Splicing SAGE-II and GOMOS ozone measurements to create a long-term stratospheric ozone climate data record

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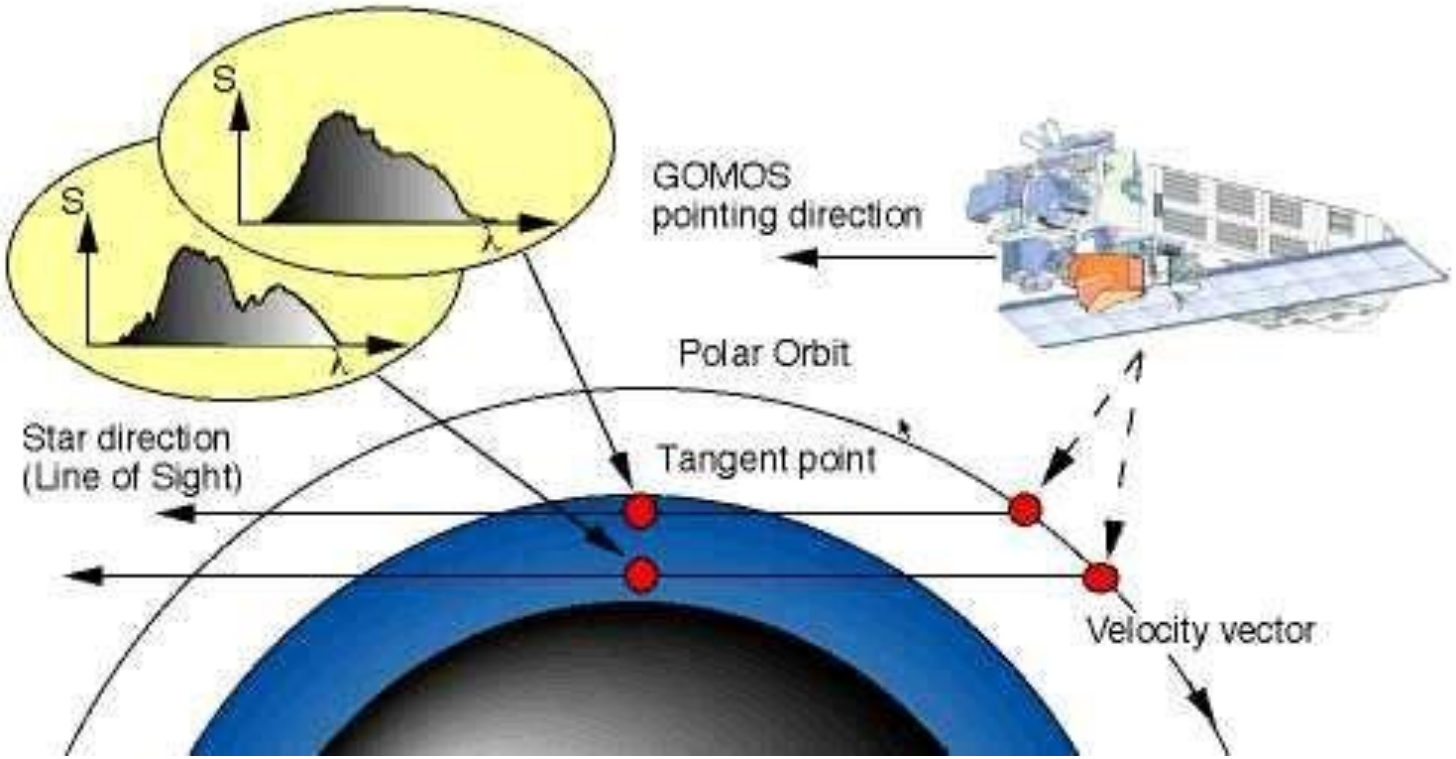
GOMOS (Global Ozone Monitoring by Occultation of Stars)

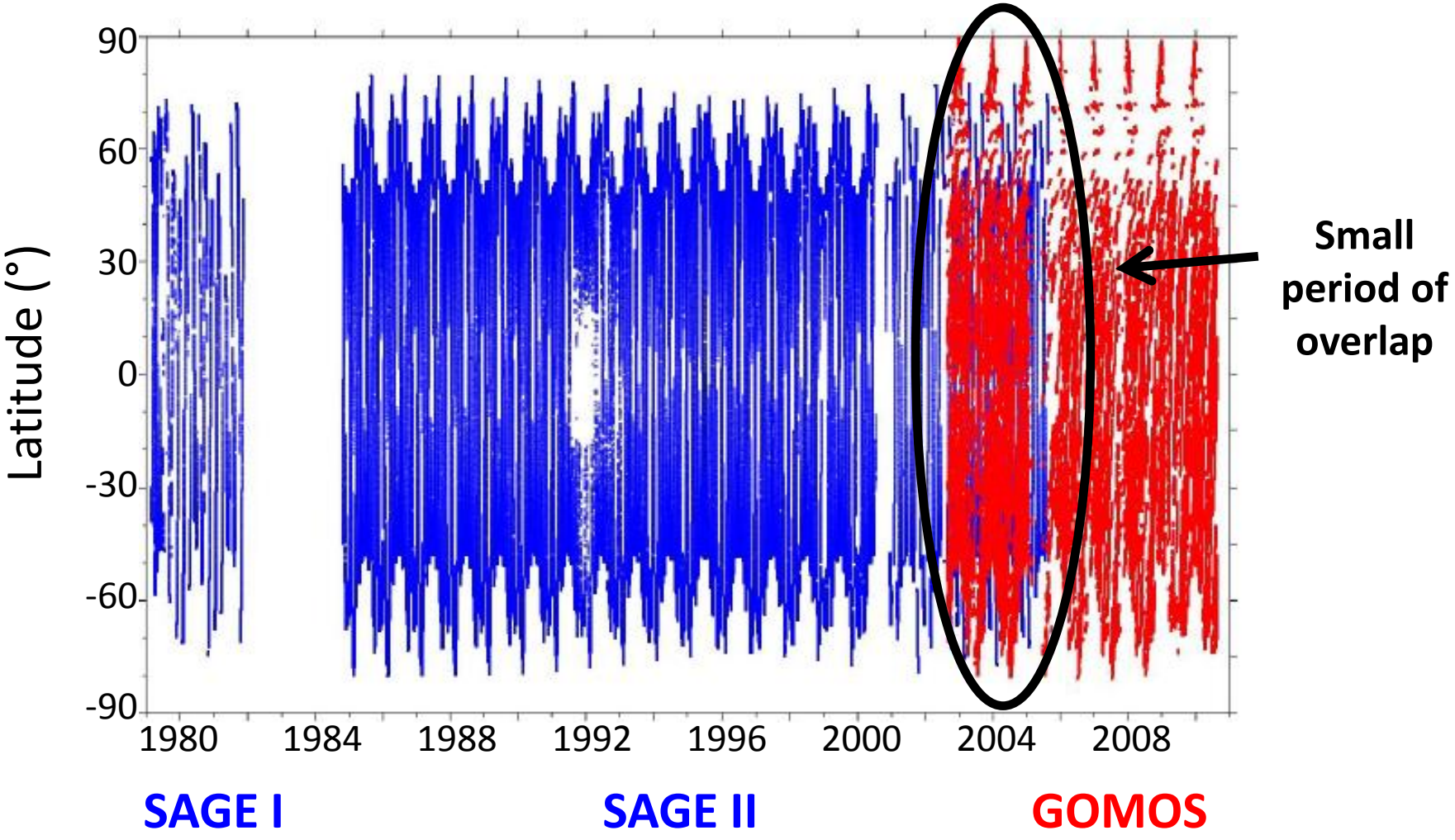


esa.earth.int

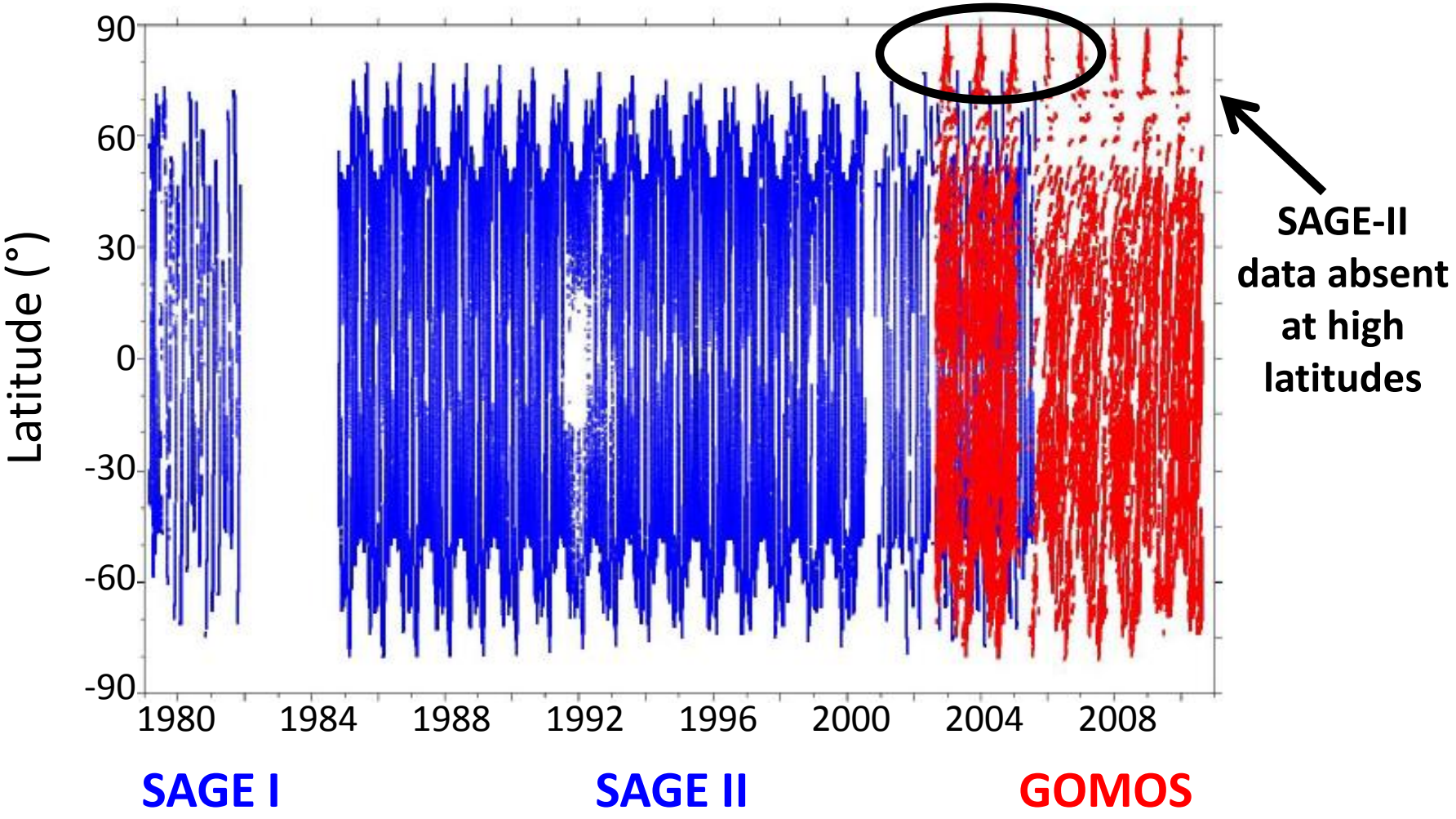
SAGE II (Stratospheric Aerosol and Gas Experiment II)

history.nasa.gov

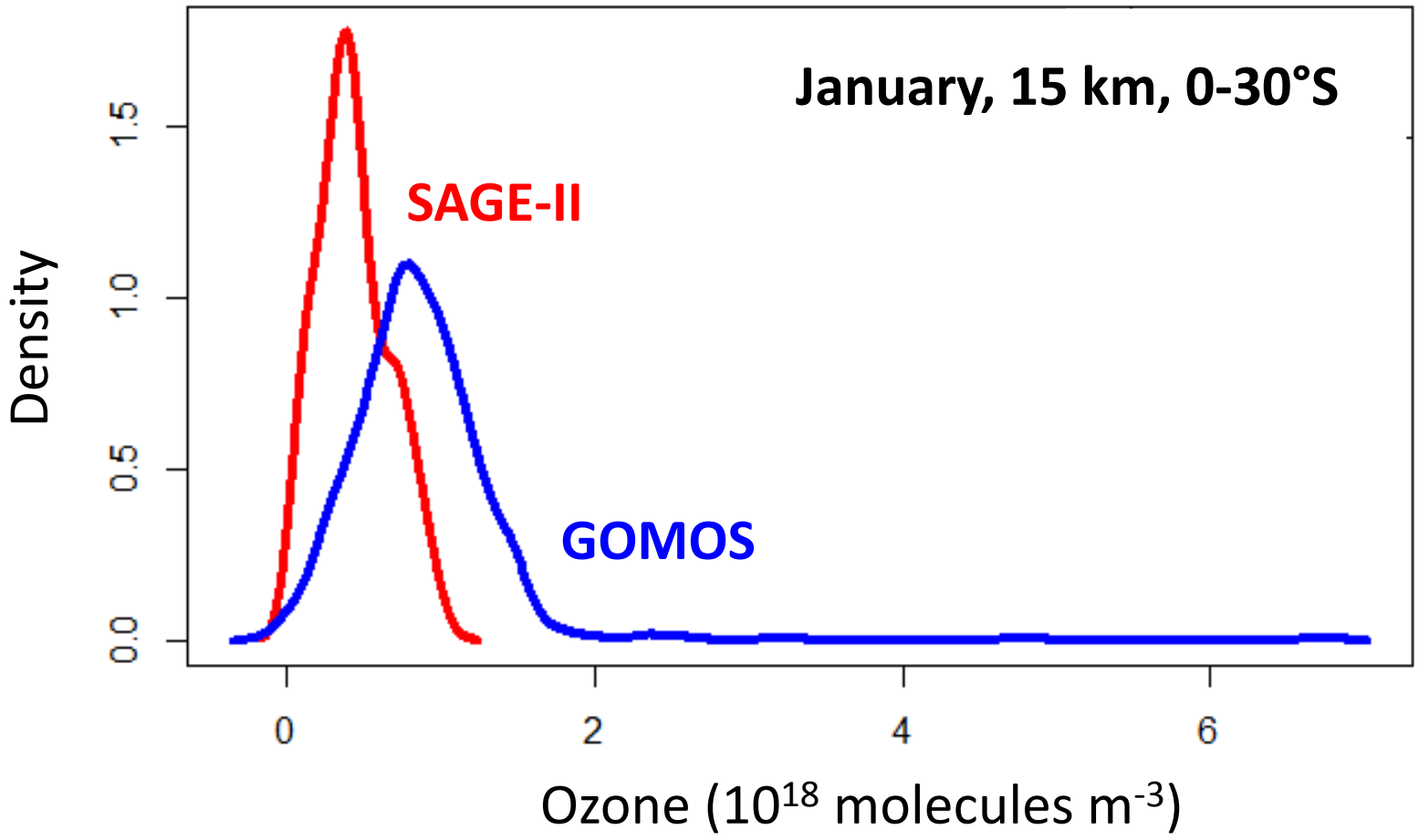
Distribution of SAGE and GOMOS measurements at 20 km



Distribution of SAGE and GOMOS measurements at 20 km

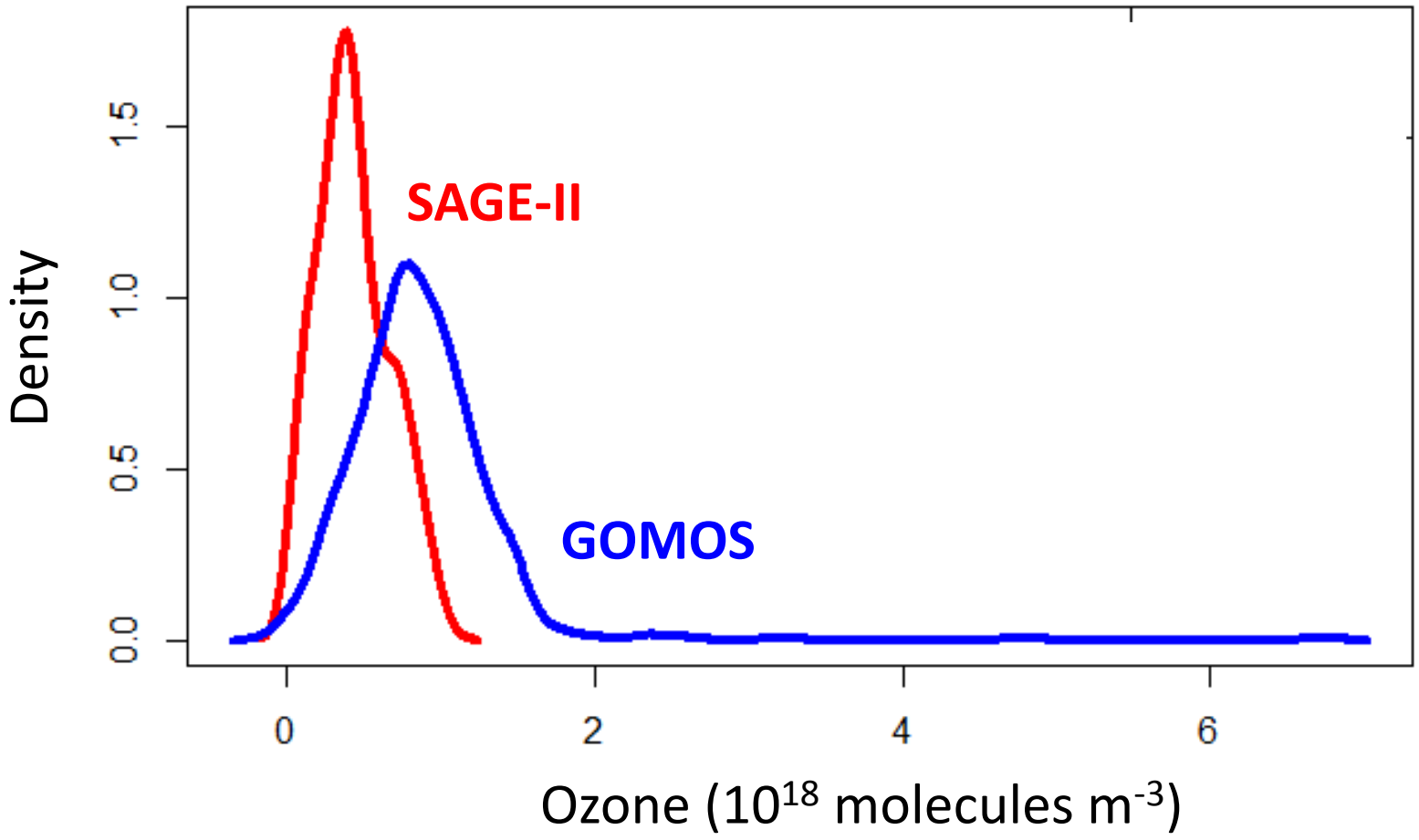


PDFs are used to correct GOMOS data

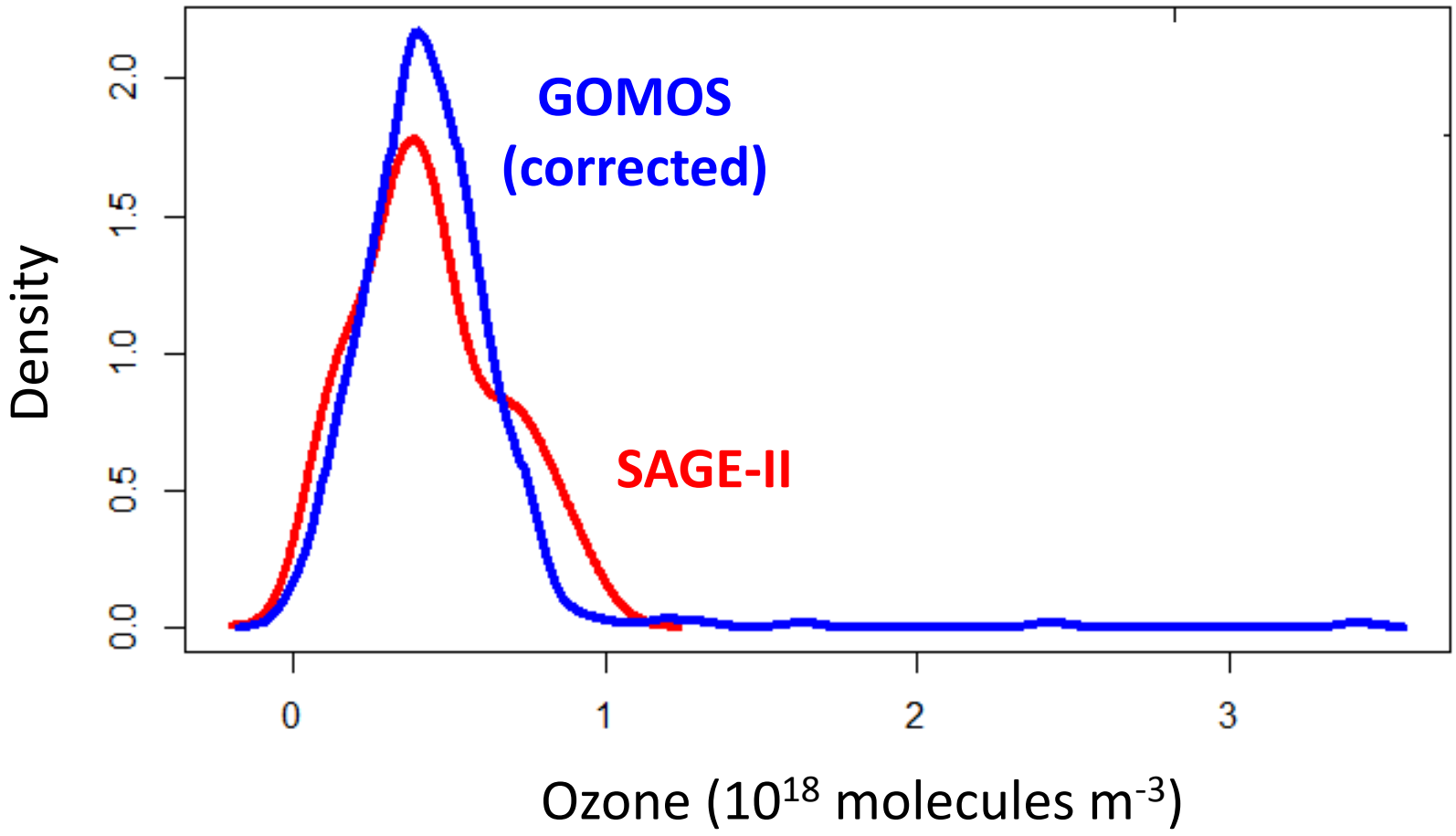


Lary & Lait (2006), "Using probability distribution functions for satellite validation." IEEE Transactions on Geoscience and Remote Sensing, 44 (5).

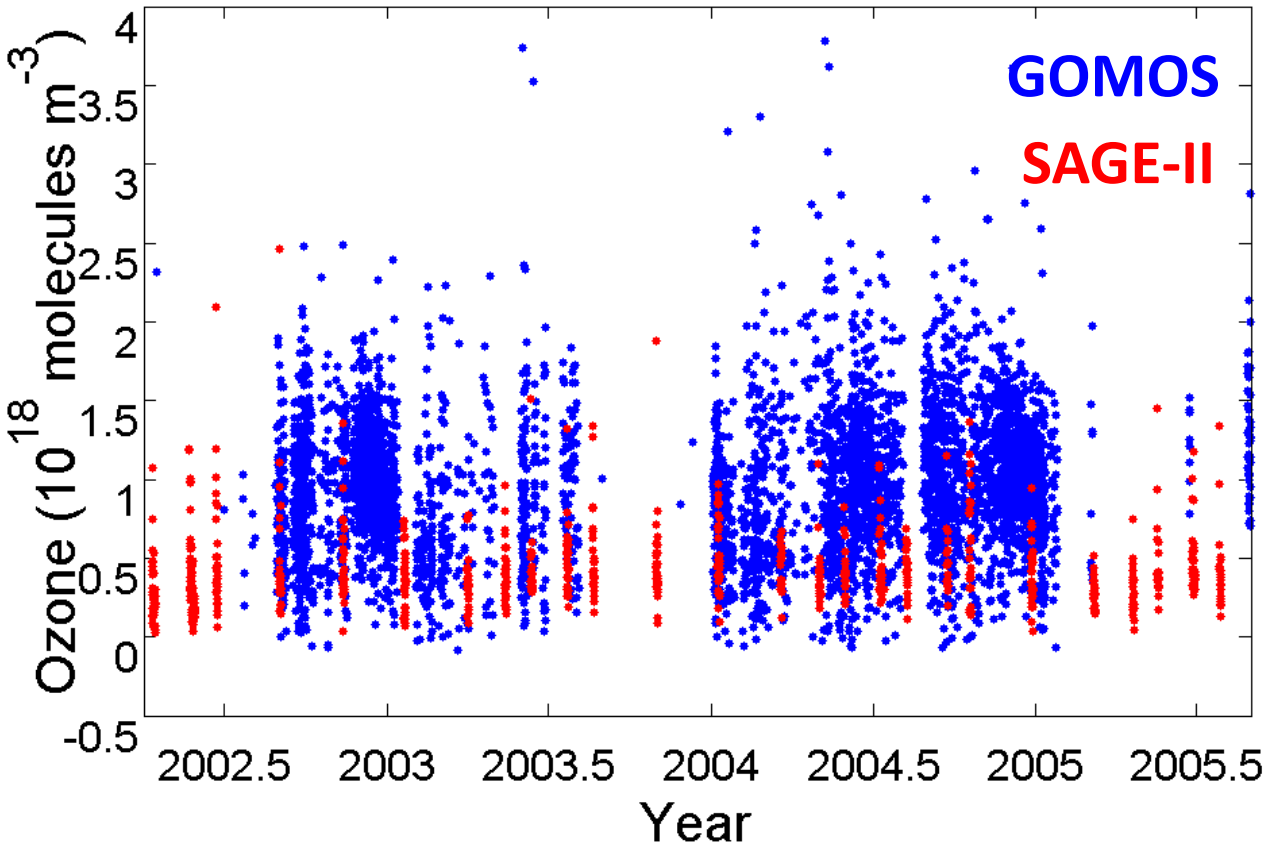
$$\text{Correction factor} = \frac{\text{mean(SAGEII)} - \text{mean(GOMOS)}}{\text{mean(GOMOS)}}$$



GOMOS meas. (corrected) = GOMOS meas. × correction factor

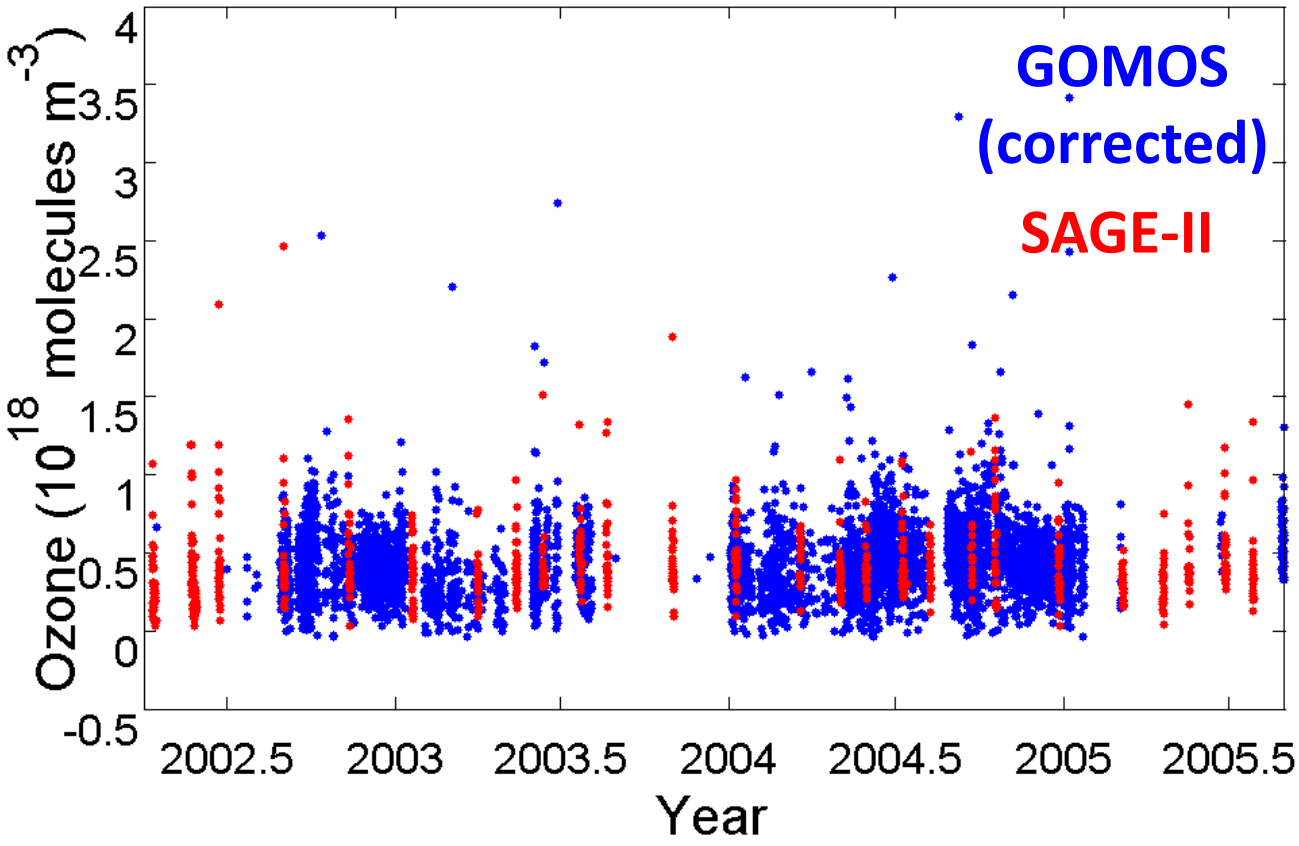


GOMOS data are too high before correction:

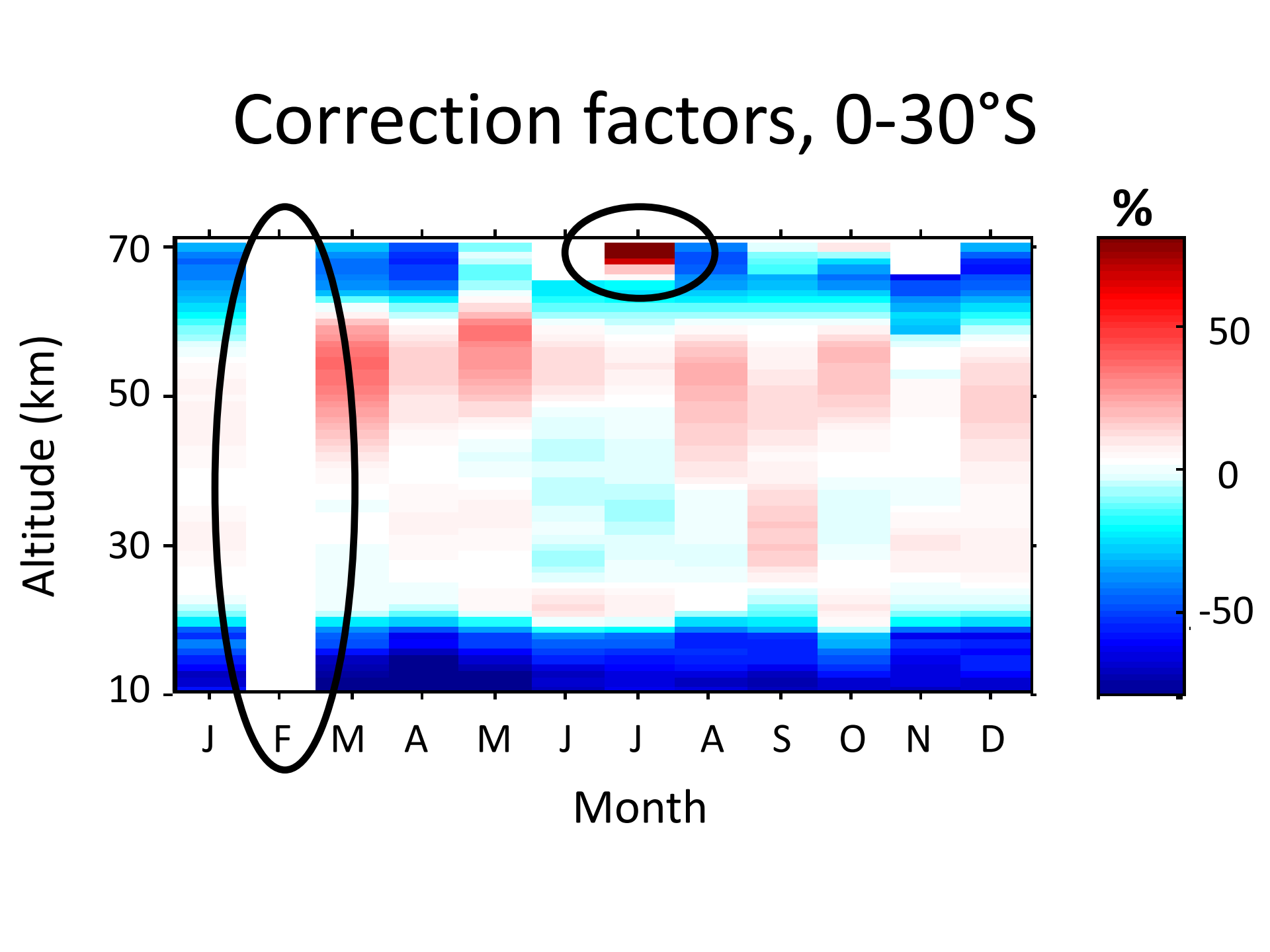


15 km, 0-30°S

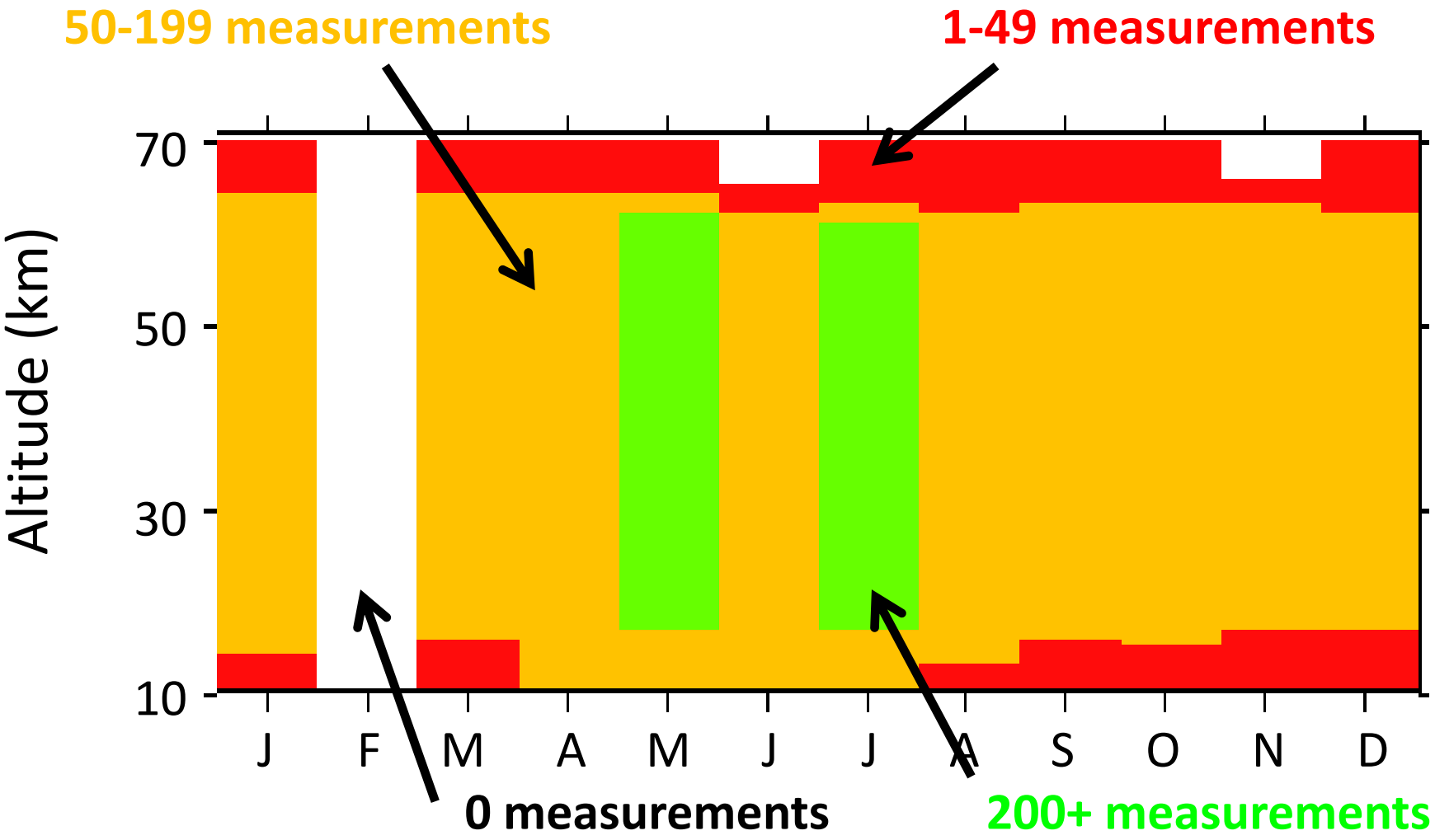
PDF-corrected GOMOS data better match SAGE-II data



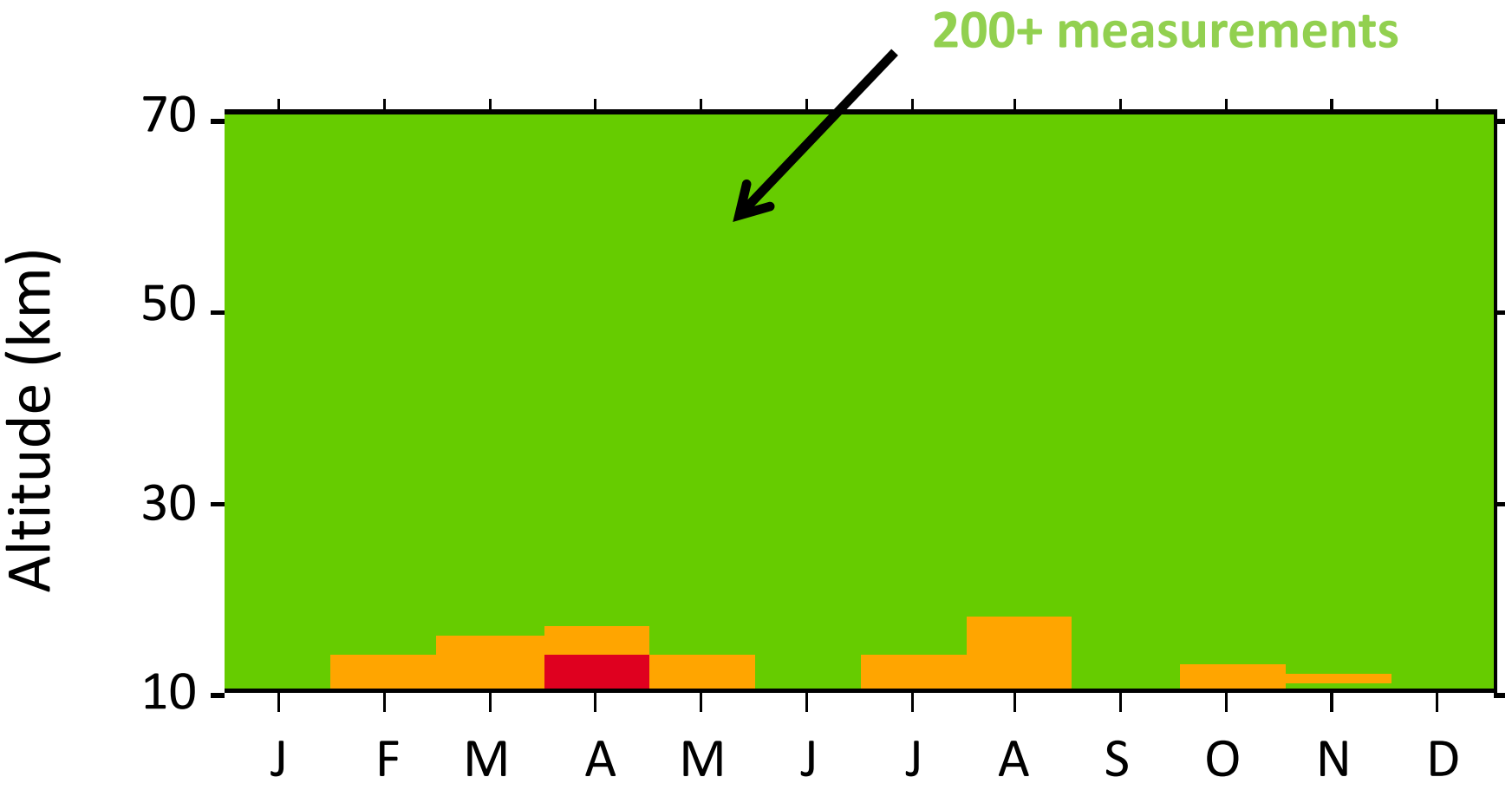
15 km, 0-30°S

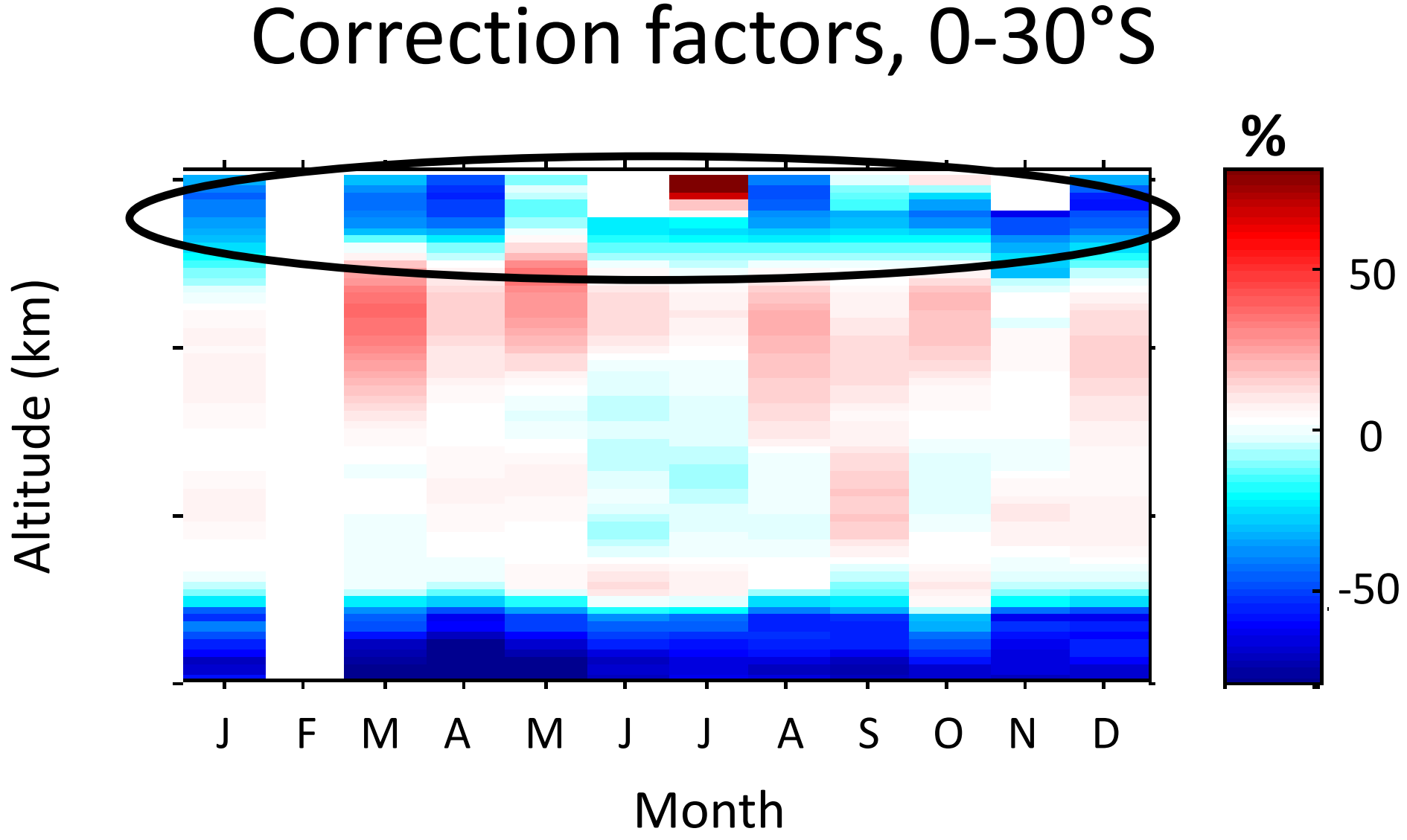

Correction factors, 0-30°S
%
70
50
30
10
Altitude (km)
J
F
M
A
M
J
J
A
S
O
N
D
Month
50
0
-50

Number of SAGE-II measurements, 0-30°S

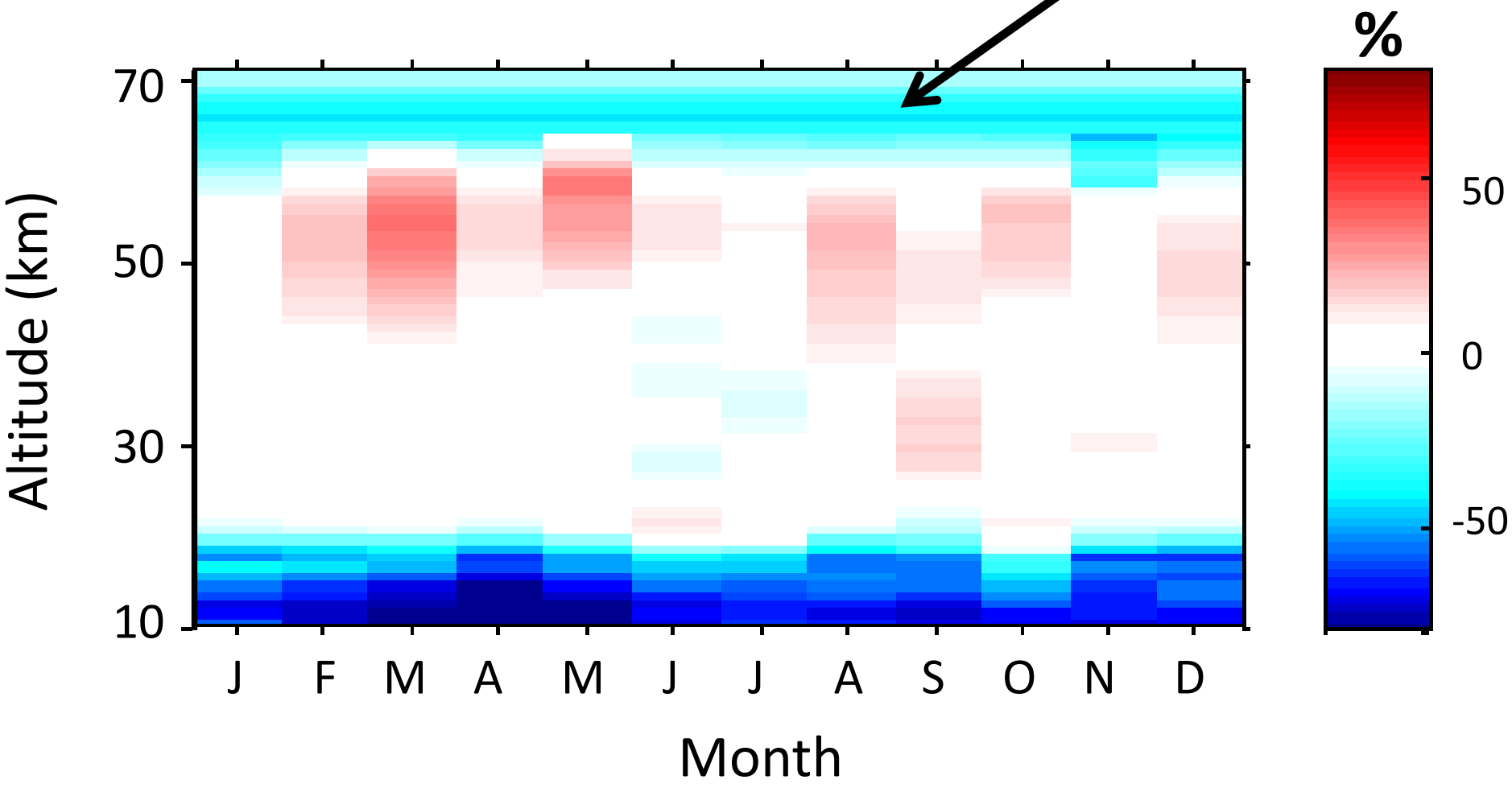


Number of GOMOS measurements, 0-30°S

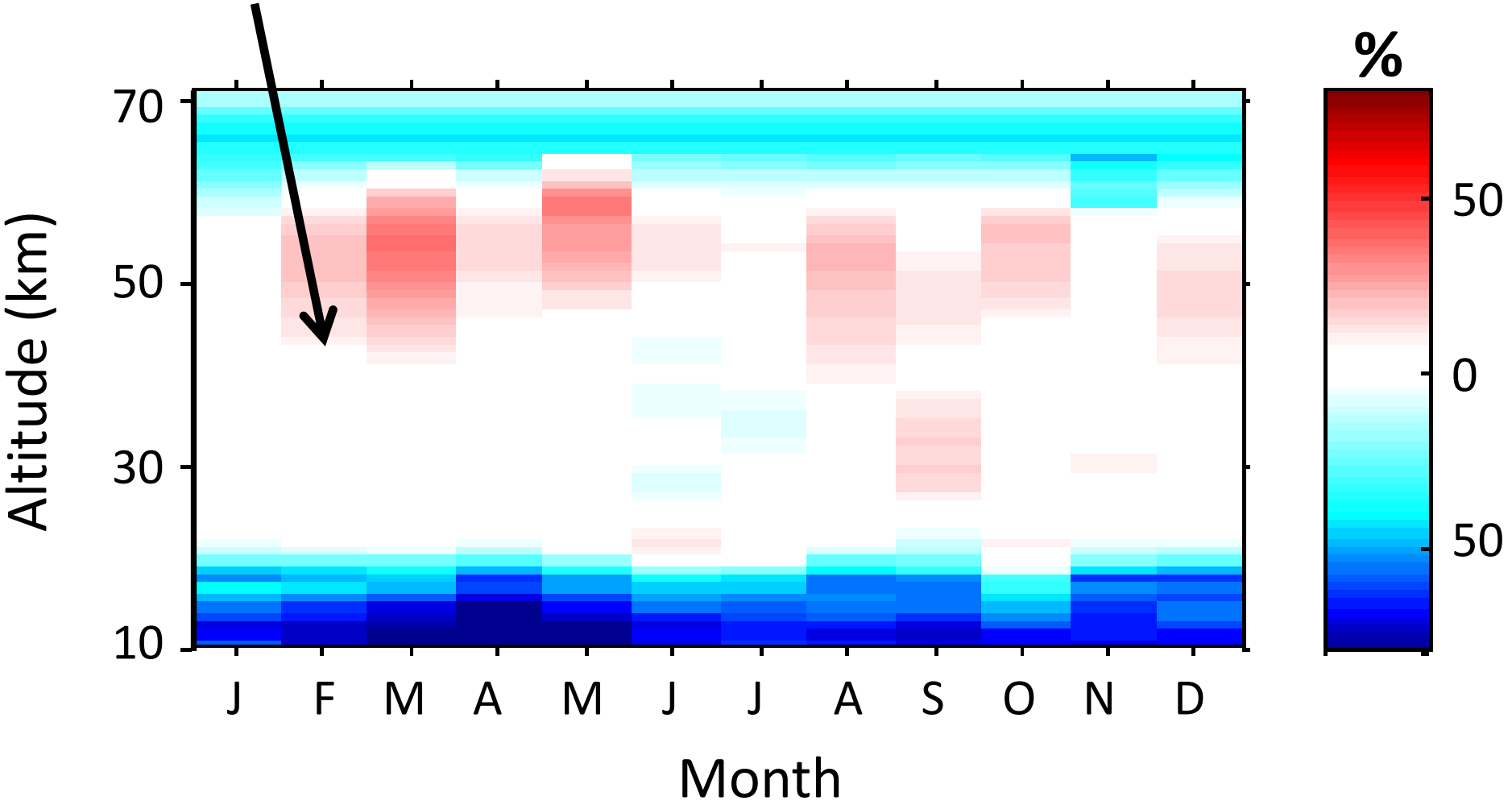



Correction factors, 0-30°S
%
50
0
-50
Altitude (km)
J
F
M
A
M
J
J
A
S
O
N
D
Month

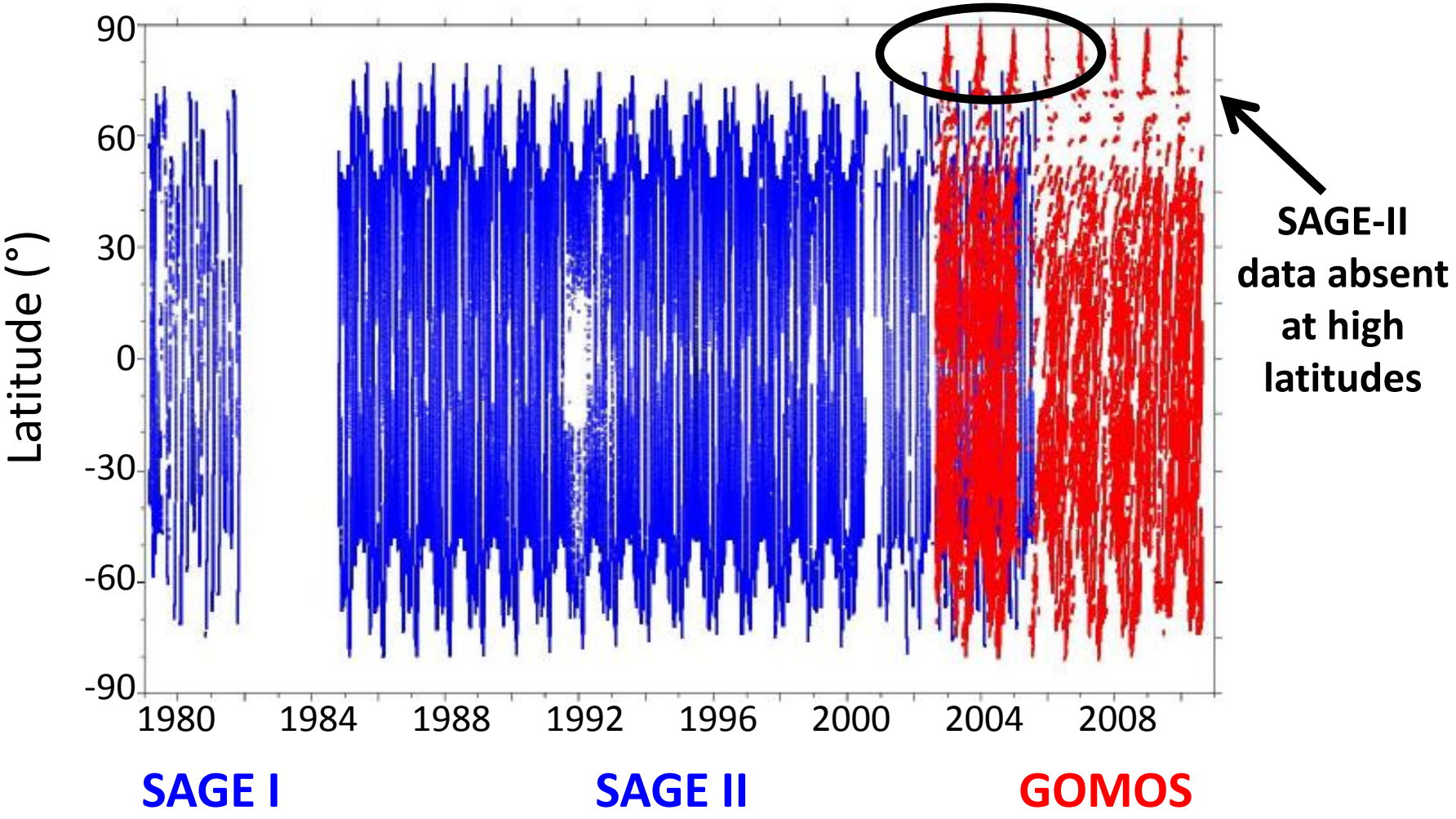
Uniform corrections are applied in the upper atmosphere

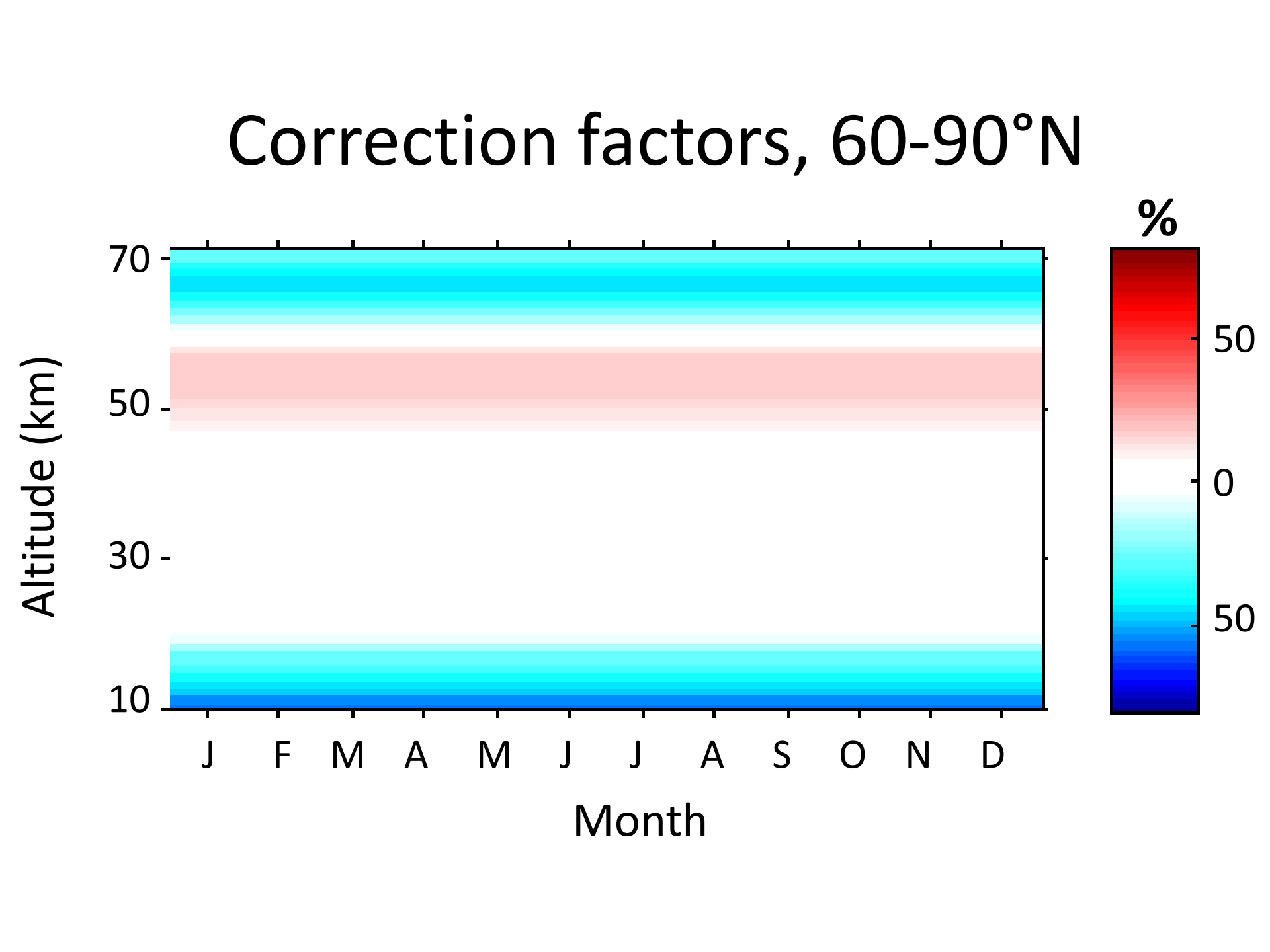


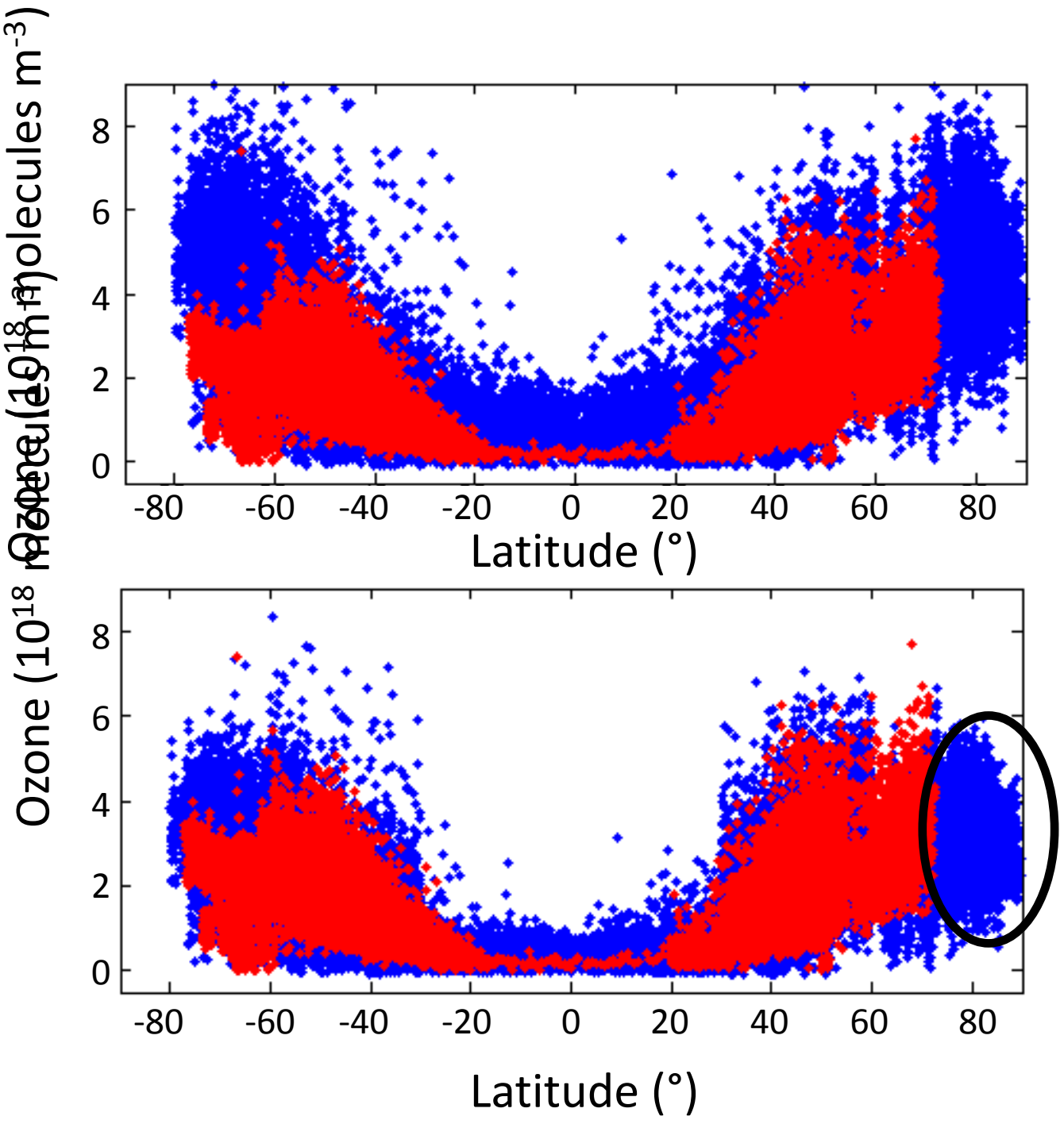
January and March corrections are averaged to calculate February corrections

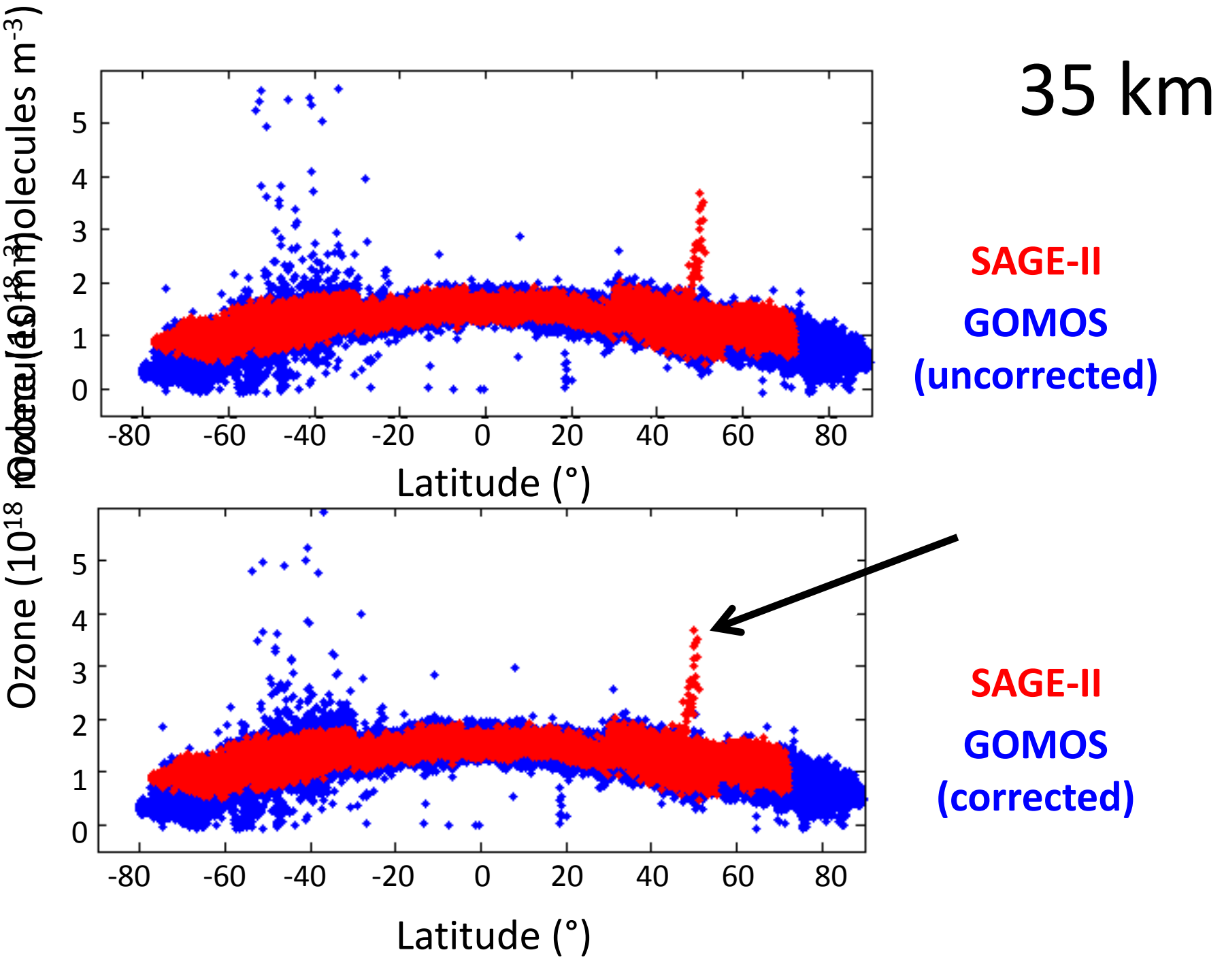


Distribution of SAGE and GOMOS measurements at 20 km

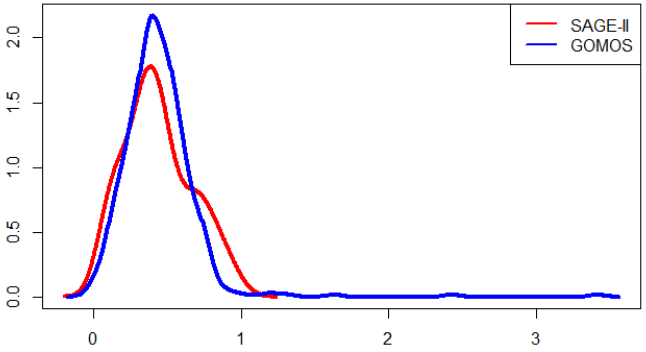



Correction factors, 60-90°N
%
70
50
30
10
Altitude (km)
50
0
50
J
F
M
A
M
J
J
A
S
O
N
D
Month


15 km
SAGE-II
GOMOS
(uncorrected)
SAGE-II
GOMOS
(corrected)
Ozone (10^{18} molecules m^{-3})
Latitude (°)
-80
-60
-40
-20
0
20
40
60
80
0
2
4
6
8

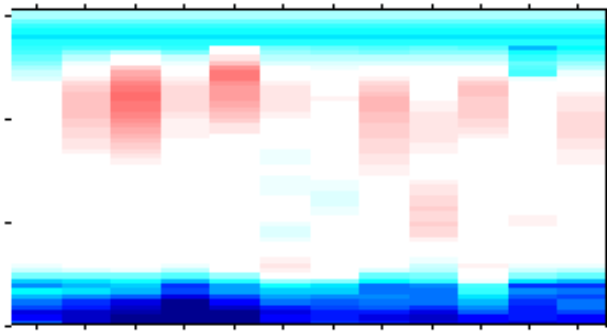

35 km
SAGE-II
GOMOS
(uncorrected)
SAGE-II
GOMOS
(corrected)
Ozone (10^{18} molecules m^{-3})
Latitude (°)
Latitude (°)

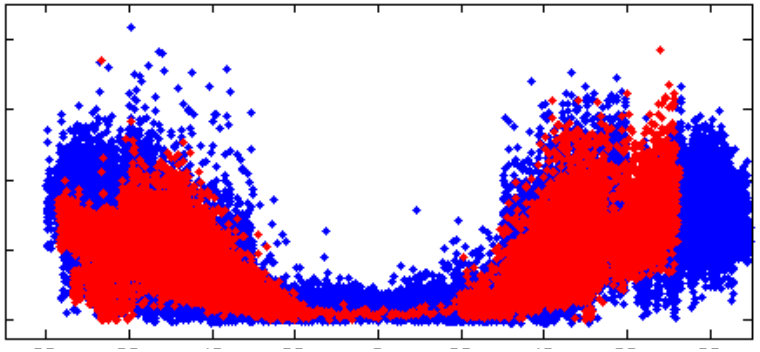
To sum up:



Probability distribution functions were used to account for offsets and drifts between satellite records

The spatial and temporal structure of the correction factors was examined





A merged SAGE-II and GOMOS dataset was created