

Technical note

Statistical comparison of vertical profiles of local density and aerosol extinction coefficient from testing datasets processed with GOPR 6.0cf and GOPR 7.0ab, v1.0
M. Guirlet, ACRI-ST, September 2008

Version details

Name	General description	Date of release
7.0ab (ref. version: 6.0cf)	GOPR modified for the next baseline	08/2008

Testing dataset

	Time period	Illumination condition	Number of products
AvgCDC (subset dark)	09/2002-06/2007	full dark	560
H2O	01/2004-12/2004	full dark	390
S029 extended	10/2002-02/2008	full dark	1004
Fussen dark	09/2002-06/2003	full dark	589

The following figures present the vertical profiles of statistical quantities for the local density of several species, for the aerosol extinction coefficient, and for the χ^2 value. Those quantities are compared on the same plot for Level 2 products retrieved with GOPR 6.0cf (reference version) and retrieved with GOPR 7.0 ab (version with all modifications foreseen for the next operational processor), for several testing datasets.

Main observations:

O₃ local density:

Differences between the median profiles from the two versions are observed at the lowest altitudes for several datasets. Though the statistical significance at these altitudes is low (fewer profiles with valid values of local density), the relative difference between the mean values (7.0ab – 6.0cf) shows consistent positive values between 5% and 10% for the four datasets in a thin altitude layer just below 20 km.

In a more extended altitude range, between about 32 km and 66 km, the relative difference between the median profiles shows small positive values for S029 extended dataset (maximum value of 1.3% at the maximum at 49 km).

The dispersion of the distribution of O₃ profiles is more often decreased than increased with the new retrieval. It is clearly smaller at altitudes up to 25 km for AvGCDC datasets, and at altitudes between 15 km and 30 km for S029 dataset.

NO₂ local density:

Within the altitude range of validity of NO₂ profiles (20 km- 50 km), several datasets show a lower median value for profiles processed with GOPR 7.0ab, at several successive altitude levels (AvGCDC dataset in 20km-25km: relative difference of -4.7% at 20 km, and around 50 km; H₂O dataset above 25 km except around 45 km with a maximum difference of -4.4% at 30 km) or at most altitude levels (S029 extended dataset, with a difference between -1% and -2% in 30 km – 40 km).

The dispersion of the distribution does not show any large difference between the two versions.

NO₃ local density:

Within the altitude range of validity of NO₃ profiles (25 km- 45 km), several datasets show a higher median value for profiles processed with GOPR 7.0ab in the lower part of the profile (up to 34 km for H₂O dataset with a maximum positive difference of 40.0% at 25 km).

The dispersion of the distribution is decreased between 20km and 30 km for H₂O dataset.

O₂ local density:

The median value of the O₂ local density is slightly increased at the lowermost altitude levels of the profile (relative difference of 2.6% at 15 km for AvGCDC dataset; of 4.4% at 18 km for Fussen dataset) and it is largely decreased at higher altitudes with an amplitude globally increasing with altitude up to 70 km or 80 km (relative difference of -4.8% at 51 km for H₂O dataset; of -28.6% at 77 km for S029 dataset).

The dispersion of the distribution is reduced for AvGCDC and Fussen datasets at the lowest altitudes of the profiles.

Aerosol extinction coefficient:

The median value of the aerosol extinction coefficient is decreased at most altitude levels of the stratosphere (excluding the lowest levels with a lower statistical significance). The maximum relative difference (7.0ab – 6.0cf) ranges between -15.2% at 21 km for H₂O dataset to -29.4% at 21 km for AvGCDC dataset.

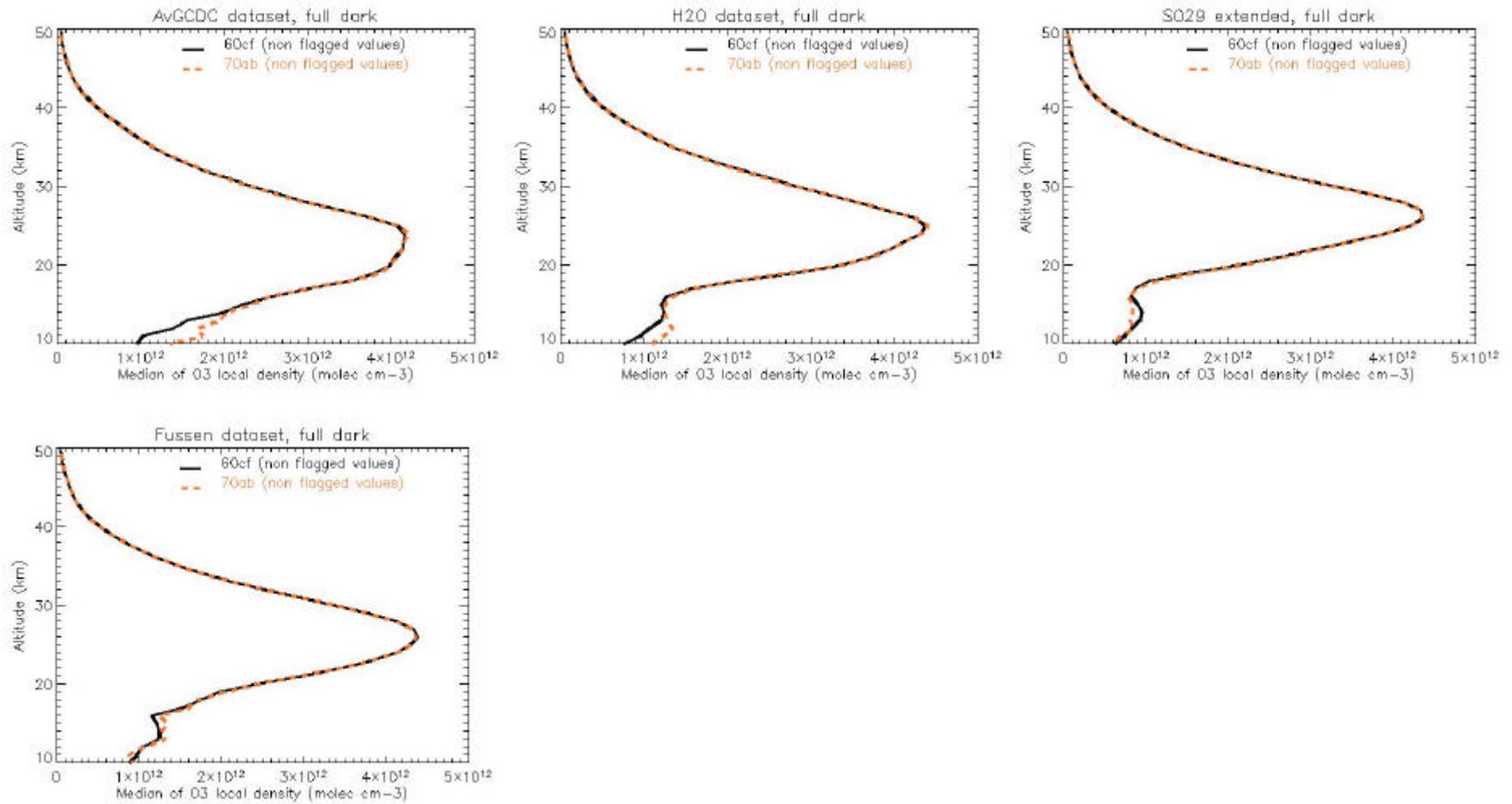
The dispersion is in most cases decreased in the lowest altitudes (below an altitude limit between 15 km and 25 km) and increased in the middle and upper stratosphere.

c^2 :

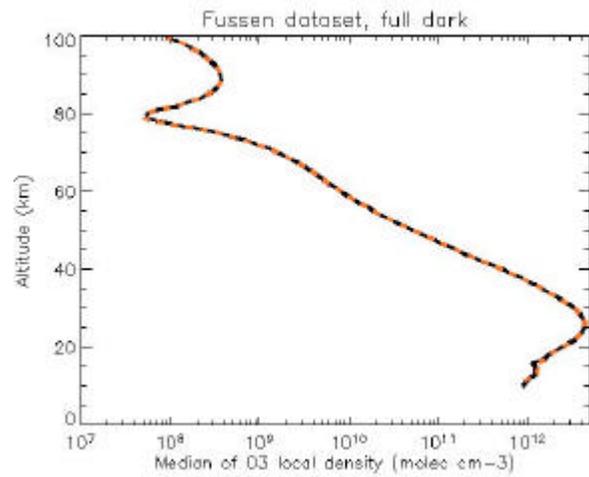
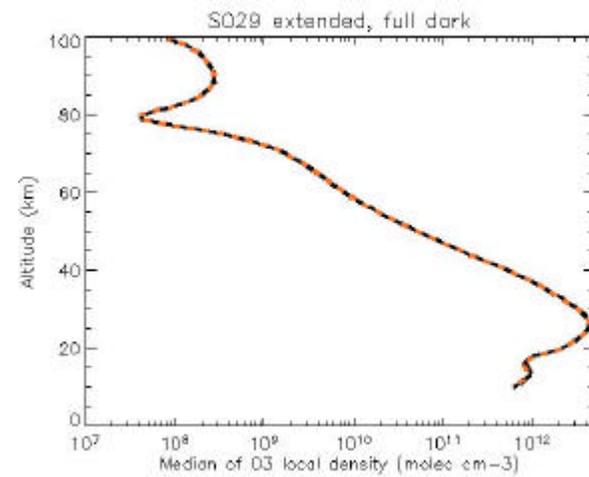
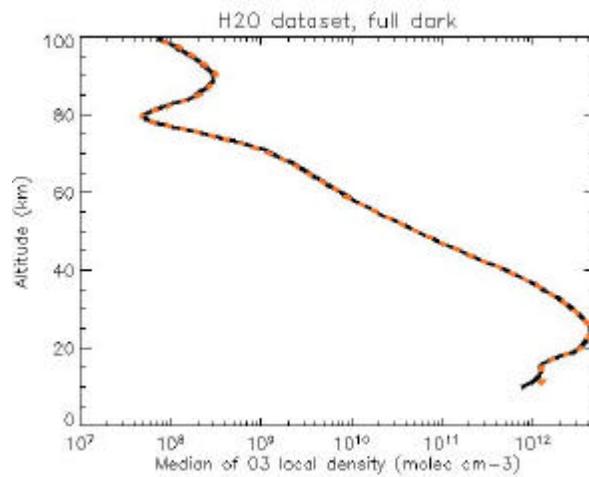
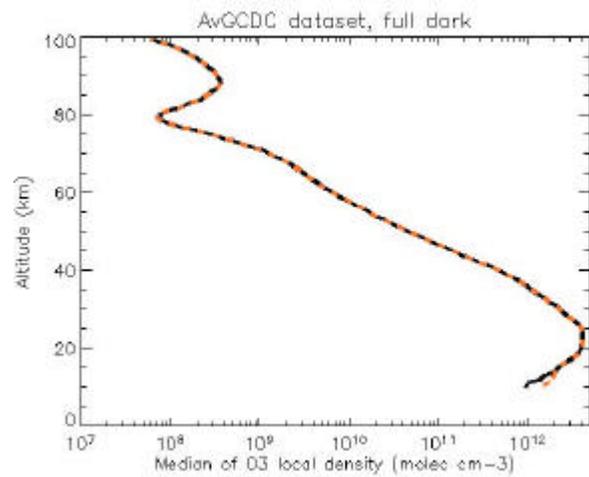
The median value of the χ^2 profiles is decreased for all datasets in some altitude range below around 40 km. The bump in the χ^2 median profile from GOPR 6.0cf products is no more visible in the 7.0ab χ^2 median profile. For H₂O dataset, the decrease of χ^2 is much larger than for other datasets (from 3.2 to 1.7 at 26 km, i.e. a relative difference of -47%; and from 3.1 to 1.6 at 28 km, i.e. a relative difference of -49%). Moreover, for this dataset, the decrease of the χ^2 affects all altitude levels down to the lowest level of the profiles.

The dispersion of the distribution is decreased for all datasets at altitude levels higher than 25 km, and this decrease is stronger for AvGCDC and H₂O datasets.

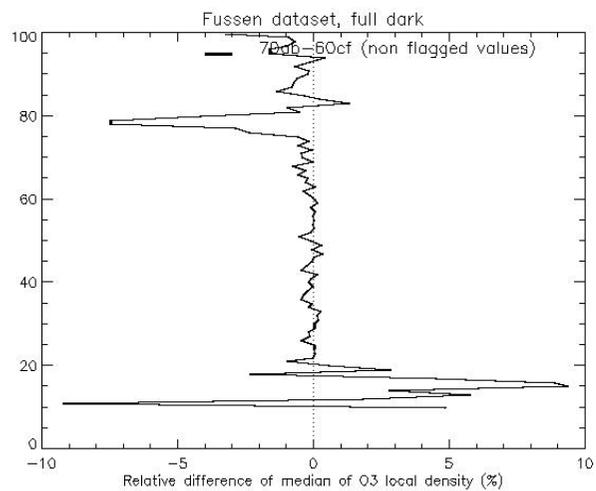
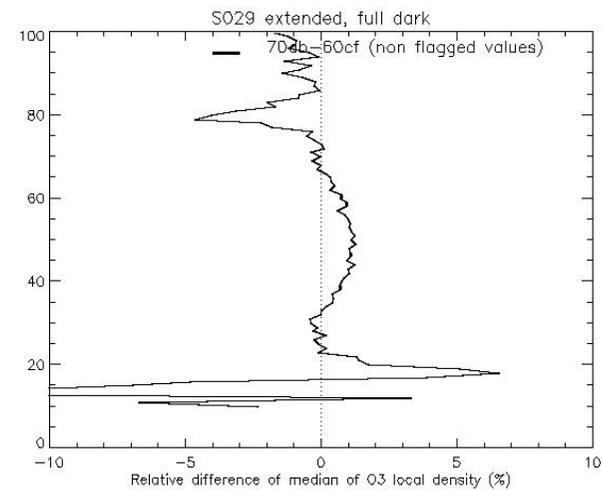
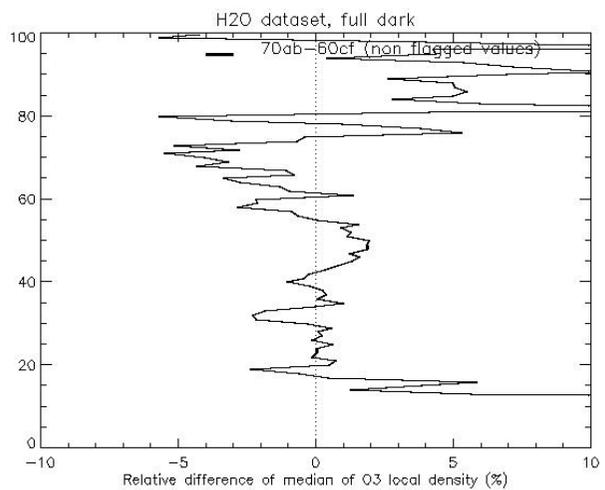
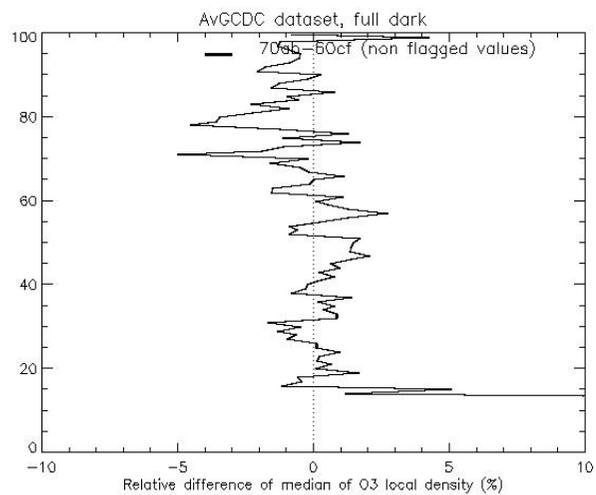
Median O₃ profiles for the testing datasets: 10-50 km



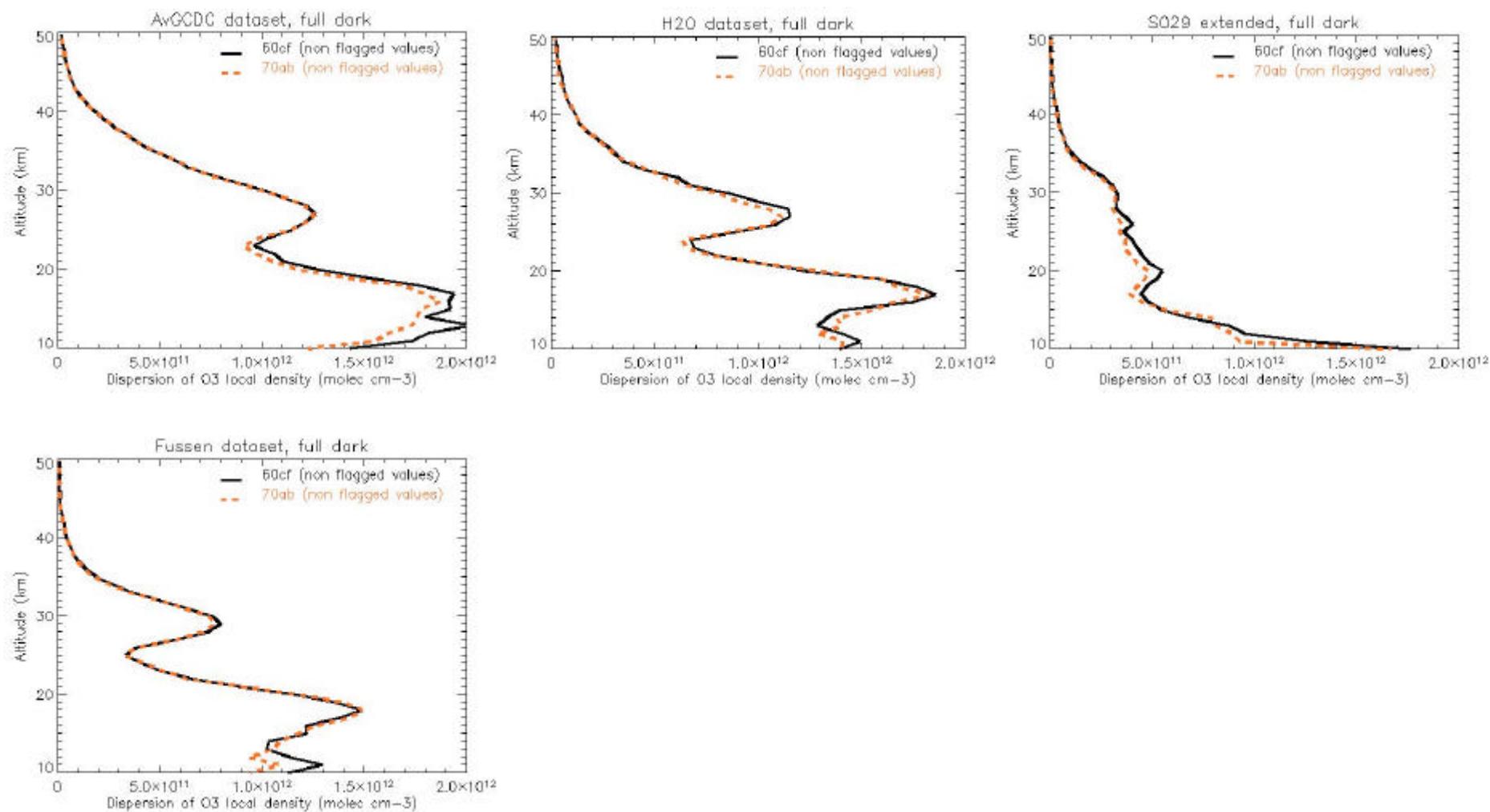
Median O₃ profiles for the testing datasets: 0-100 km, logarithmic scale



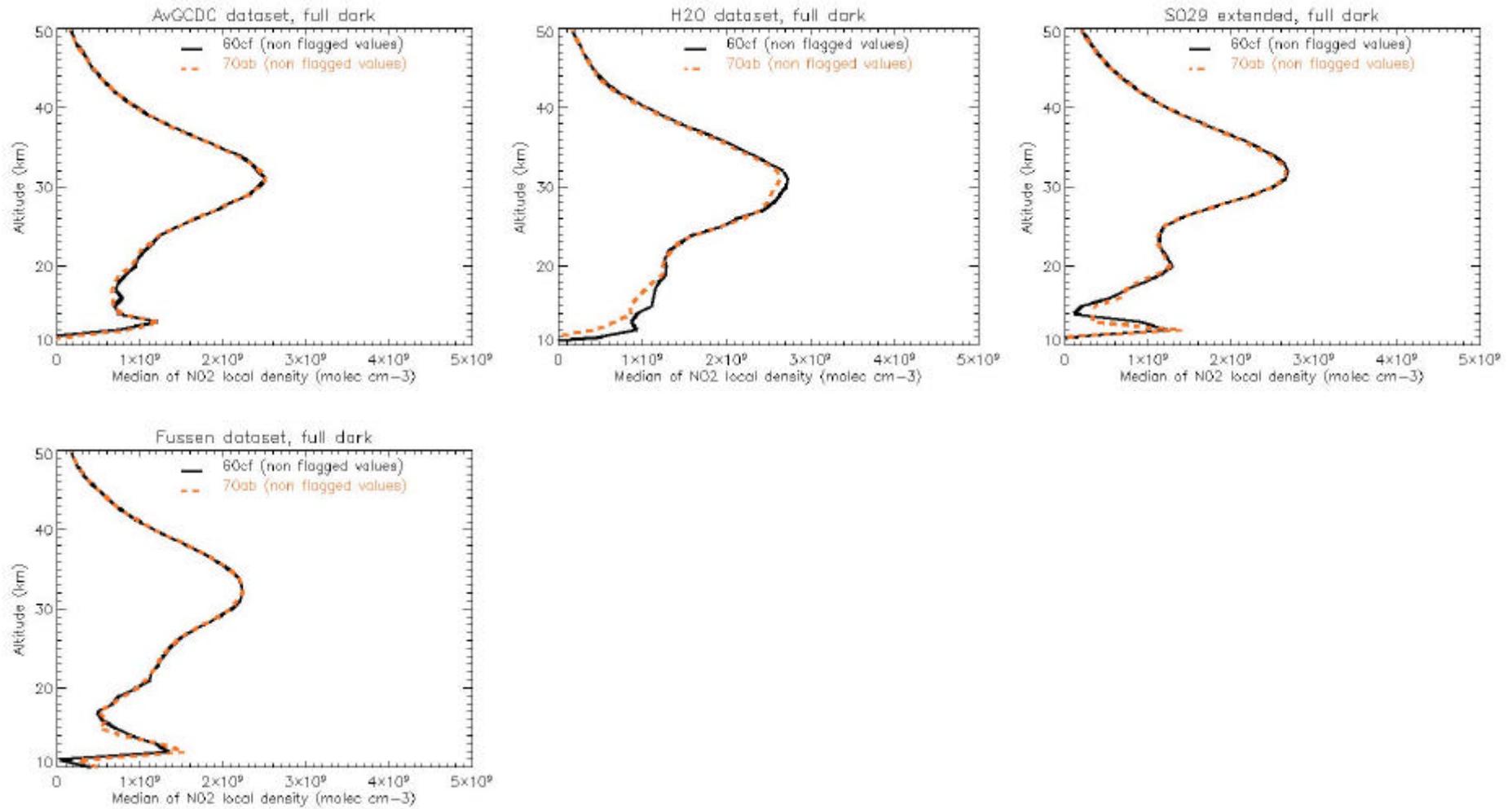
Relative difference between the median O₃ profiles



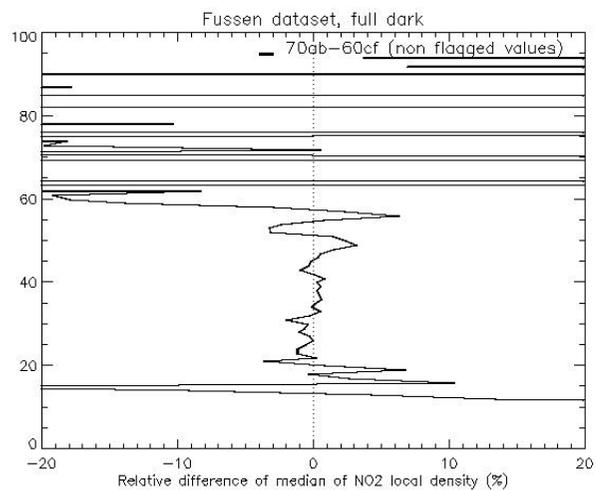
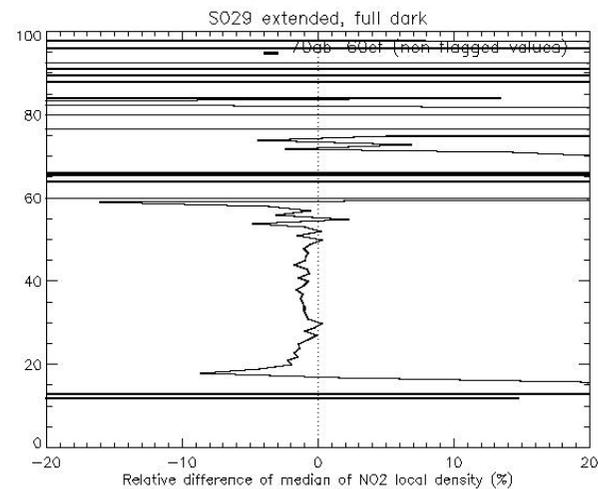
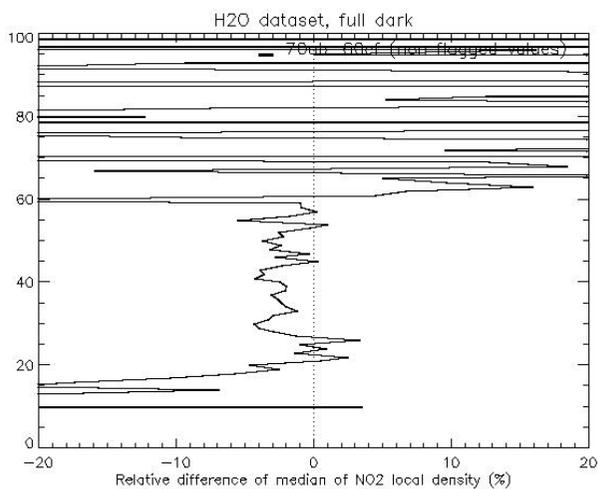
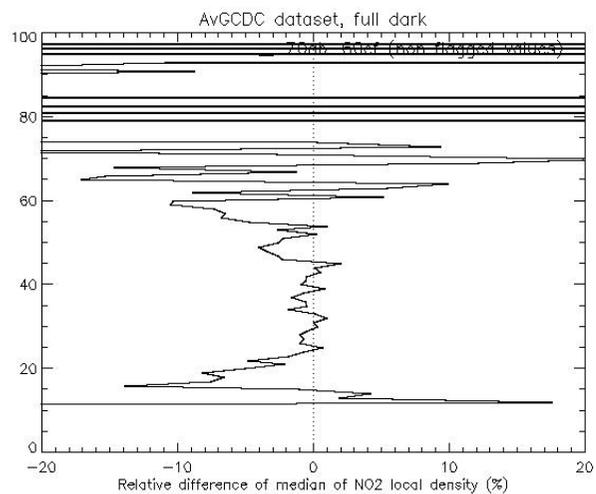
Dispersion of the O₃ profiles (half difference of 16 and 84 percentile limits)



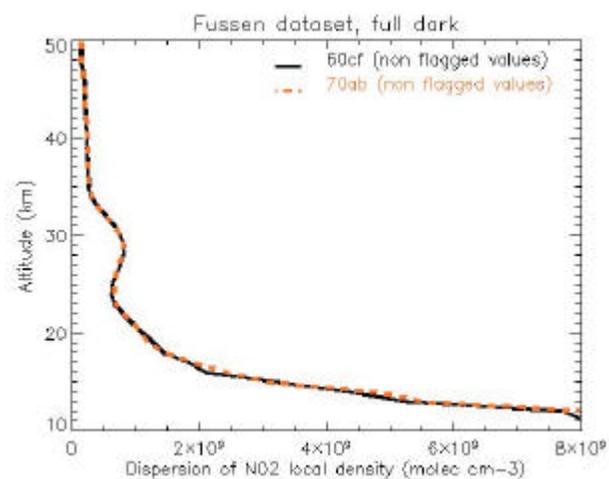
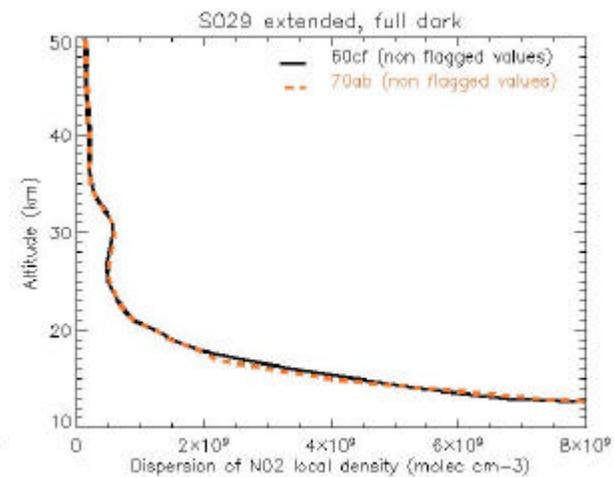
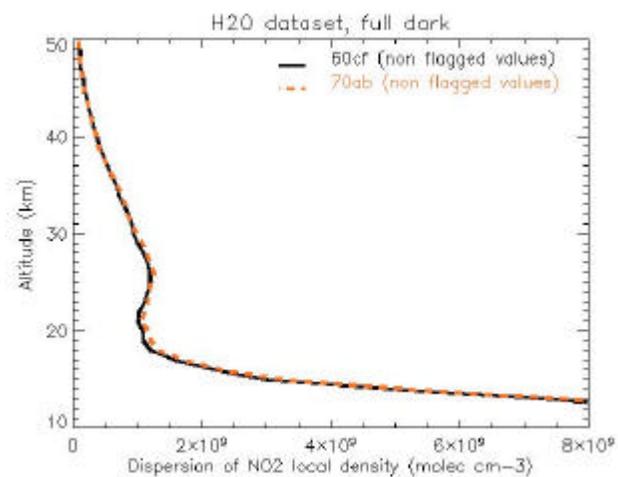
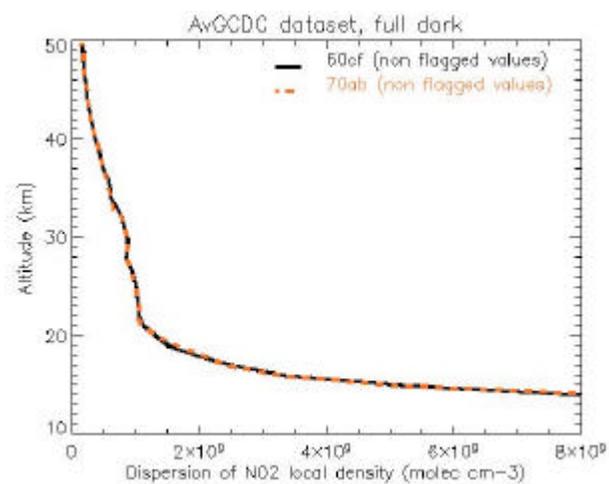
Median NO₂ profiles for the testing datasets: 10-50 km



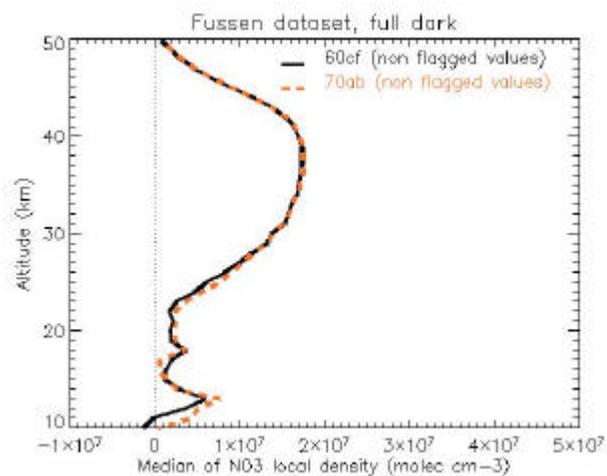
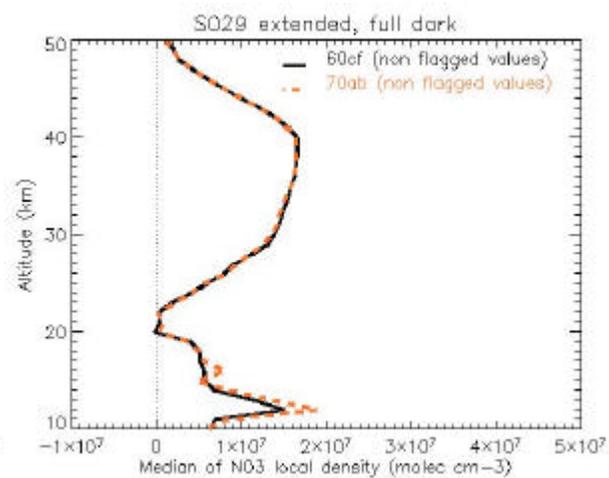
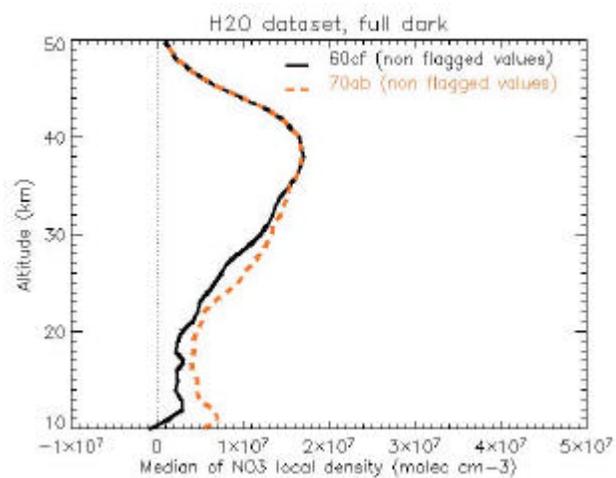
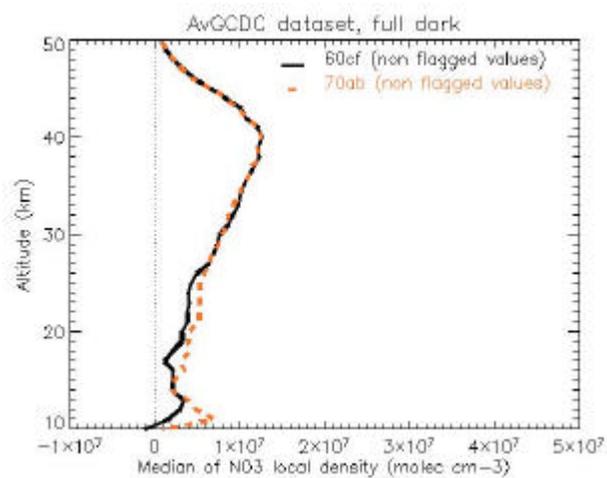
Relative difference between the median NO₂ profiles



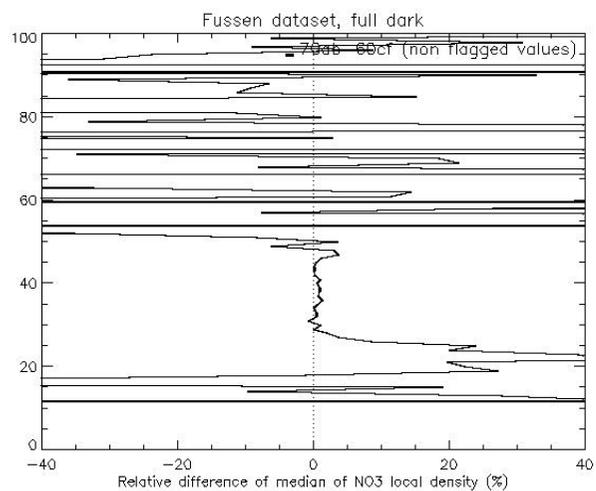
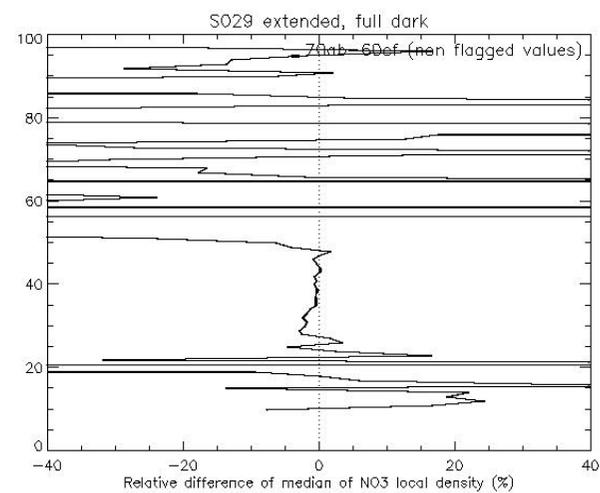
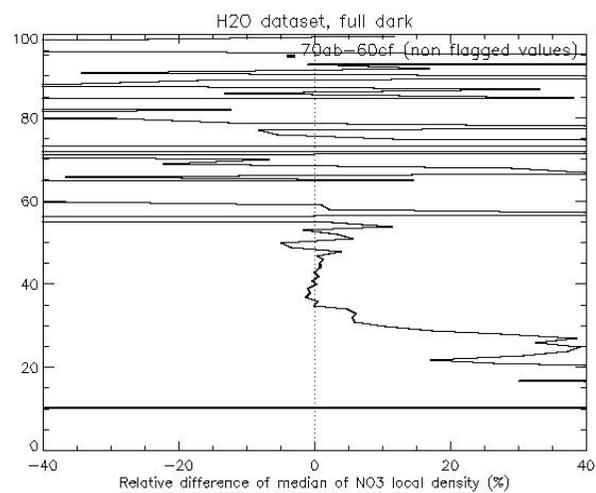
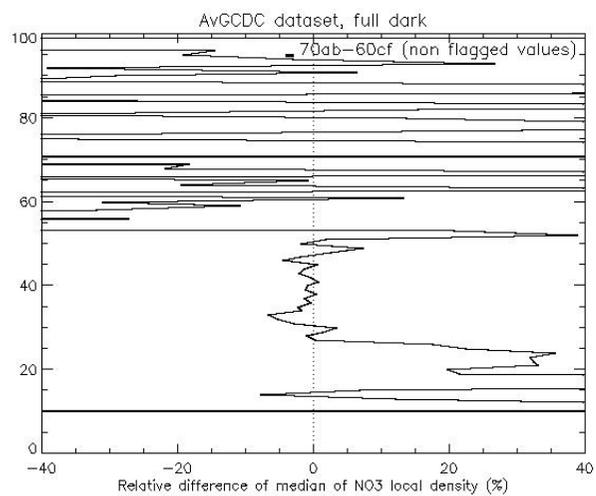
Dispersion of the NO₂ profiles (half difference of 16 and 84 percentile limits)



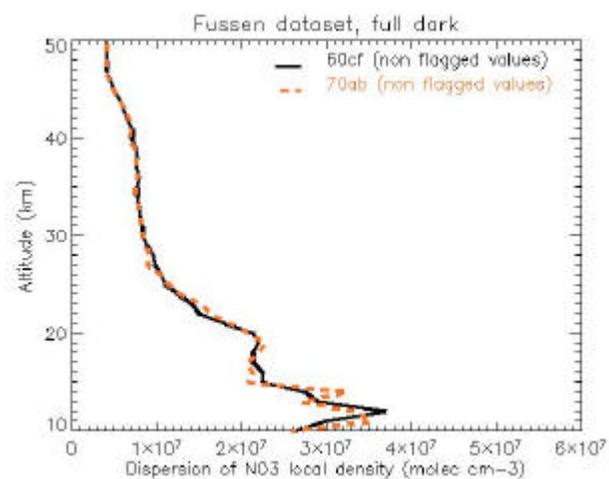
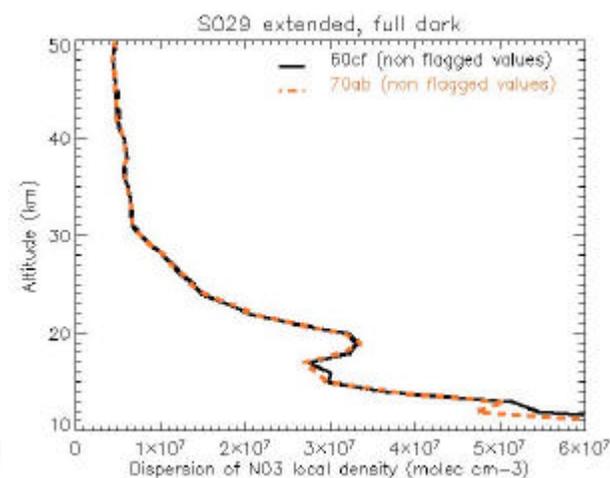
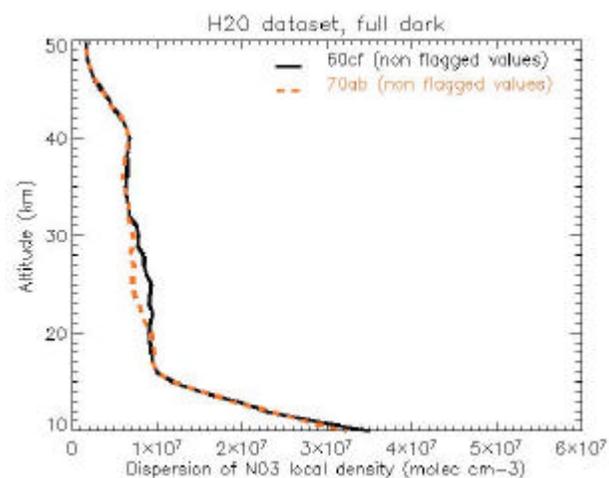
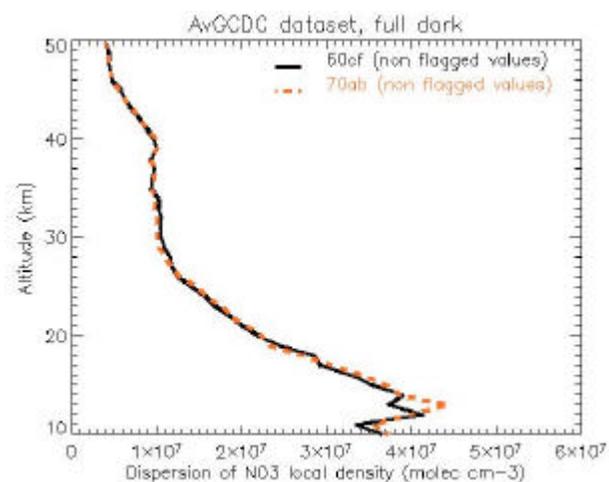
Median NO₃ profiles for the testing datasets: 10-50 km



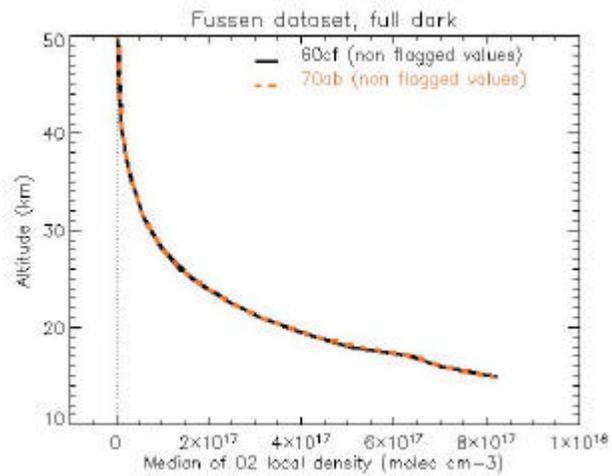
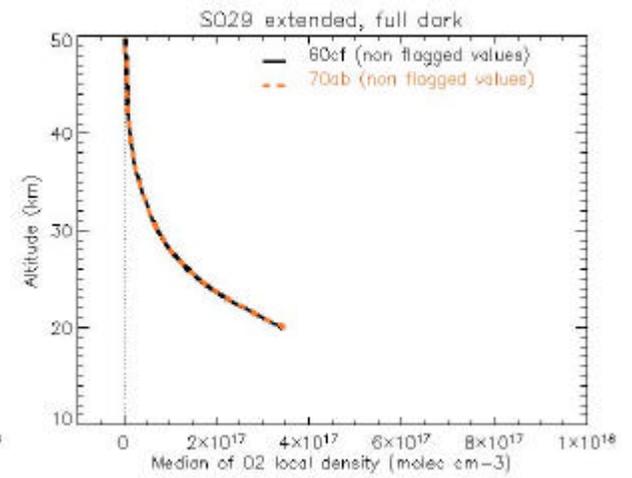
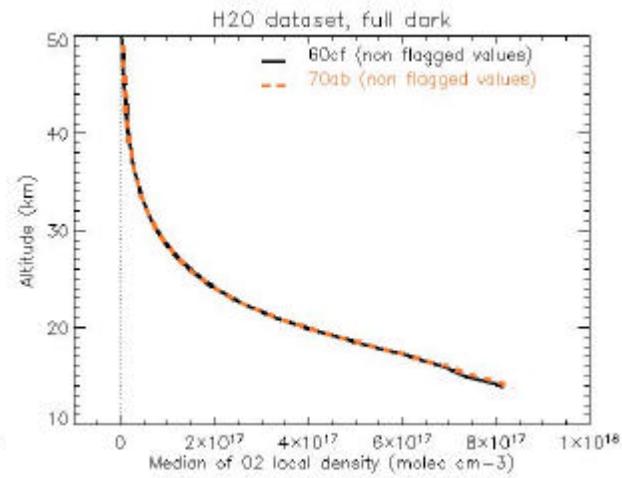
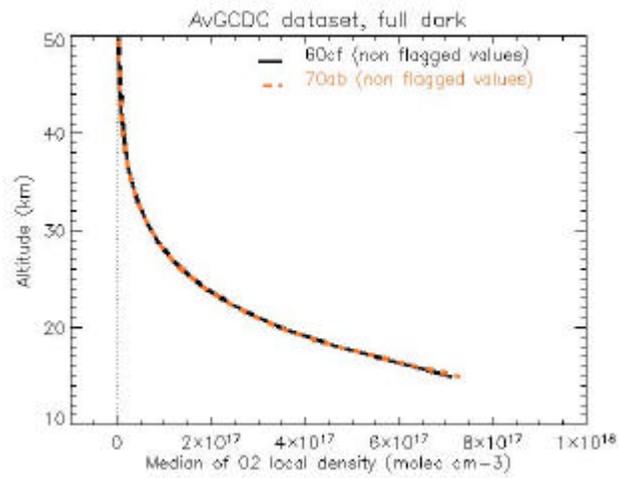
Relative difference between the median NO₃ profiles



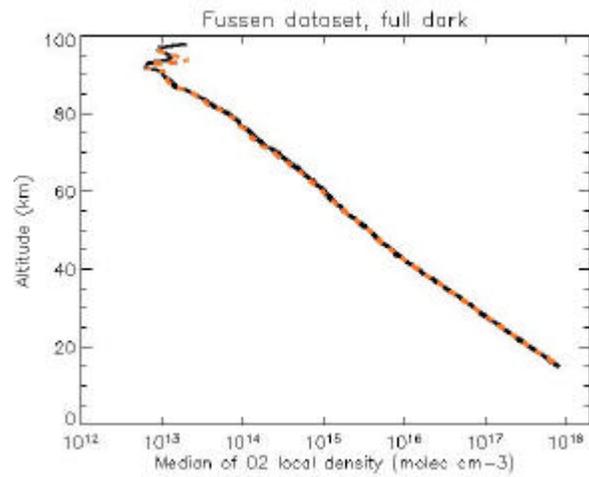
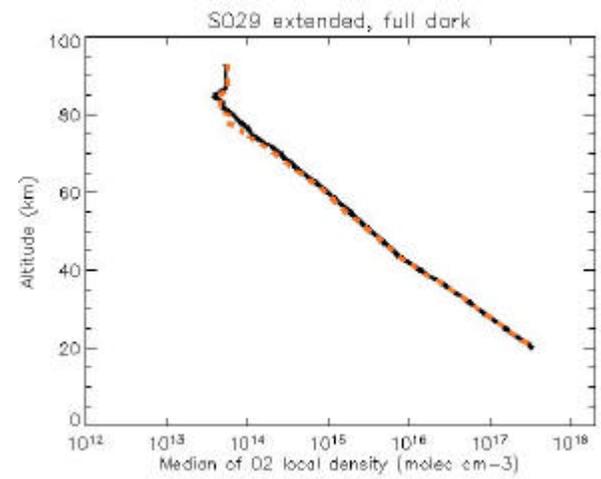
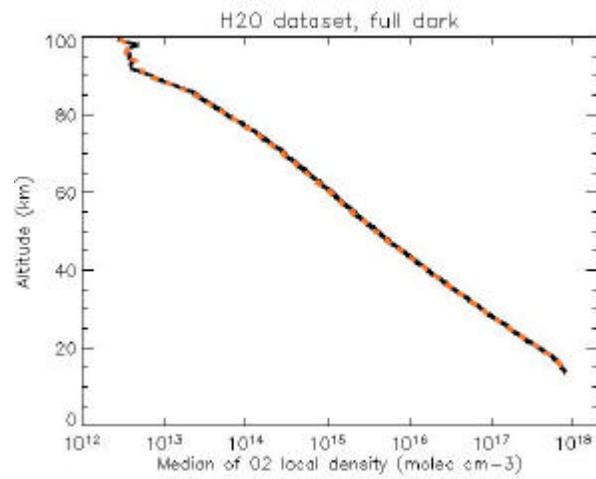
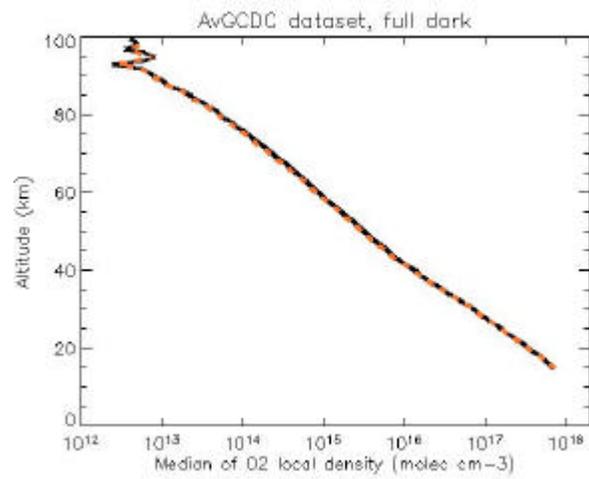
Dispersion of the NO₃ profiles (half difference of 16 and 84 percentile limits)



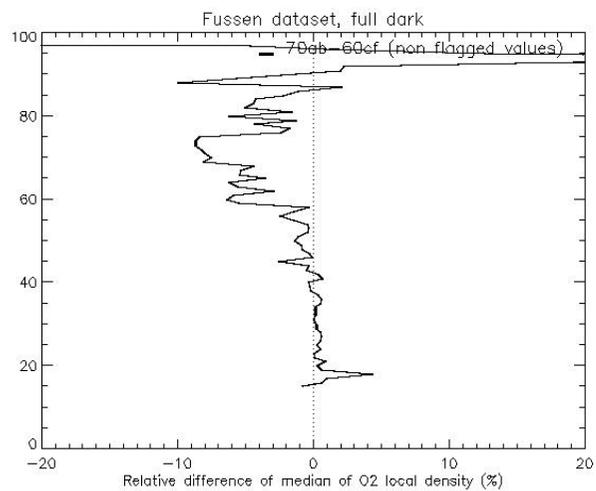
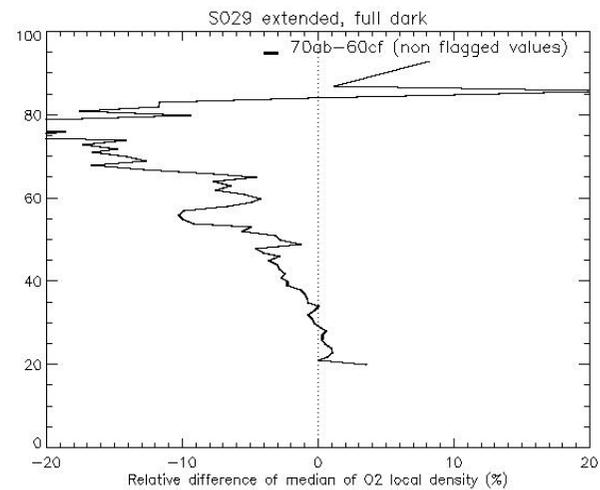
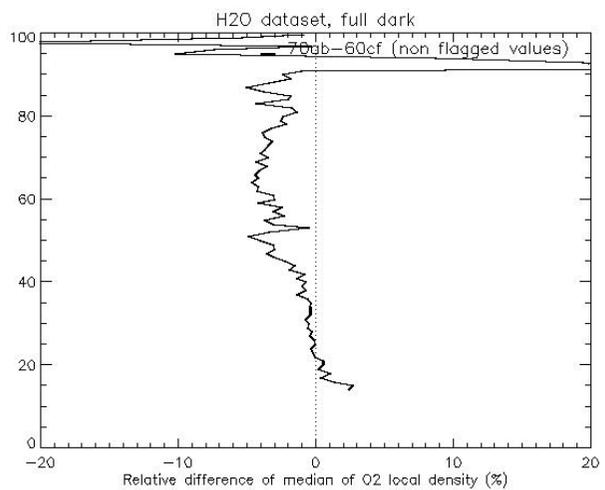
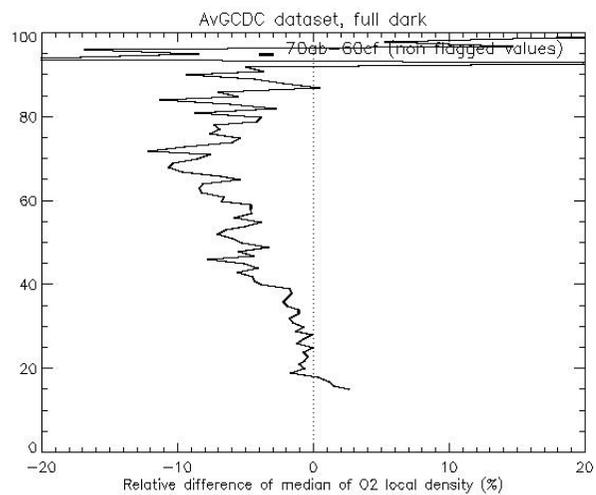
Median O₂ profiles for the testing datasets: 10-50 km



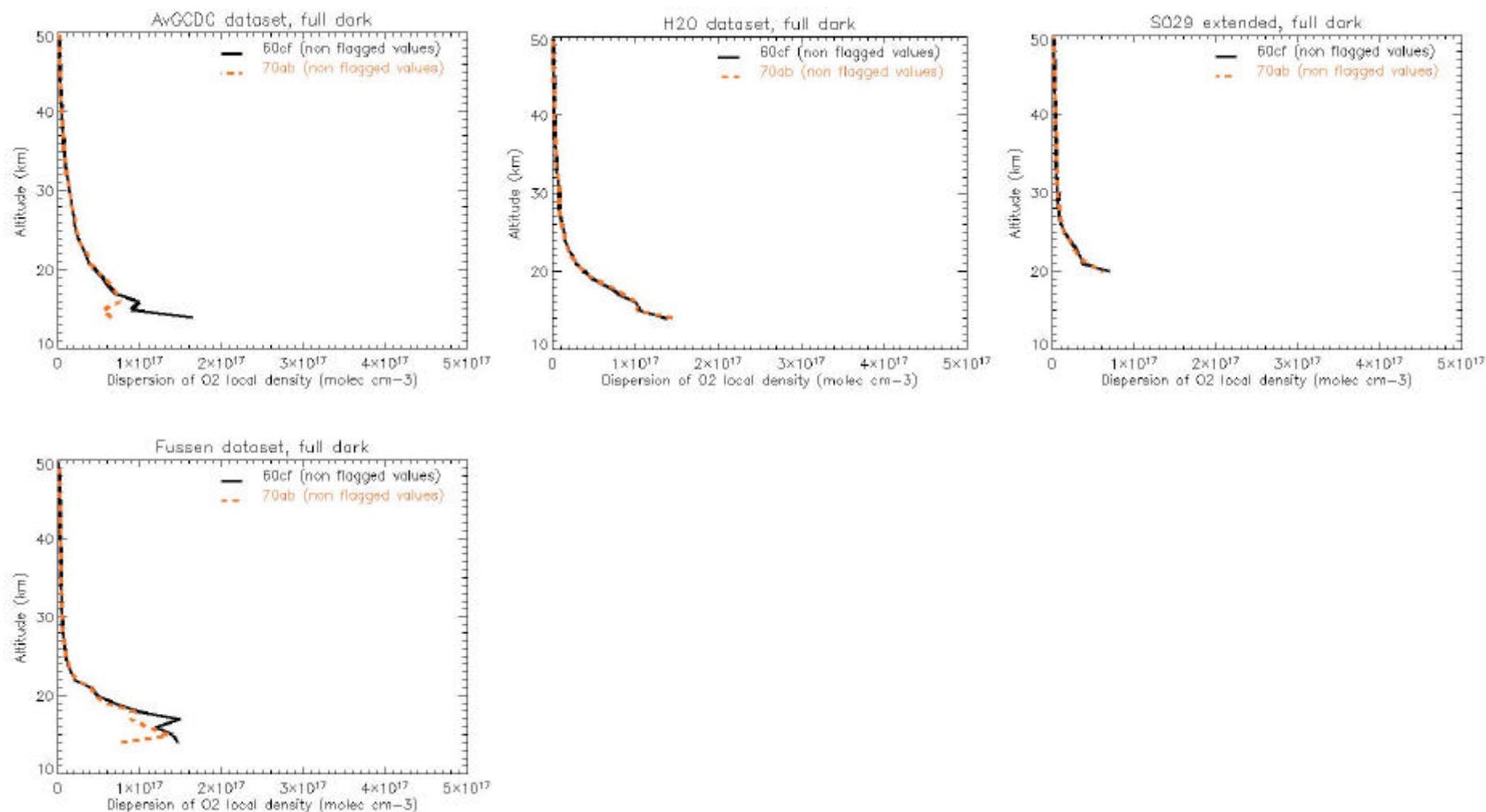
Median O₂ profiles for the testing datasets: 0-100 km, logarithmic scale



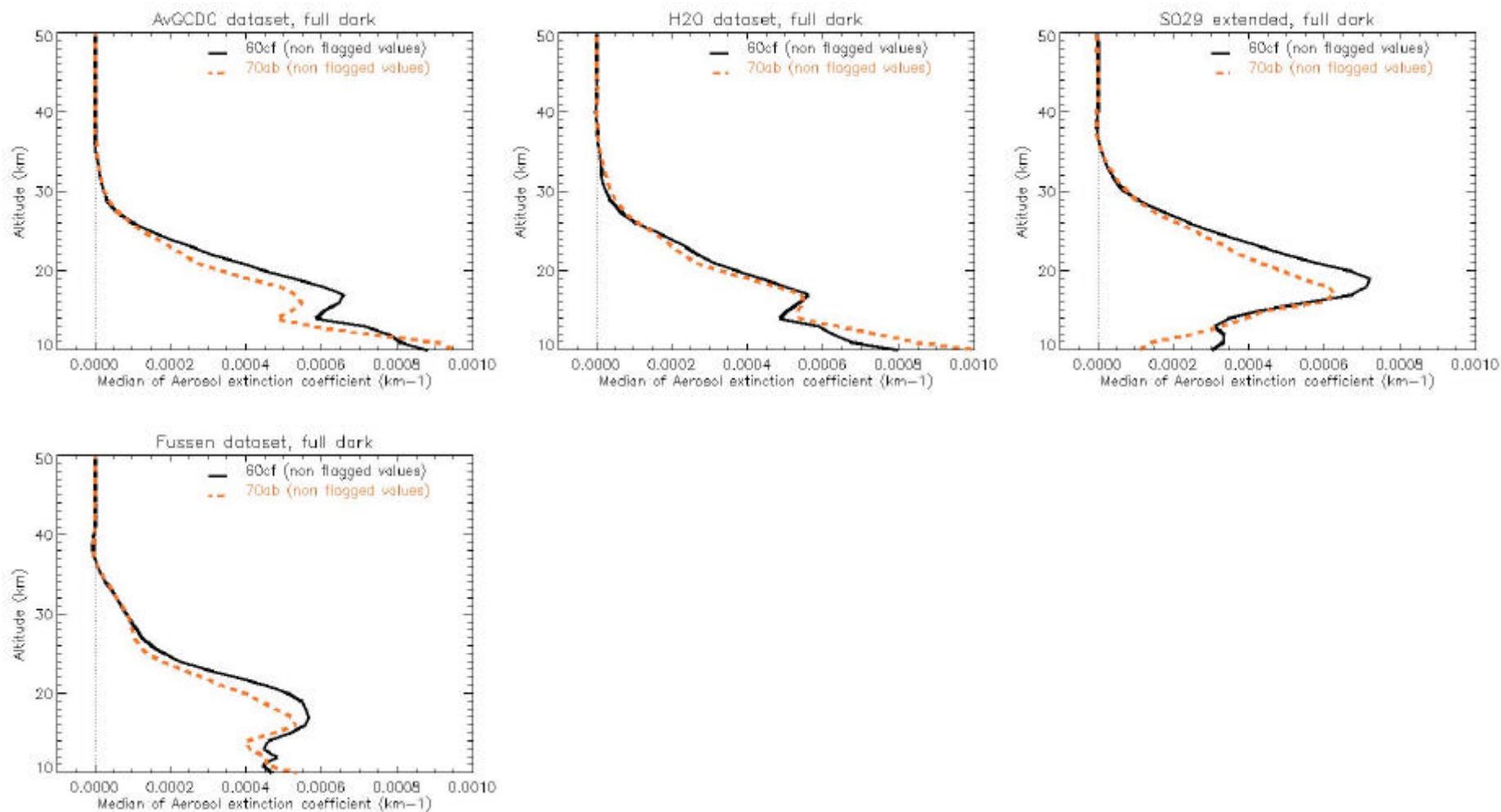
Relative difference between the median O₂ profiles



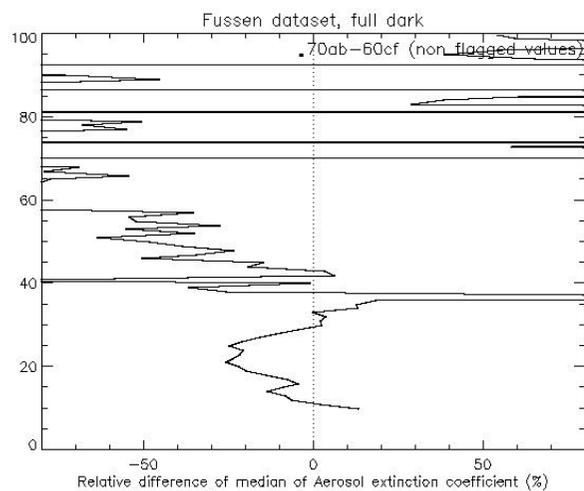
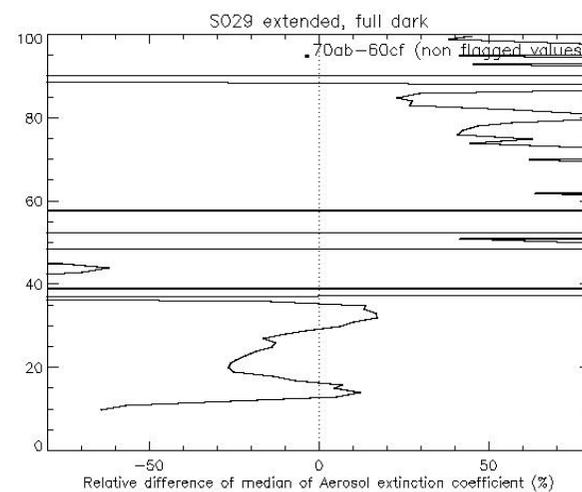
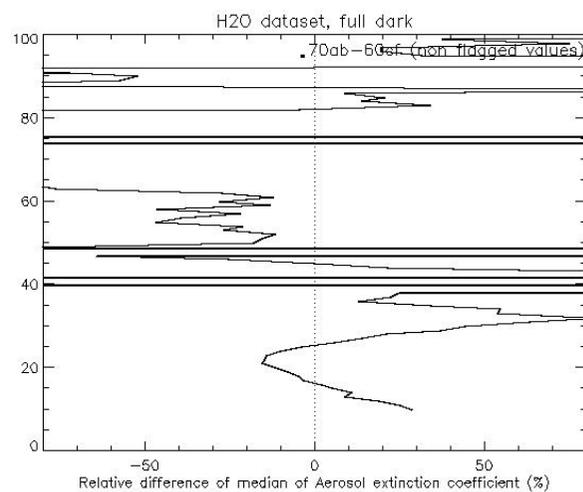
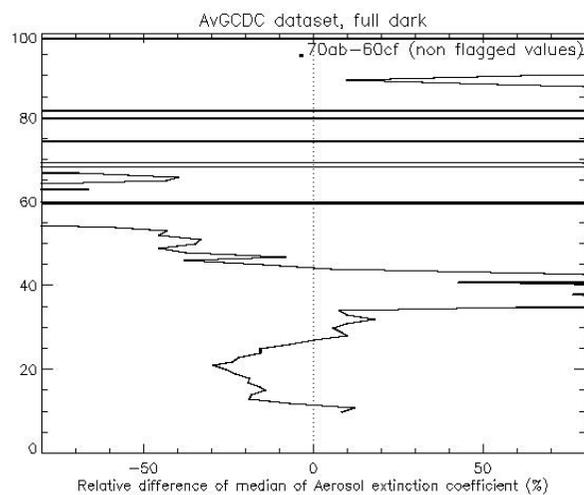
Dispersion of the O₂ profiles (half difference of 16 and 84 percentile limits)



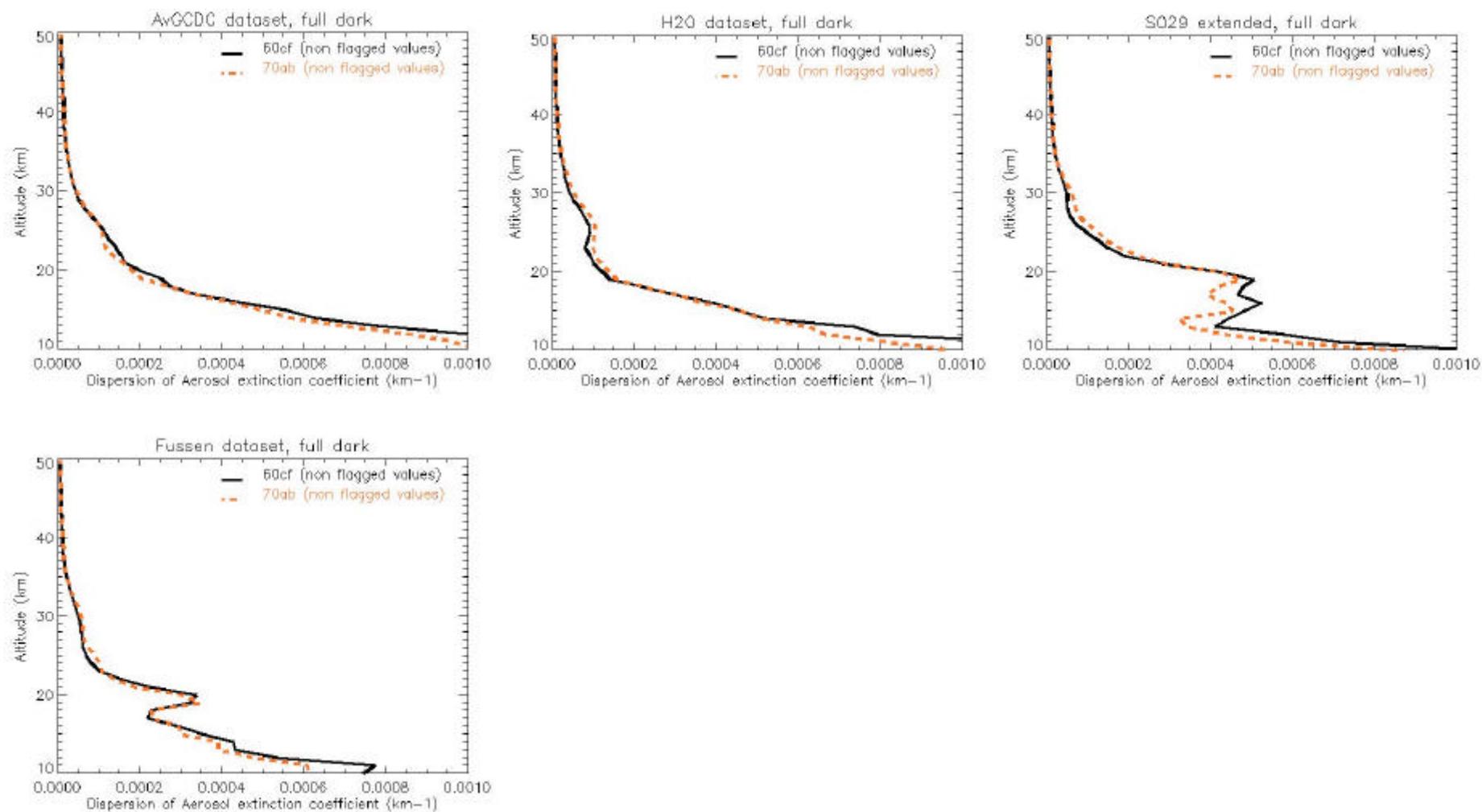
Median profiles of the aerosol extinction coefficient for the testing datasets: 10-50 km



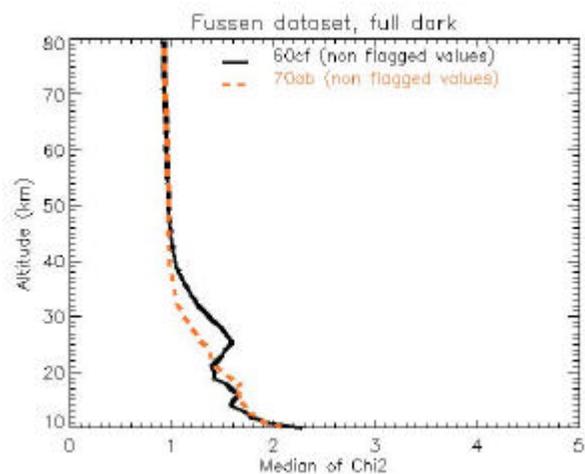
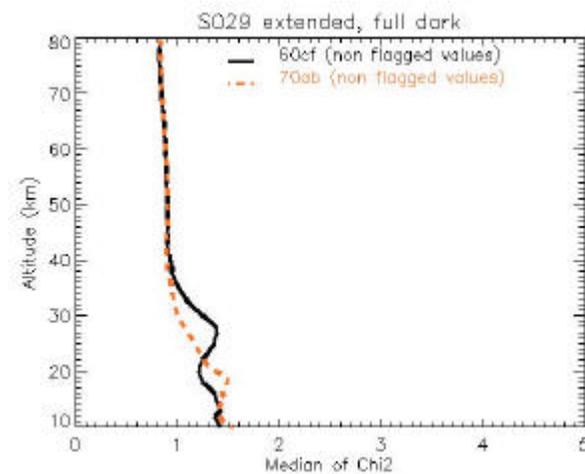
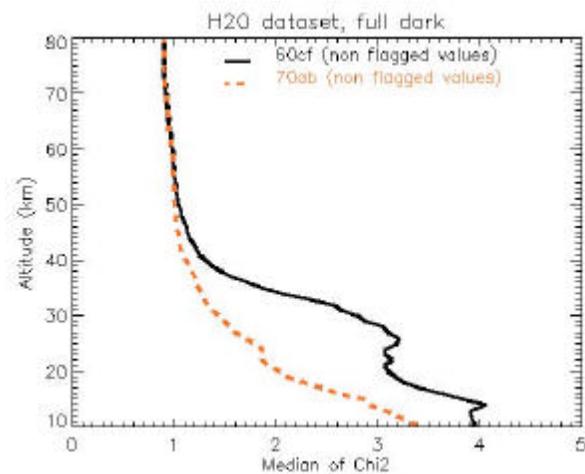
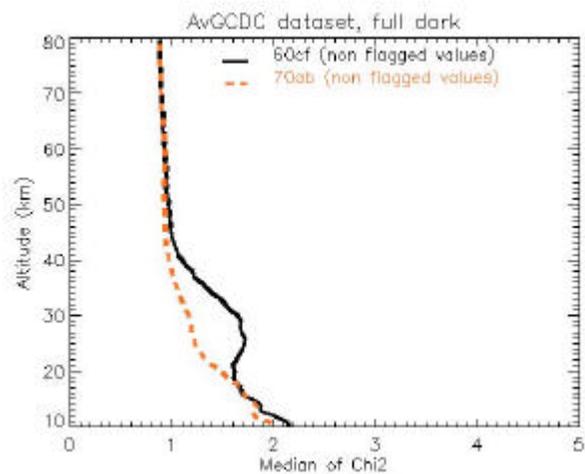
Relative difference between the median profiles of the aerosol extinction coefficient



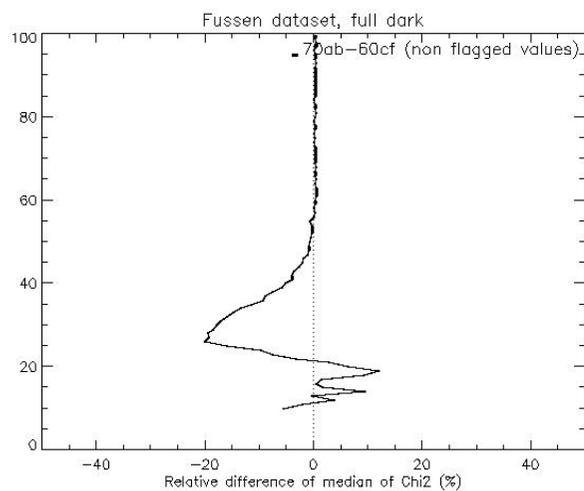
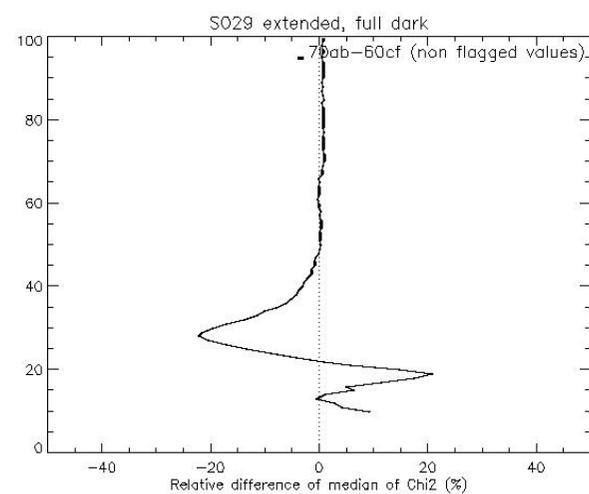
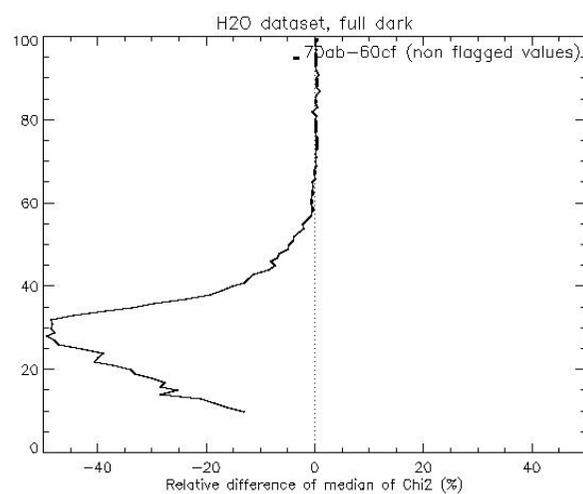
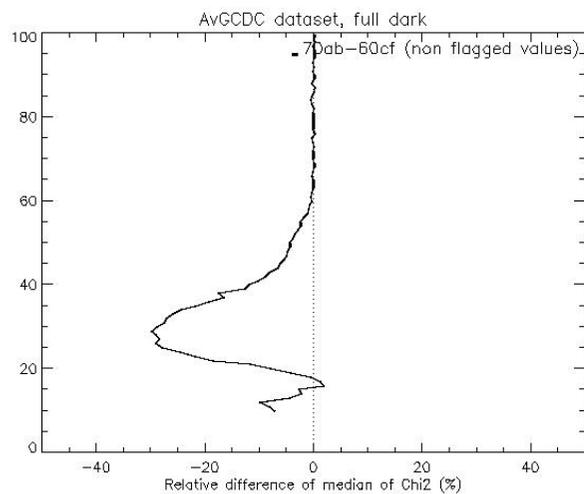
Dispersion of the profiles of the aerosol extinction coefficient (half difference of 16 and 84 percentile limits)



Median c^2 profiles for the testing datasets: 10-50 km



Relative difference between the median c^2 profiles for the testing datasets



Dispersion of the c^2 profiles for the testing datasets (half difference of 16 and 84 percentile limits)

