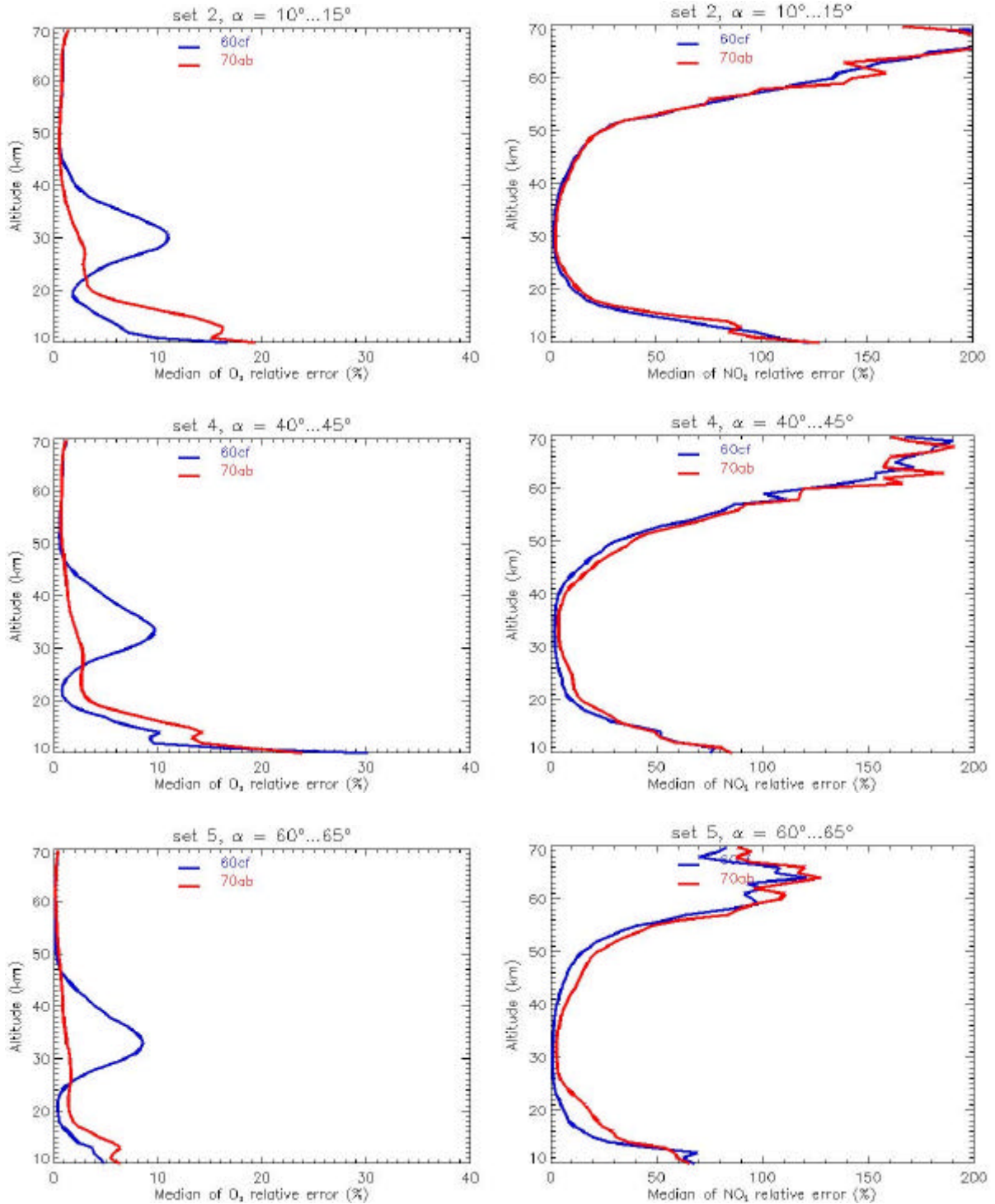
Line densities of O₃ (left column) and NO₂ (right column) for datasets 2 (top), 4 (middle) and 5 (bottom)



Line densities of NO₃ (left column) and aerosol tangent integrated extinction (right column) for datasets 2 (top), 4 (middle) and 5 (bottom)



Median relative error estimates for O₃ (left column) and NO₂ (right column) for datasets 2 (top), 4 (middle) and 5 (bottom)



Median relative error estimates for NO₃ (left column) and aerosols (right column) for datasets 2 (top), 4 (middle) and 5 (bottom)

