Monthly mean tropospheric NO_2 datafiles (TOMS format)

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The files no2_yyyymm.asc.gz contain averaged and gridded tropospheric NO_2 columns for a particular month in the TOMS-format. The header (first 4 lines) describes the specifics of the file; below an example is shown for November 2008 from OMI.

```
OMI monthly-mean tropospheric NO2 columns, KNMI, version 1.0
Year 2008 Month 11, units: 1e13 molecules/cm2, undef=-999
Longitudes:  2880 bins centered on 179.9375 W to 179.9375 E  (0.125 degree steps)
Latitudes :  1440 bins centered on  89.9375 S to  89.9375 N  (0.125 degree steps)
lat=  -89.938
-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999
-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999
-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999
-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999
-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999
-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999-999
```

The header shows that tropospheric columns are stored in units of 10^{13} molecules/cm^2, on a 0.125° × 0.125° grid. After the line that specifies the latitude, 2880 values follow (20 per line) that cover all longitudes from 179.9375° W (1st value) to 179.9375° E (2880th value). Then a new line starts that specifies the next latitude (-89.8125), followed by the next 2880 values, and so on.

The values given are the result of averaging and gridding mostly-clear retrievals. Mostly-clear means that tropospheric NO_2 has been retrieved in situations with a cloud radiance fraction <50%, corresponding to cloud fractions approximately <20%. Our tropospheric NO_2 columns are the residual of subtracting two large numbers (the total slant column, and stratospheric slant NO_2 column) that are both subject to noise, and over regions with background NO_2 concentrations this may result in zero or negative monthly means. Because negative (or zero) tropospheric NO_2 columns are statistically meaningful, they should not be discarded, or a positive bias would be introduced. A value of -999 indicates that no meaningful measurement has been available during the month. This can be due to the absence of sunlight (at high latitudes in winter), because a location was persistently covered by clouds, or because of instrument failure.

The gridding procedure accounts for the fraction of a satellite pixel overlapping with a particular grid cell. The contribution of every pixel to the monthly mean is thus weighted with the overlap fraction. Note that the mean tropospheric NO_2 column for different grid cells may have very different overlap statistics, i.e. grid cell *x* may have been covered by only 1 meaningful retrieval, whereas grid cell *y* may be the average of 30 successful cloud-free retrievals. For this reason, we generally do not recommend directly comparing the monthly mean ascii data to model output as these are sampled differently in space and time. For direct model-to-measurement comparisons, it is best to use the daily data and sample the model in the same way as the satellite retrievals. Statistics on the number of pixels used in the average are available upon request.