

NEW GLOBAL STATIC AND DYNAMIC OZONE PROFILE CLIMATOLOGY



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Abstract

In the scope of the ESA funded project "CHEOPS-GOME" (Climatology of Height-resolved Earth Ozone and Profiling Systems for GOME) a new up-to-date ozone profile climatology was developed.

The **NNORSY-CLIMATOLOGY** is available in the form of several ASCII look-up-table climatologies (**LUT**), which's specifications in respect to data grid and format were defined by means of a broad user consultation.

Furthermore a dynamical version of the climatology can be obtained, which bases on neural network technique (**NN**). Here latitude and time are mandatory input parameters. Additionally user specific input like "total ozone column", "LAT/LON-Intervals" and "temperature profile" can be used to get a dynamical climatological ozone profile.

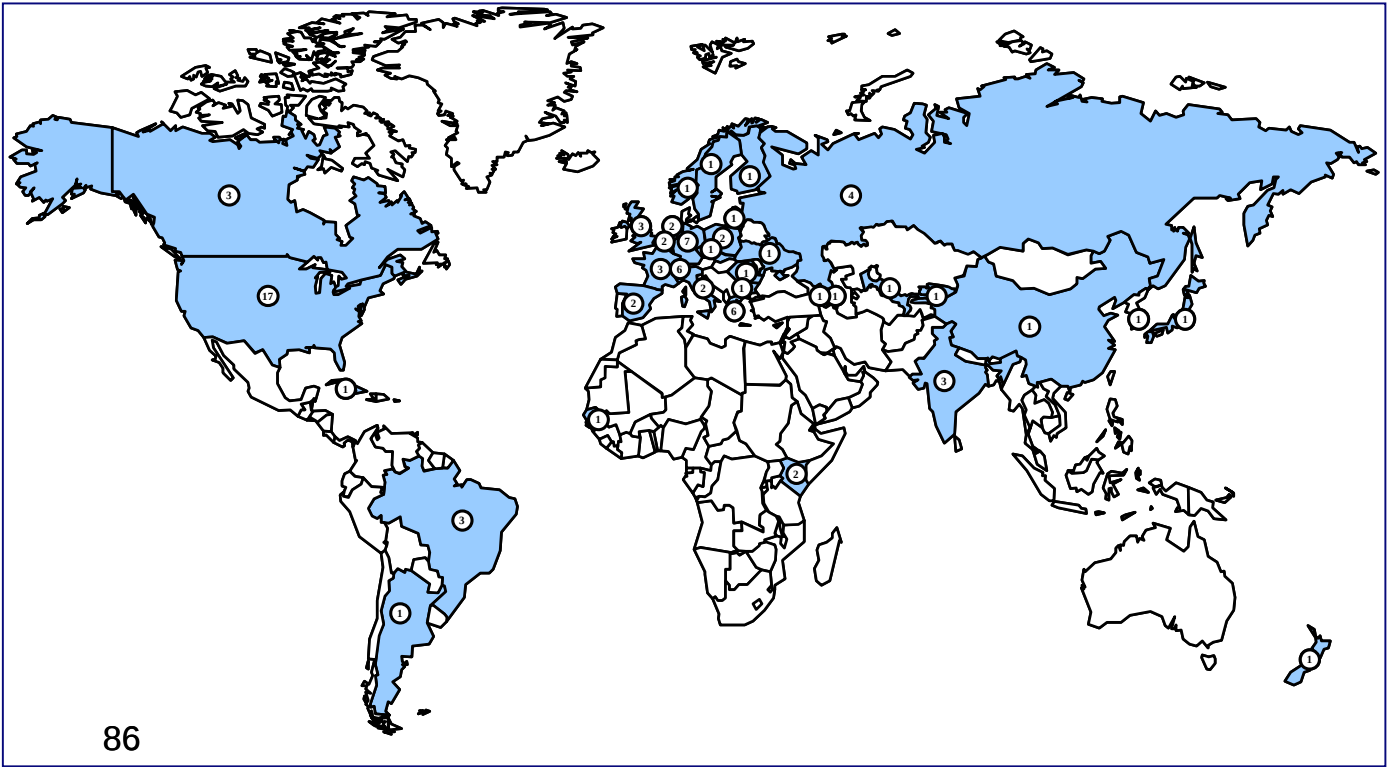
Comparisons of the **NNORSY-CLIMATOLOGY** with widespread climatologies show good agreement and emphasize to profit of the gain of information from using up-to-date ozone data and software technique.

User Consultation - Results

In early 2004 an email request for individual demands on a new ozone profile climatology was sent out to 1214 atmospheric scientists. Thereupon a total of 86 working groups from all over the world sent back the questionnaire including their individual feedback. Within a subsequent user consultation meeting the survey results were presented and the final specifications were stated (see table to the right).

Besides the two LUTs on altitude and pressure grid a third climatological data set is available following the specifications of the TOMS V.8 climatology (**LUT III**).

Geographical distribution of the potential users of the **NNORSY-CLIMATOLOGY**



Specifications **NNORSY-CLIMATOLOGY**:

Characteristics	LUT I	LUT II
Input Parameter	Month, Lat, Lon	Month, Lat, Lon
Temporal Resolution	1 Month	1 Month
Latitudinal Resolution	2.5°	2.5°
Longitudinal Resolution	10.0°	10.0°
Height Coordinate	Altitude (km)	Pressure (hPa)
Vertical Sampling	2 km	28 std. pressure levels
Ozone Data Unit	Ozone Number Density	Volume Mixing Ratio
Output Parameter	O ₃ Profile O ₃ Profile Stdev.	O ₃ Profile O ₃ Profile Stdev.
Disc Space	~120 MB	~ 100 MB

Characteristics	NN
Input Parameter	Time*, Lon*, Lat*, TOZ**, T_profile**
Temporal Resolution	Maximum, 1 Day
Latitudinal Resolution	Arbitrary
Longitudinal Resolution	Arbitrary
Height Coordinate	Altitude (km) / Pressure (hPa)
Vertical Sampling	> 1 km / < 54 pressure levels
Ozone Data Unit	Ozone Number Density / Volume Mixing Ratio
Output Parameter	Ozone profile
Disc Space	~200 KB

* demanded ** optional

Data Basis - NNORSY V2.1

PROJECT	ADDITIONAL DATA
CHEOPS-GOME	Pressure Profile (hPa)
TEMPORAL COVERAGE	Total Ozone: Integrated Profiles GDP4/TOMS (DU)
Start Date: July 1995	Tropopause Height: km
End Date: June 2003	Tropospheric Ozone: DU
Number of Orbits: 37496	Stratospheric Ozone: DU
LEVEL 2 PROFILES	GEOS4 T-Profile
Minimum Altitude: surface	GEOS4 Surface pressure
Maximum Altitude: 61 km	DATA SOURCES
Vertical Sampling: 1 km	ERS-2 GOME instrument
Ozone Number Density: 1e18/m ³	
Ozone Error: %	

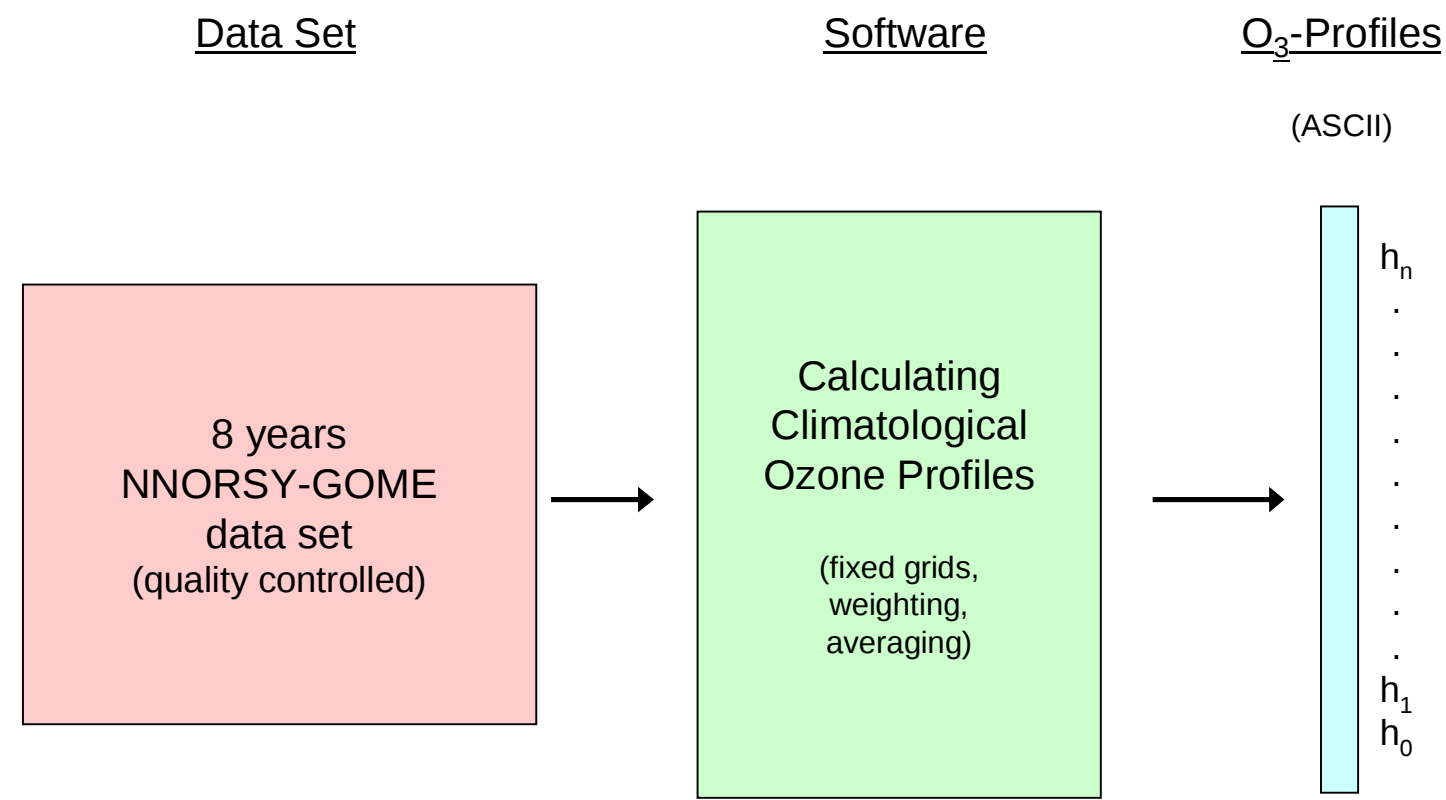
Main specification of the NNORSY V 2.1 data set

NNORSY-Climatologies

Two separate approaches for the new climatologies were followed:

Static Version

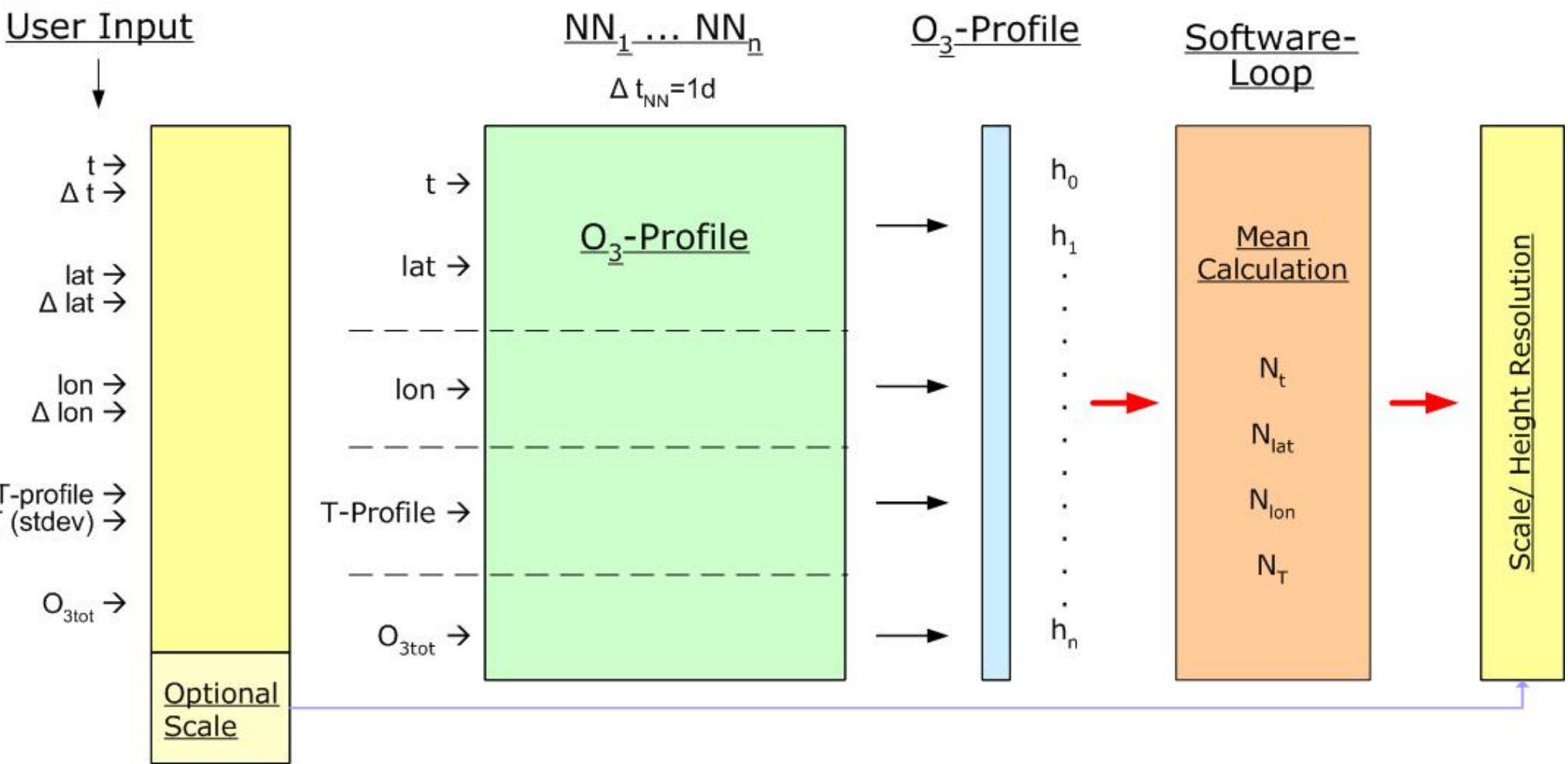
On the right hand side a coarse scheme of the operation for the **LUT** data is shown. The Level 2 NNORSY-GOME ozone profiles are mapped into specified climatological structure and are optionally interpolated to pressure grid. **LUT** versions on altitude and pressure grid are available. On demand customized height coordinates can be provided.



Dynamic Version

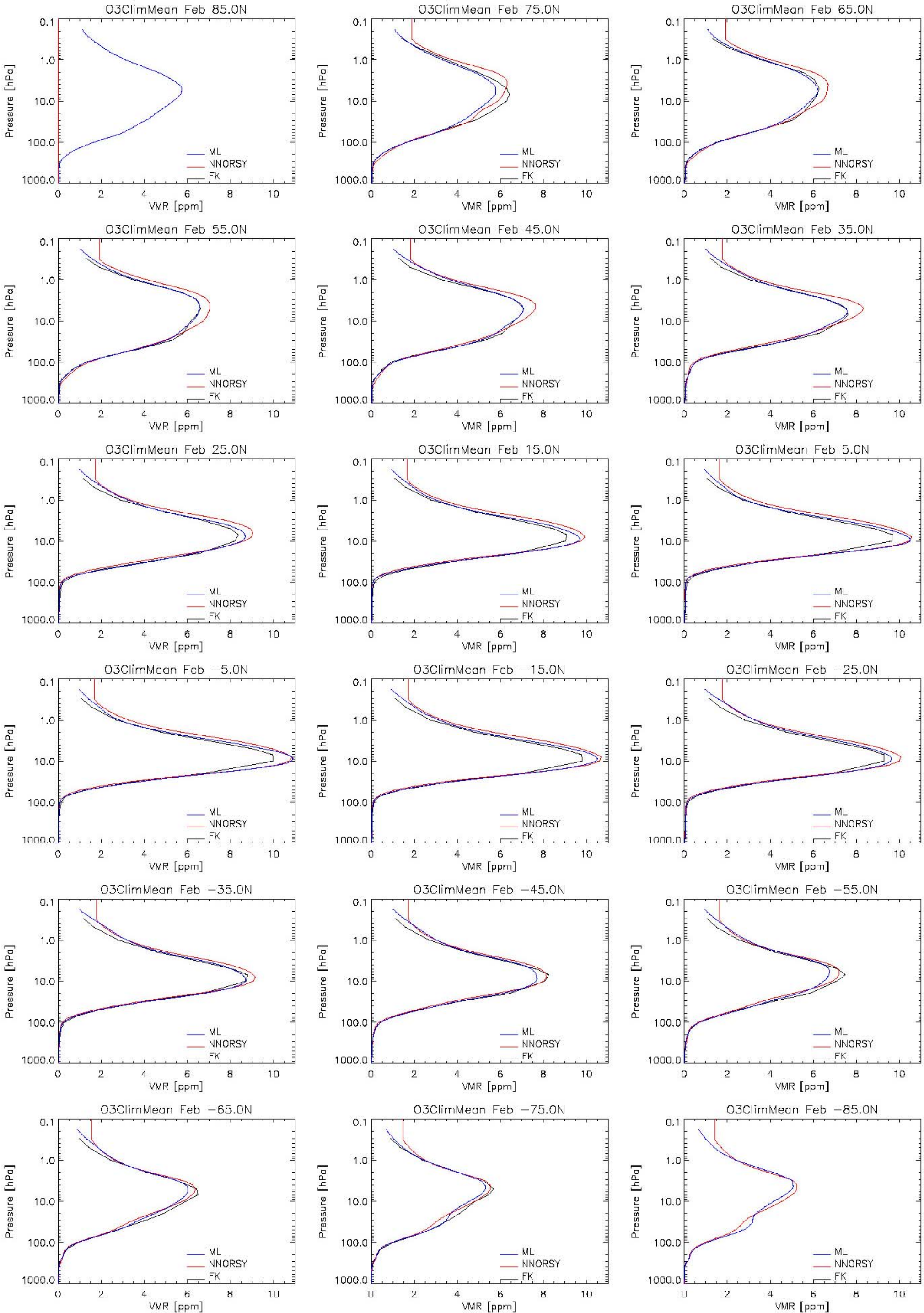
In case of the dynamical **NN** climatology a bundle of neural networks together with standard routines for data conversion, interpolation etc. will be provided. For each combination of input parameters an appropriate neural network is used to retrieve the corresponding ozone profile. Varying the input parameters within user provided intervals result in several climatological ozone profiles, which are averaged to the user demanded climatological ozone profile.

The climatological ozone profiles will be available on user specific altitude or pressure grid.



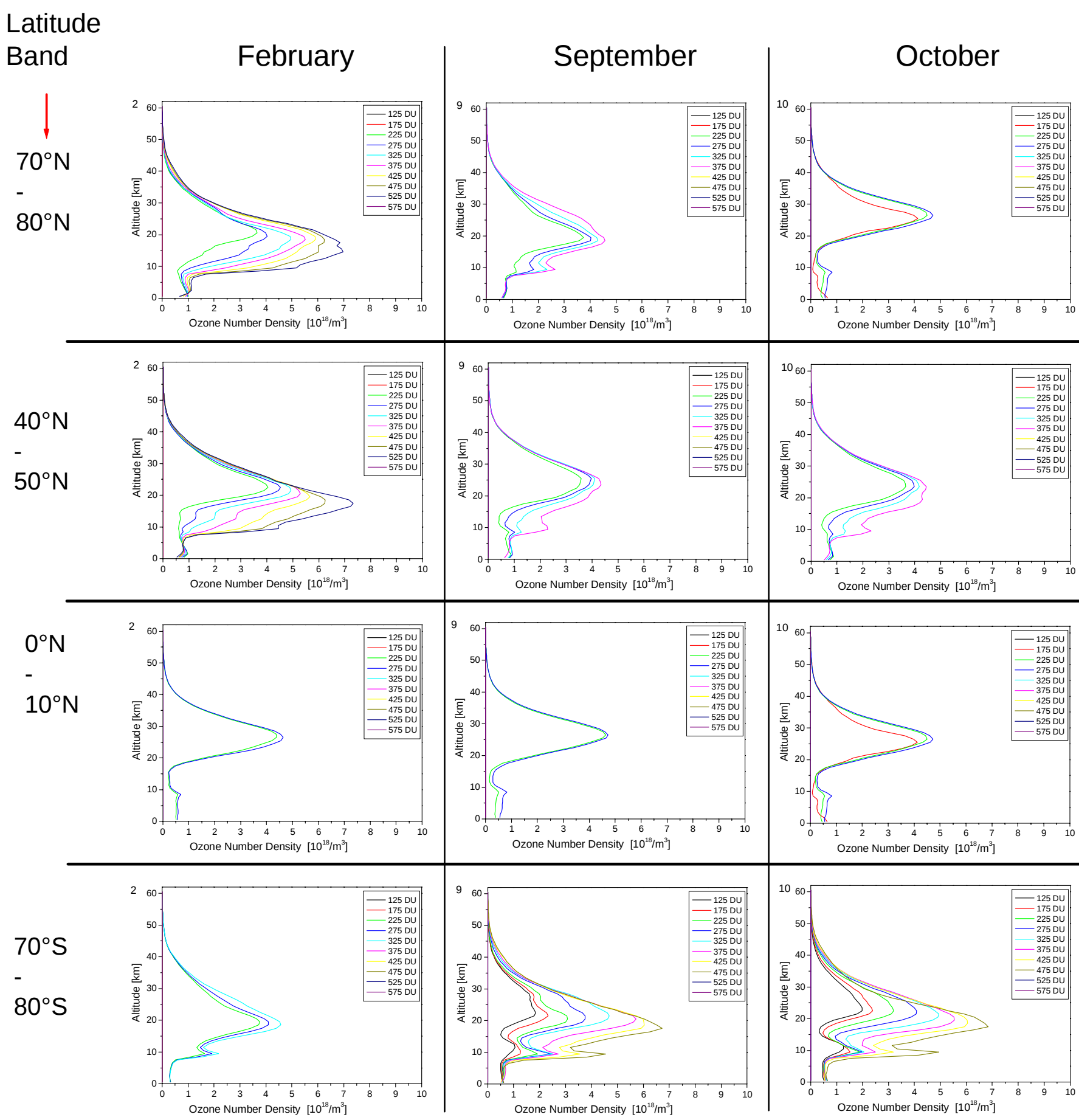
Comparisons with standard climatologies

Climatological ozone profiles of **NNORSY-CLIMATOLOGY (LUT II)** compared to climatologies of "Fortuin&Kelder" * and "McPeters&Labow" **

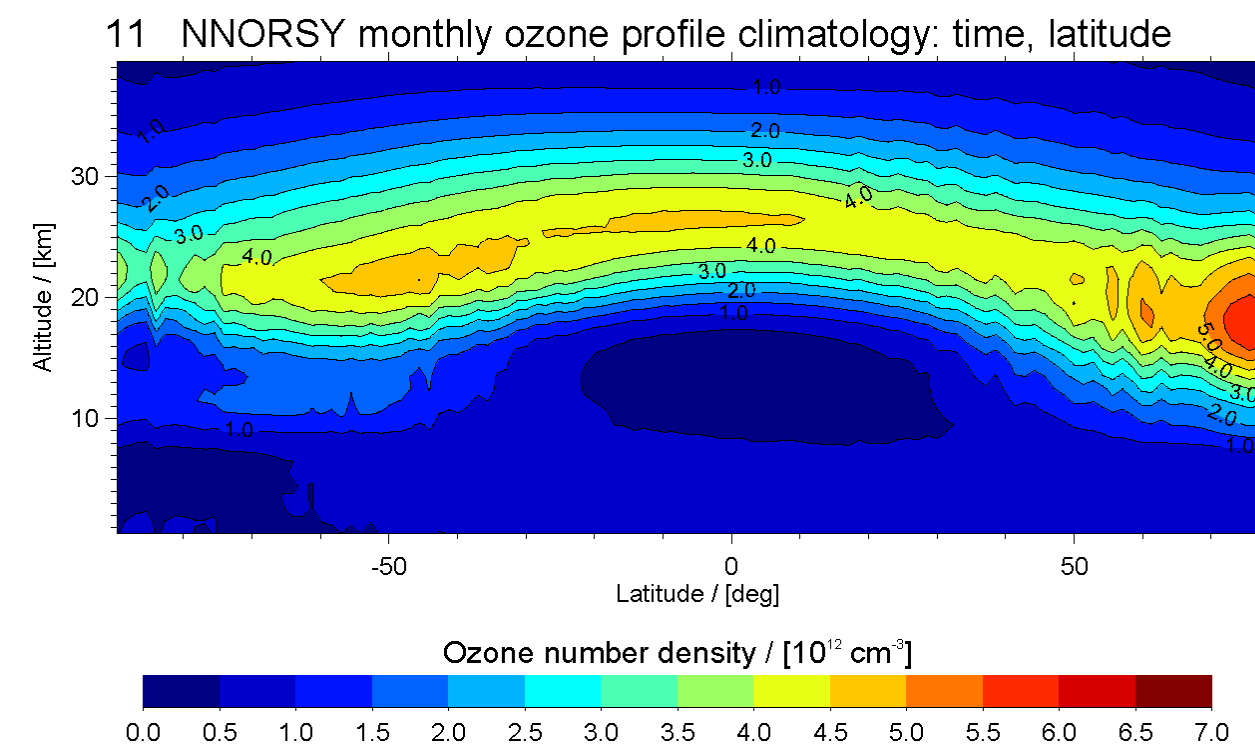
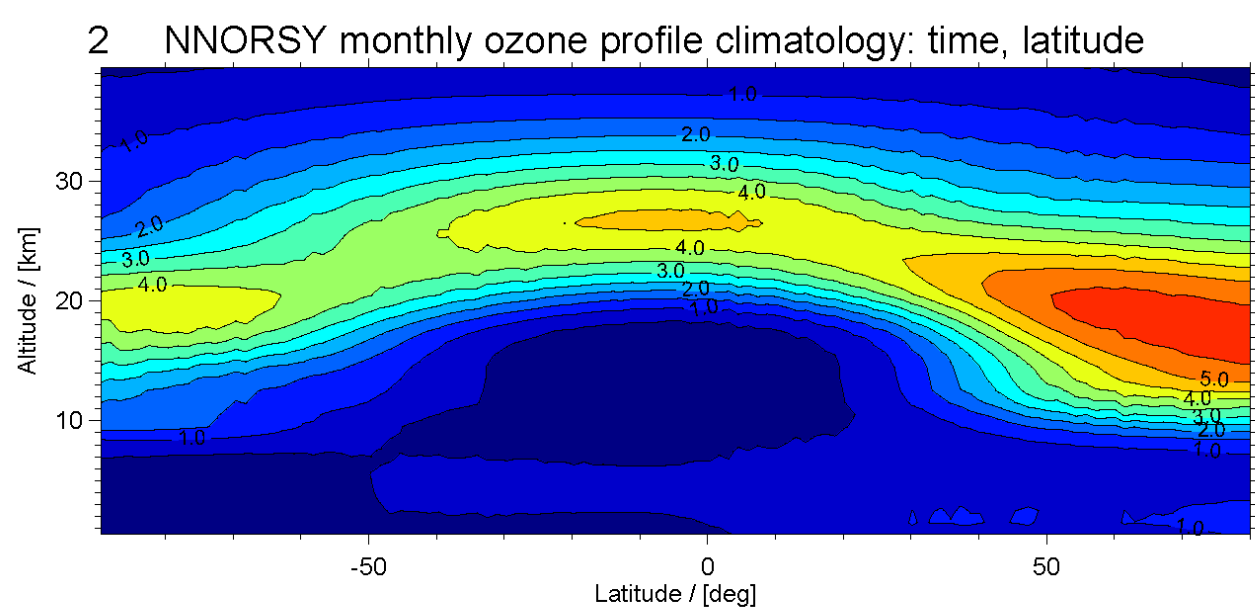


* P. Fortuin, H. Kelder: An ozone climatology based on ozonesonde and satellite measurements; JGR 103, D24,1998, pp. 31709-31734
** R. D. McPeters, G. J. Labow: A satellite-derived ozone climatology for balloonsonde estimation of total column ozone; JGR 102, D7,1997, pp. 8875-8886,

CHEOPS-GOME Ozone Profile Climatology - Examples



Climatological ozone profiles from **NNORSY-CLIMATOLOGY (LUT III)**



Climatological vertical section plots from dynamical **NNORSY-CLIMATOLOGY (NN)** for February and November