Aerosol – ozone correlations for long-range aerosol transport over Austria

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INTRODUCTION

The presence of aerosols in the atmosphere has an important contribution to climatic variations, influencing the behavior of reactive trace gases and changing therefore the oxidizing capacity of the atmosphere.

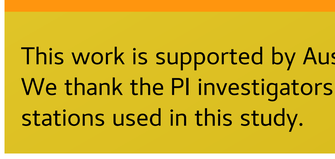
The purpose of this analysis is to determine the correlations between the long-range transport of aerosols and the tropospheric ozone over Austria, using selected transport events recorded over Central and South-Eastern Europe in the period March – August 2014.

METHODOLOGY

The study has been performed for Illmitz, Austria (47°46'N, 16°48'E) which is an EMEP regional background site for reactive gases and aerosols. The concentrations of ozone measured here using in-situ instruments for the period considered have three peaks over the allowed limits (120 µg) for compact time intervals (larger than 48 h) .
For the same period, three major cases of long-range transport of aerosols over Austria were identified using measurements from the EARLINET [1] remote sensing stations close to Austria (Munich, Leipzig and Bucharest).
Starting from the aerosol concentrations at Illmitz determined from CAMS [2] reanalysis data for each peak interval, the source-receptor sensitivity were computed [3] using the aerosol transport model FLEXPART [4], run in backward mode for a period of ten days. A back-trajectory analysis was performed for Illmitz, correlating the trajectories with the remote sensing stations.
The aerosol type at lidar stations was identified with NATALI algorithm [5]. For Austria, the aerosol classification from Calipso satellite data was used.

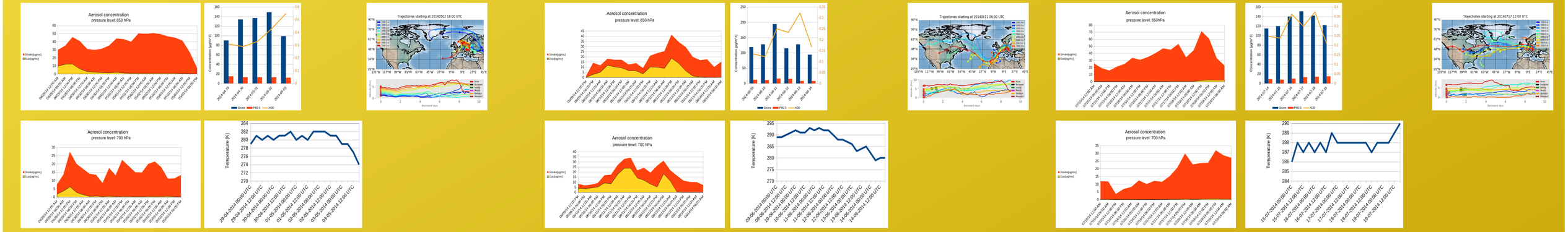
EVENTS OF LONG-RANGE TRANSPORT OF AEROSOLS

Events of long-range transport of aerosol over Austria, and data selected correlated with lidar measurements



Case	Event period	Selected data	850 hPa	LR [sr]	Dep [%]	Type	700 hPa	LR [sr]	Dep [%]	Type
1	29.04.2014 – 03.05.2014	02.05.2014, 18:00 UTC		68	12	Continental polluted / Smoke		65	11	Continental polluted / Smoke
2	09.06.2014 – 14.06.2014	11.06.2014, 06:00 UTC		65	17	Dust polluted (smoke + dust)		61	20	Dust polluted (smoke + dust)
3	15.07.2014 – 19.07.2014	17.07.2014, 12:00 UTC		76	4	Smoke		75	4	Smoke

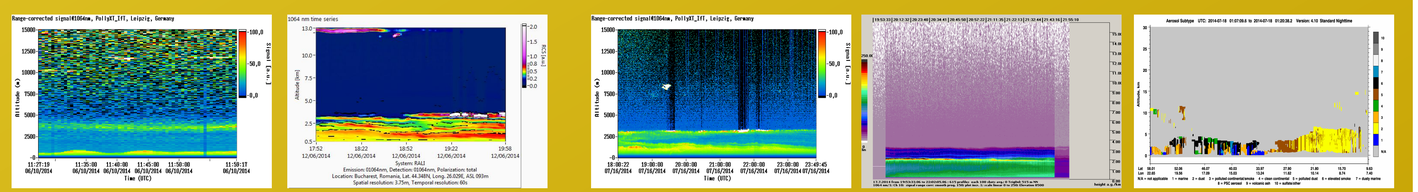
RESULTS



CONCLUSIONS

The ozone peak from June (10 – 13 June, 2014) and the peak from July (16 – 18 July, 2014) are correlated with aerosols originating from Canadian forest fires transported over Germany towards Eastern Europe, while the peak from beginning of May (1 – 2 May, 2014) is correlated with aerosols originating from Scandinavian boreal fires.

In conclusion, the surface ozone concentrations in Austria are strongly influenced not only by local, anthropogenic aerosols but also by long-range transported aerosols: air pollution is a global problem, requiring global solutions.



ACKNOWLEDGMENTS

This work is supported by Austrian Science Fund (FWF), project number M 2031 Meitner-Programm
We thank the PI investigators and their staff for establishing and maintaining the EARLINET lidar stations used in this study.

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EGU 2018, Vienna, Austria, April 08 – 13, 2018