First steps to control of ground-level ozone in southeastern Europe:

Development of monitoring sites in Ukraine and in the Northern Caucasus

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33 substances are currently being monitored in Ukraine at 162 monitoring sites (at 16 sites in Kiev). No surface ozone measurements.

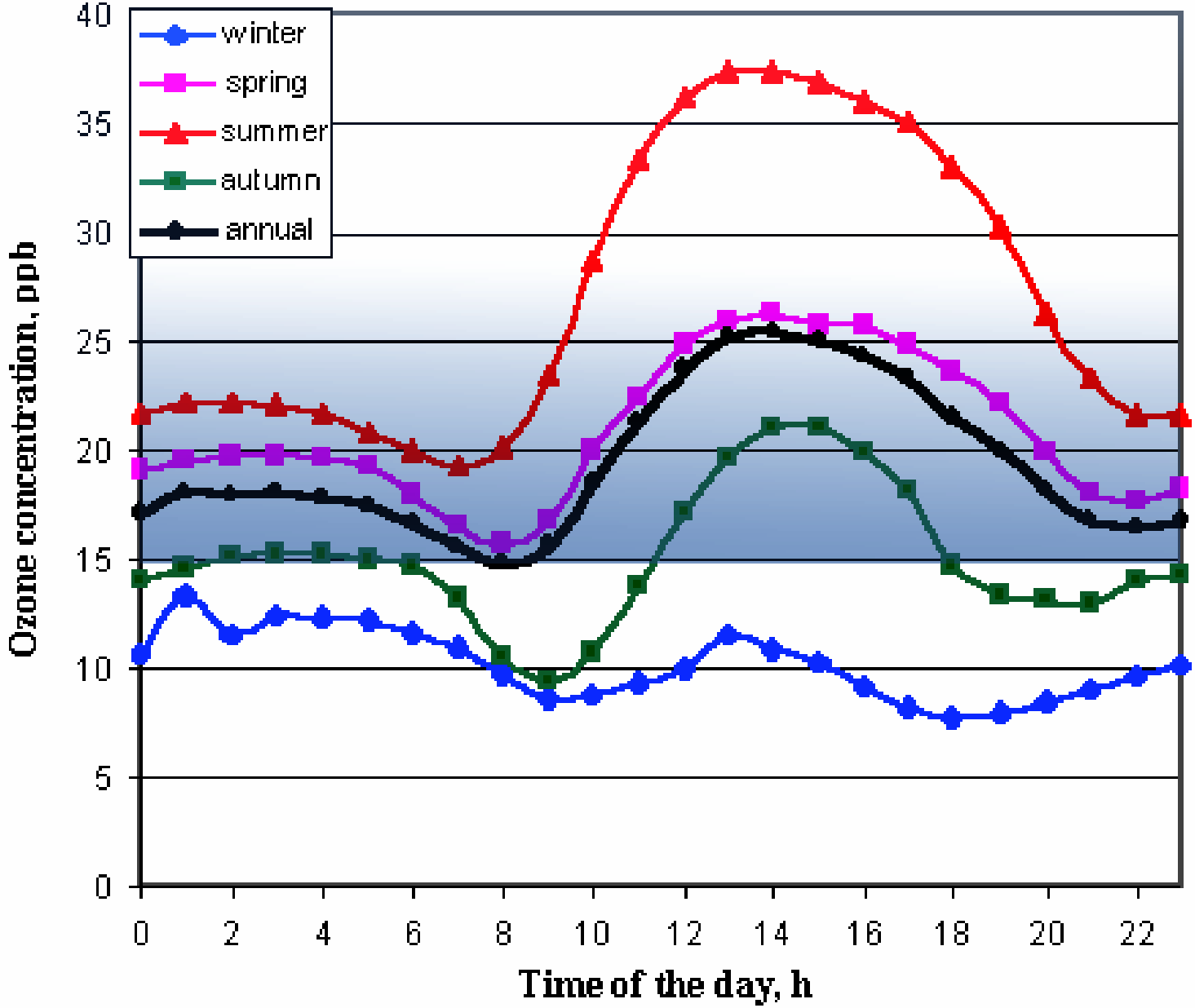
We have at present four sampling points for surface ozone monitoring:

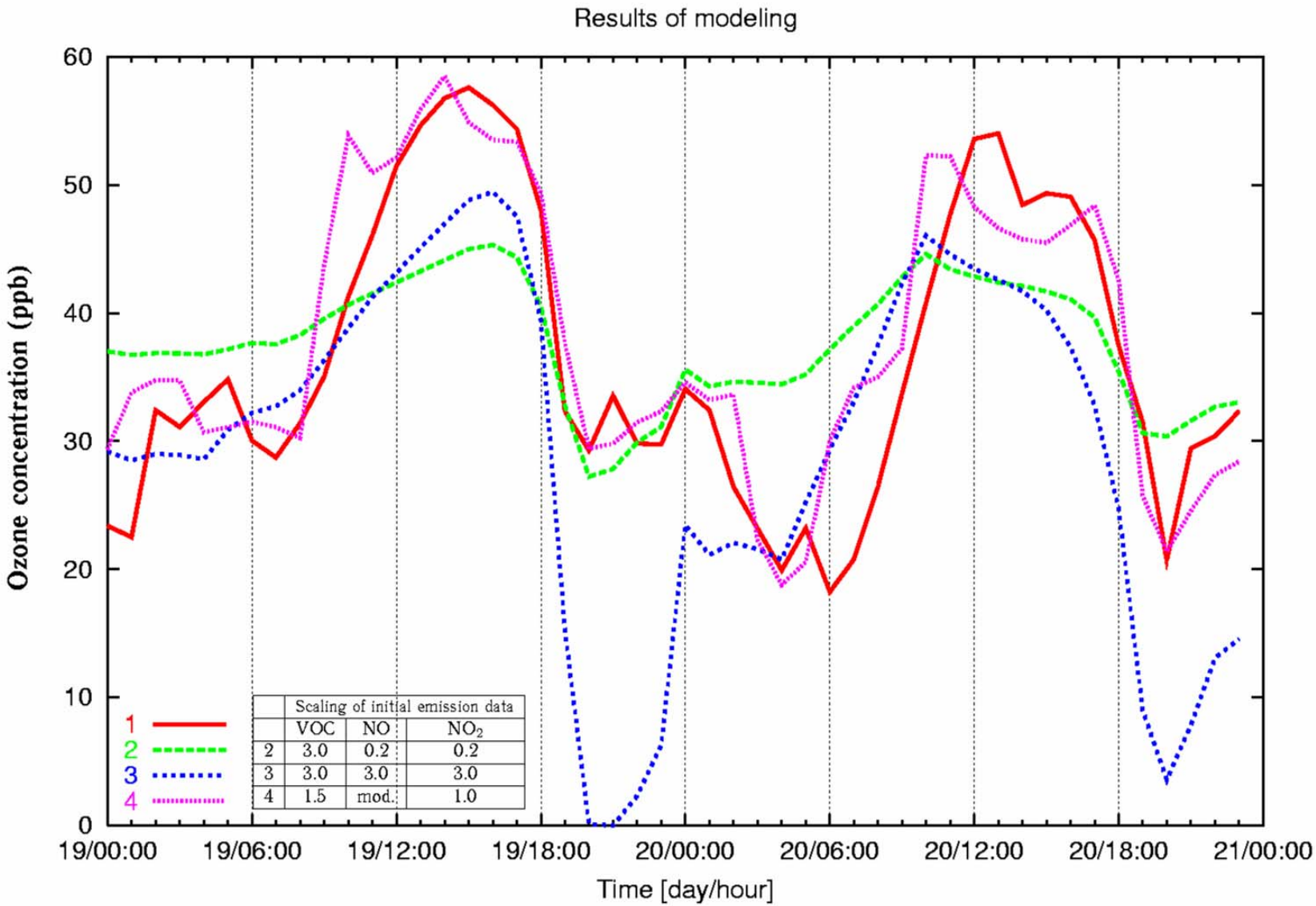
- two sites in Kiev
- one site in the Crimea (non-permanent)
- one site in the Russian part of the Northern Caucasus (Terskol Peak near Mount Elbrus)


Kiev
Terskol

Activities in the field of atmospheric science

- Measurements and preliminary analysis of surface ozone concentration
- Mathematical modeling of ground-level ozone concentrations in the urban environment
- Development of monitoring sites


winter
spring
summer
autumn
annual
Ozone concentration, ppb
Time of the day, h
0
5
10
15
20
25
30
35
40
0
2
4
6
8
10
12
14
16
18
20
22



Sosonkin M., A.V.Shavrina, A.A. Veles, V.A. Dyachuk, O.B.Blum,V.I.Nochaj The study of surface ozone for Kiev city. In: Proceedings of the 4th International Conference on Urban Air Quality: Measurement, Modeling and Management. R.S. Sokhi & J.Brechler (Editors), 2003- pp. 106-109

International context:

- **An Associate in the EU FP6 project ACCENT**

(subproject “Transport and Transformation of Pollutants” (T&TP))

Measurements at Terskol are used to analyze tropospheric ozone regime at a background site and to define factors influencing surface ozone concentration.

- **A participant of the SCOPES joint research project**

Coordinator: Prof. Staehelin, Johannes

Institute for Atmospheric and Climate Science, ETHZ (Switzerland).

The main objective is a study of long-range transport and stratospheric-tropospheric exchange of ozone.

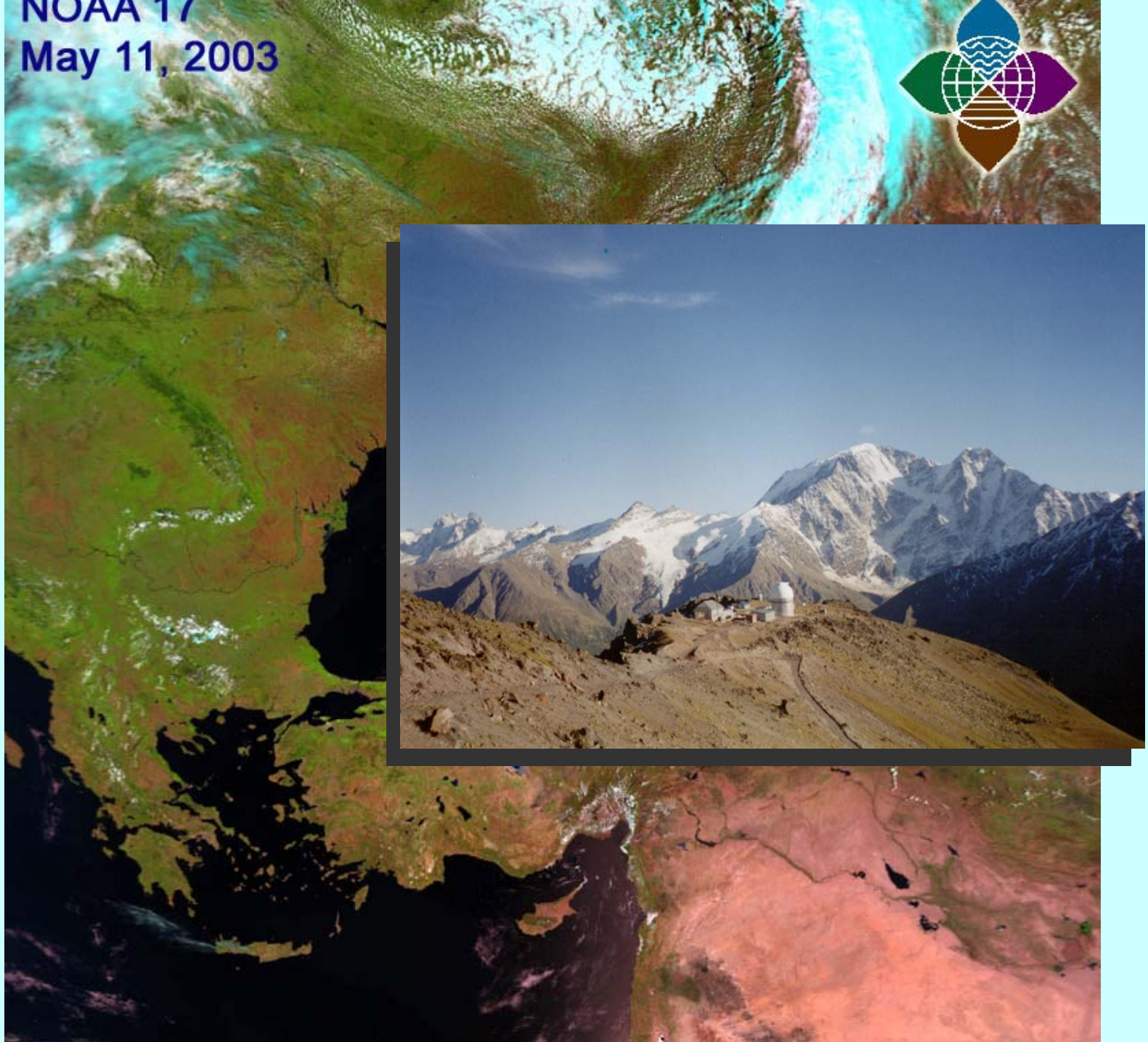
- A participant of the Turkish-Ukrainian joint research project

Collaborator: Prof. Semra G. Tuncel

Middle East Technical University (Ankara, Turkey)

Collaboration with META is focused on the analysis of short-term and long-term variations in surface ozone.

The co-operation offers a scientifically more robust basis for research (not many Ukrainian scientists has experience in studying air pollution).


NOAA 17
May 11, 2003

The Terskol Observatory is operated by the International Center for Astronomical, Medical and Ecological Research (ICAMER).

The site is well suited to monitoring the local and global environment due to the following advantages:

1) high-altitude position (3120m above sea level);
2) availability of optical telescopes to control the atmosphere by astronomical techniques;
3) availability of provisions for data distribution via modem and/or computer networks.

The main objective of present-day activities is to develop at Terskol Peak a regular station for monitoring of variations of ozone, its precursors, and other atmospheric gases and particles and to provide data sets on the state of the atmosphere by the use of both astronomical and air control techniques. Some of these investigations are already underway, the other are planned to be conducted in the near future.

The Terskol station can be used to extend the European monitoring networks into the southeastern part of Europe.

Location:

Terskol Peak in the Northern Caucasus

(43^{O}16’29”N, 42^{O}30’03”E, 3120 m asl)

Measurements:

surface ozone concentrations

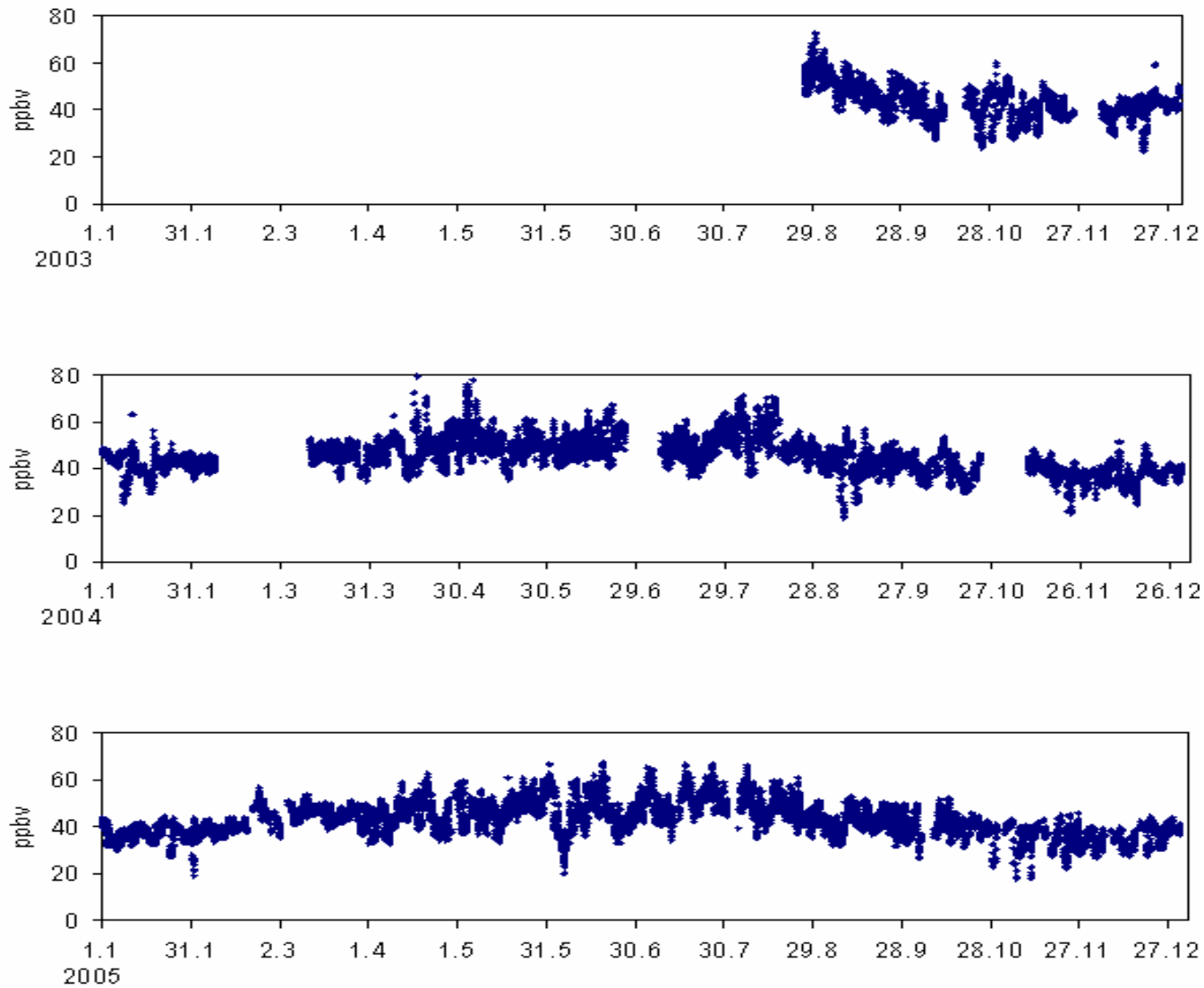
(volume mixing ratios sampled at 1-min intervals and the average 10-min and 1-hour values)

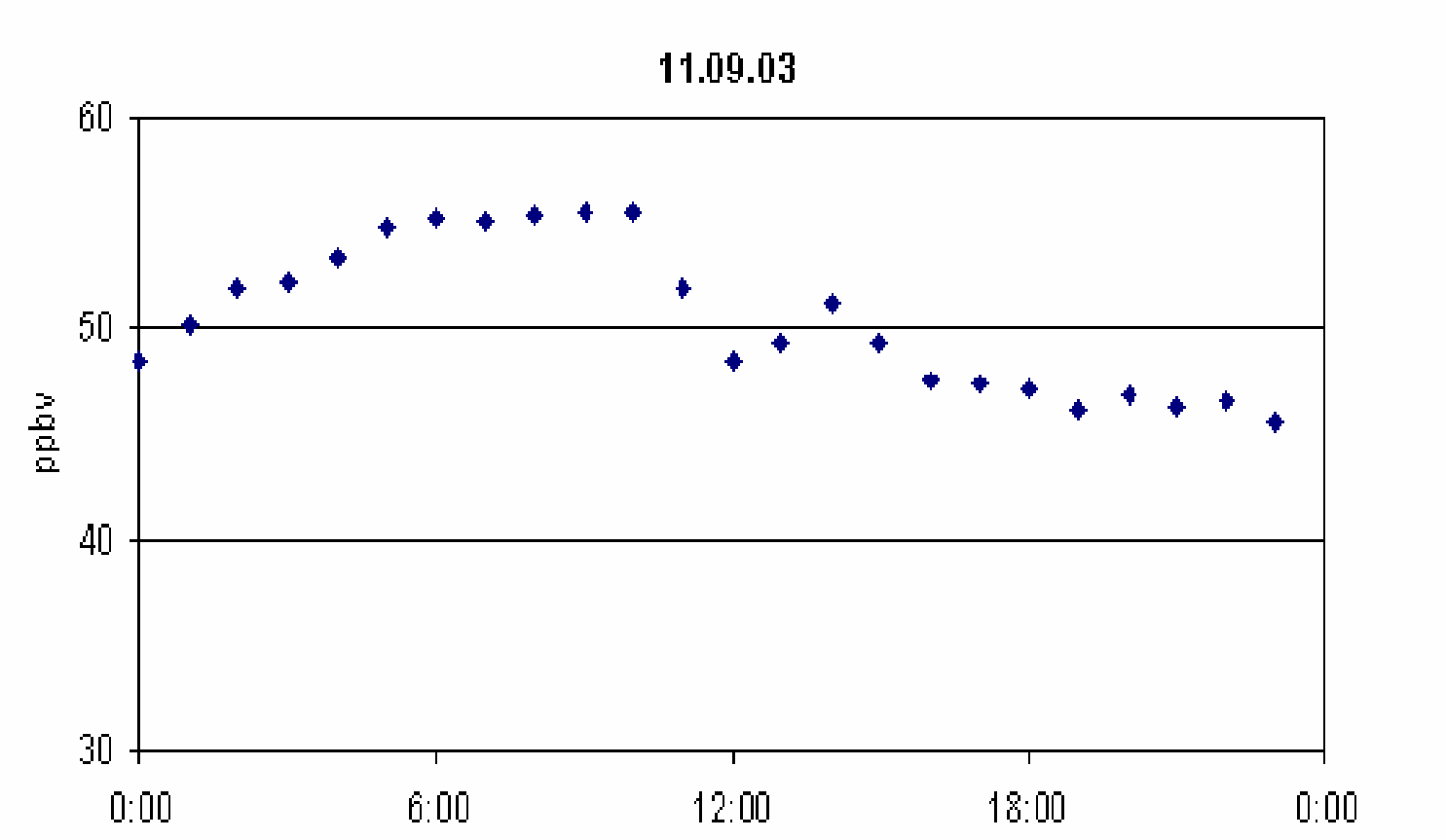
Instrumentation:

2003-2005 DASIBI 1008 UV Photometric Ozone Analyzer

June 2006- Thermo Electron 49i UV Photometric Ozone Analyzer

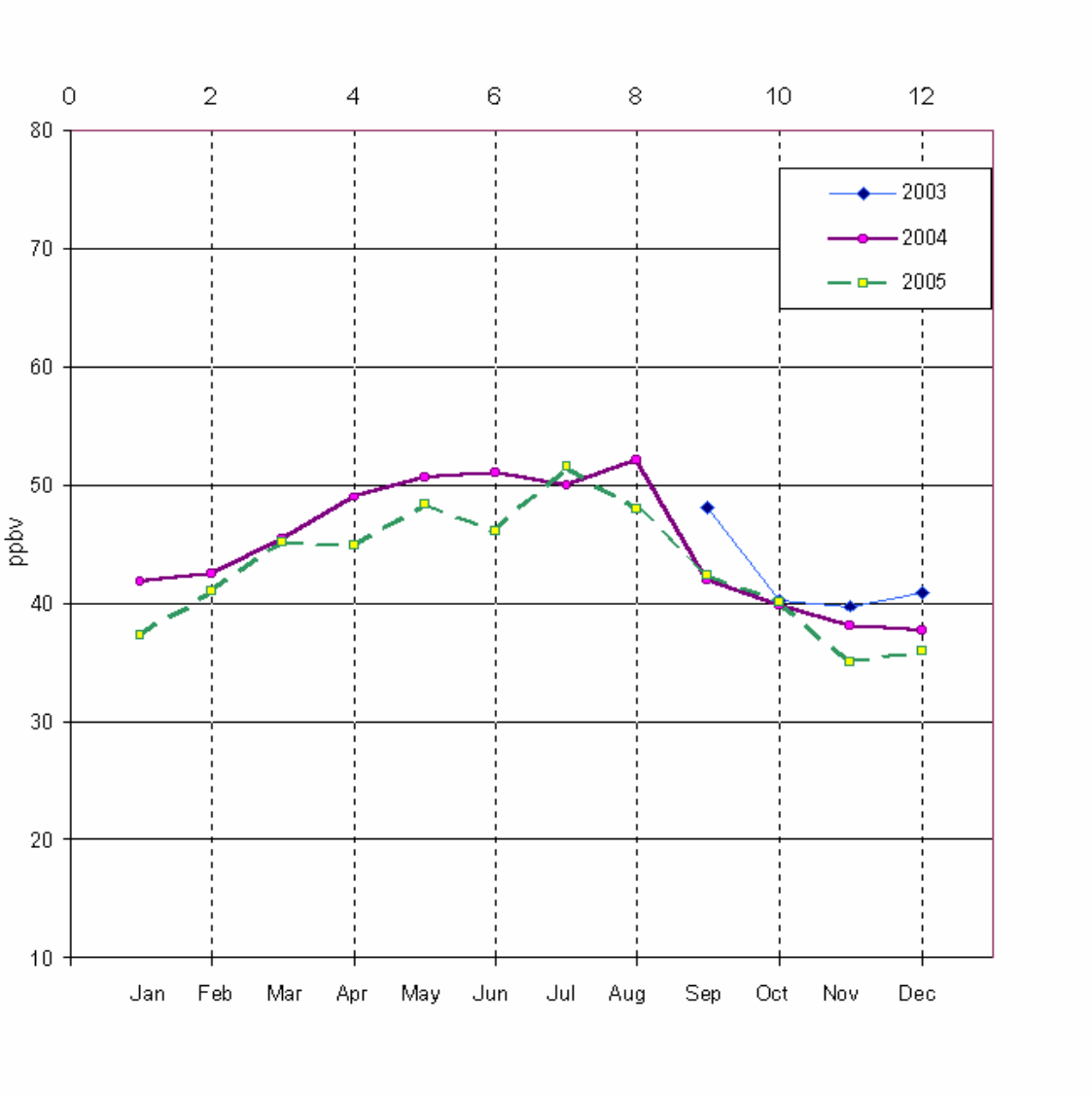
Time series of the 1-hour ozone observations made at Terskol Peak during the period August 2003 - October 2005



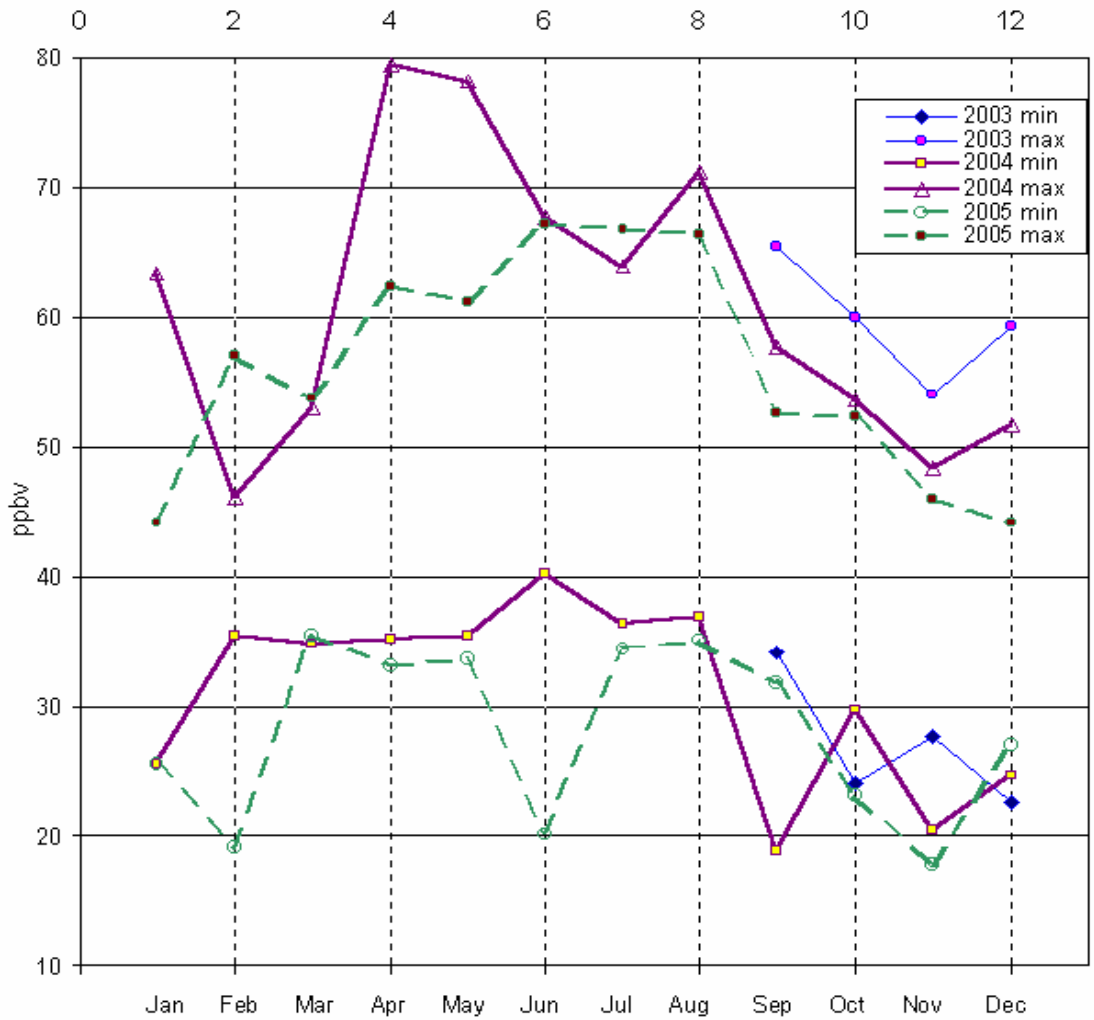


This behavior of ozone is typical during the sunny days for the period from the late spring to the autumn: a slightly pronounced diurnal pattern with ozone picking up till 9:00 AM and a small peak around 2:00 PM local time.

Monthly average ozone concentrations at Terskol in 2003-2005



Monthly maximum and minimum ozone concentrations at Terskol in 2003-2005



Results

- Ozone concentrations at Terskol peak show a distinct seasonal cycle with the highest concentrations during the spring-summer and a peak amplitude of about 90 ppbv.

-The variability of hourly O_3 concentrations observed during different days is mainly related to variations of meteorological conditions and vertical exchange processes over mountain terrain.
Thus,daily ozone concentration profiles are much different. Mean daily values typically do not exceed 50 ppbv in October-February and are on average 40 ppbv in this period and roughly 50 ppbv in April-August.

-The mean surface ozone concentrations at Terskol Peak are founded to be roughly 40 ppbv in winter and 50 ppbv in summer.
-There is no increase in surface ozone concentration in 2003-2005.

To gain a better understanding of the in-situ chemistry and long-term variability of the atmosphere over Terskol, we need:

- To have longer series of ozone observations
- To organize systematic or intense field companies to measure meteorological and air quality parameters at the local complex terrain
- To install instruments to measure CO, NOx, etc.

The last problem could be solved, for example, if instruments would be donated to us from European leading institutes.

Thank you for attention!

RESULTS

The surface ozone concentrations at Terskol Peak are mainly influenced by :

- meteorological phenomena (visibility, relative humidity, wind direction, etc.);
- intrusion of stratospheric ozone;
- vertical transport of polluted air masses from the valley.

The ozone concentrations at Terskol Peak are similar to concentrations observed on Jungfraujoch (3650 m a.s.l., Alps) with roughly 40 ppbv in winter and 50 ppbv in summer. The general features of seasonal variations are characterized by a slight spring maximum, late summer occurrences of ozone episodes (up to 90 ppbv) and autumn/winter minimum.