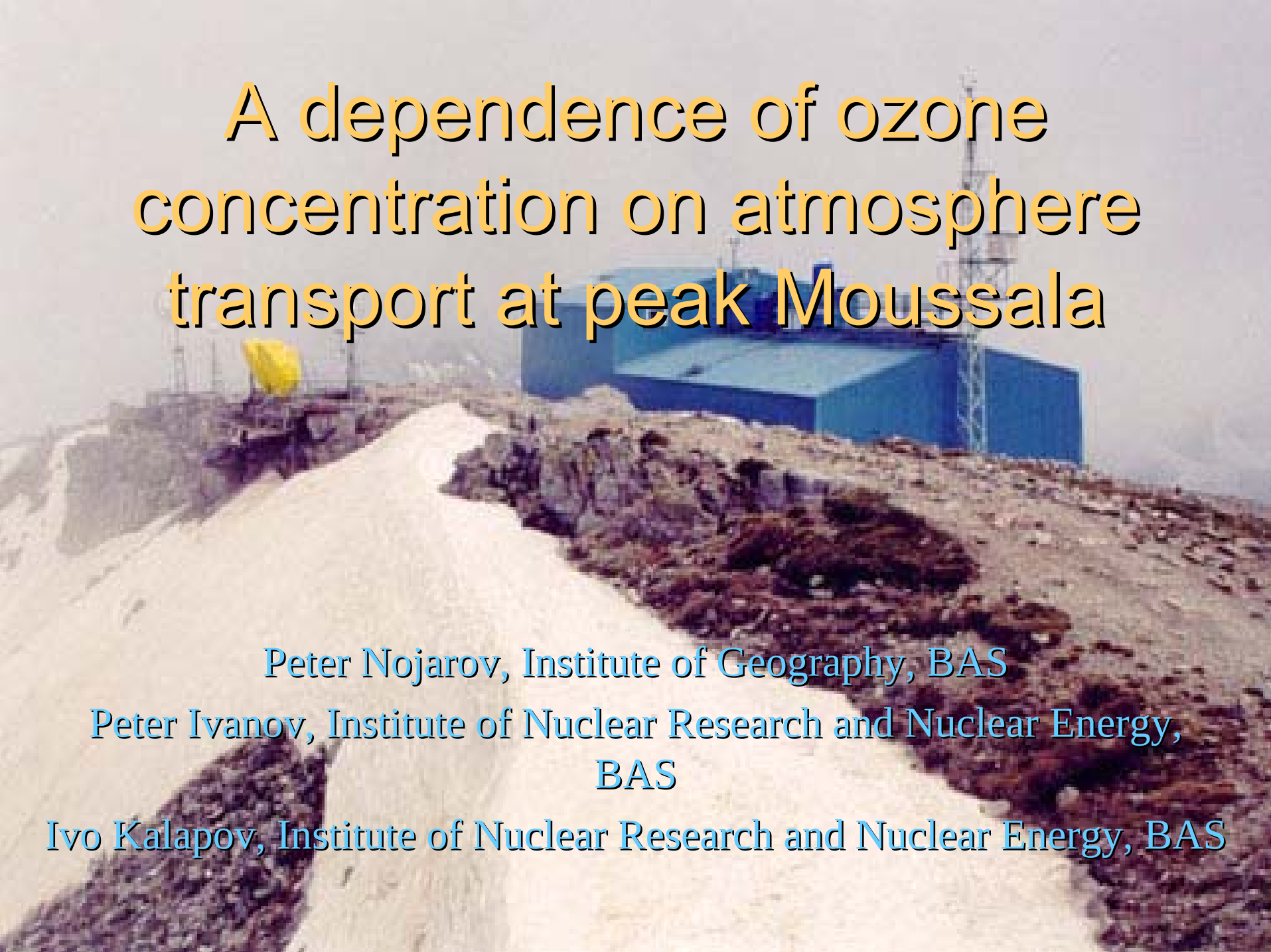
A dependence of ozone concentration on atmosphere transport at peak Moussala



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Main goal – to reveal the connection between ozone concentration and atmosphere transport at peak Moussala

- Directions of transport of air masses rich of ozone
- Anthropogenic impact
- Natural causes

Data – BEO "Moussala"
Period 01.12.2003 – 24.05.2005

Ozone concentration:

- UV-Analyzer "Dasibi – 1003 AH"
- Range between 0 – 1000 ppb
- Sensitivity – 1 ppb
- 30 – minute intervals

Meteorology:

- Weather station "Vaisala"
- Wind direction measured with step 5.6°
- Wind velocity range 0 – 75 m/s

Method of research

Mann-Whitney nonparametric test – comparison of means

- Quarters regardless of wind velocity – north, east, south and west centered at 0°, 90°, 180° and 270°
- Same quarters with two ranges of wind velocity: 0 – 8.9 m/s and above 8.9 m/s
- Eighths regardless of wind velocity – centered at 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315°

Results

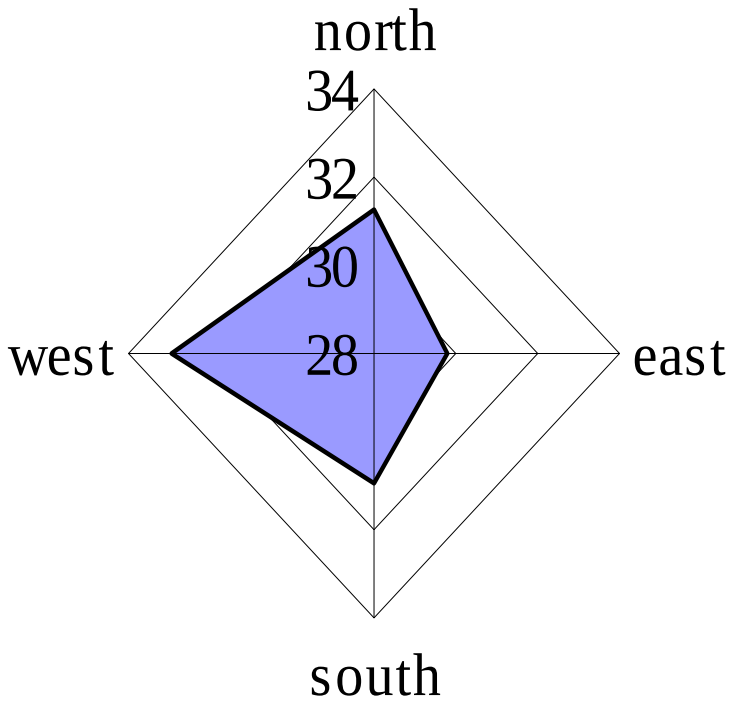

Fig.1 Average ozone concentration (in ppb) by quarters of wind direction at peak Moussala for the period 01.12.2003-24.05.2005

Table 1. p-values from the Mann-Whitney test. Distribution by quarters
(based on wind directions) at station peak Moussala for the period 01.12.2003-24.05.2005

	North p-value	East p-value	South p-value	West p-value
North	-	0.8	0.9	0
East	0.8	-	0.76	0
South	0.9	0.76	-	0.01
West	0	0	0.01	-

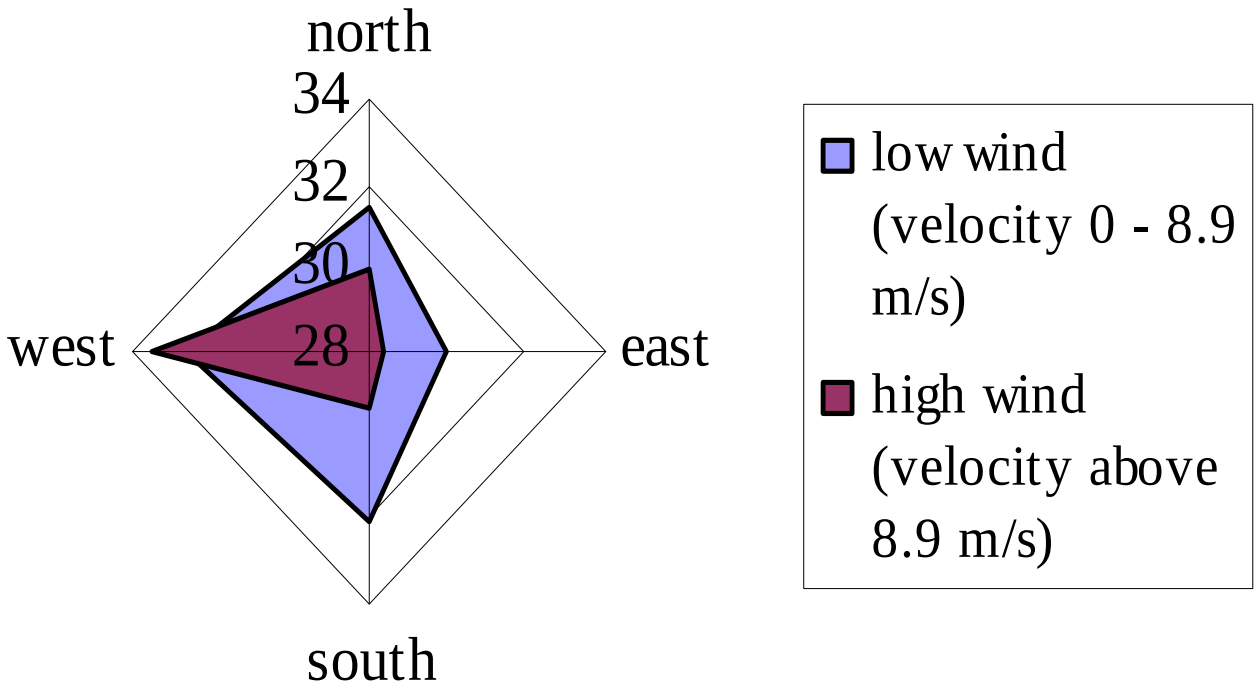

Fig.2 Average ozone concentration (in ppb) by quarters of wind direction at different wind velocities at peak Moussala for the period 01.12.2003-24.05.2005

Table 2. p-values from Mann-Whithey test. Distribution by quarters (based on wind directions)

and by wind velocity (LW - wind velocity 0-8.9 m/s and HW - wind velocity above 8.9 m/s) at station peak Moussala for the period 01.12.2003-24.05.2005

	North p-value LW	East p-value LW	South p-value LW	West p-value LW	North p-value HW	East p-value HW
North LW	-	0.76	0.47	0.01	0.32	-
East LW	0.76	-	0.34	0.01	-	0.64
South LW	0.47	0.34	-	0.26	-	-
West LW	0.01	0.01	0.26	-	-	-
North HW	0.32	-	-	-	-	0.97
East HW	-	0.64	-	-	0.97	-
South HW	-	-	0.08	-	0.69	1
West HW	-	-	-	0.23	0.01	0.05

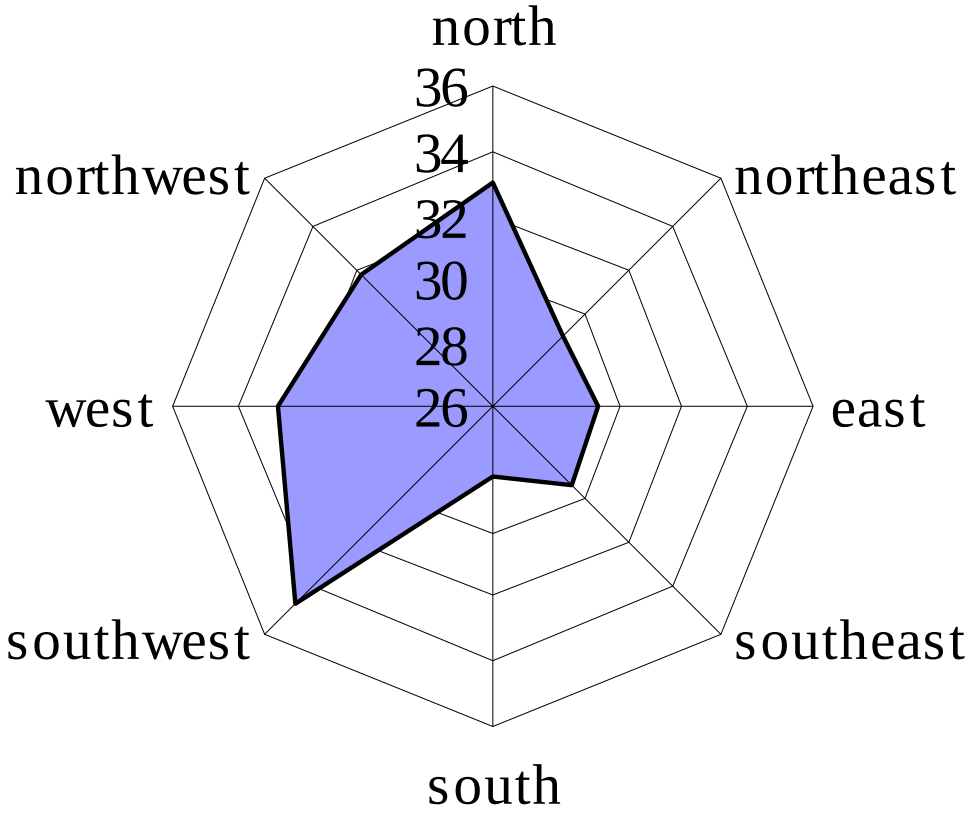

Fig.3 Average ozone concentration (in ppb) by eighths of wind direction at peak Moussala for the period 01.12.2003-24.05.2005

Table 3. p-values from Mann-Whitney test. Distribution by eighths

(based on wind directions) at station peak Moussala for the period 01.12.2003-24.05.2005

	N p-value	NE p-value	E p-value	SE p-value	S p-value	SW p-value	W p-value	NW p-value
North	-	0.01	0.26	0.22	0	0.01	0.25	0.55
NorthEast	0.01	-	0.35	0.56	0.13	0	0	0
East	0.26	0.35	-	0.88	0.09	0	0.02	0.08
SouthEast	0.22	0.56	0.88	-	0.16	0	0.04	0.11
South	0	0.13	0.09	0.16	-	0	0	0
SouthWest	0.01	0	0	0	0	-	0.09	0.01
West	0.25	0	0.02	0.04	0	0.09	-	0.36
NorthWest	0.55	0	0.08	0.11	0	0.01	0.36	-

Conclusions

- The course of ozone concentration at peak Moussala is due to natural causes
- Cyclonal atmosphere conditions lead to a higher ozone concentrations and vice versa
- Vertical air transport due to turbulent mixing is important
- Horizontal transport of ozone rich air masses is mainly from west and north