

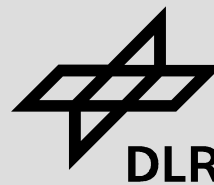
Air mass characterisation of the free troposphere during MINOS: NO_y - partitioning, comparison with previous campaigns, and model simulations

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Introduction

In August 2001 focussed aircraft measurements were performed out of Heraklion airport on Crete within the MINOS (Mediterranean Intensive Oxidant Study) project. In total 14 flights were performed with the DLR research aircraft Falcon. In this study in situ measurements of NO , NO_2 , PAN, O_3 and CO are discussed.

Nitrogen oxides act as the dominant catalyst for the photochemical ozone production in the troposphere. Hence they are important for atmospheric chemistry and climate.

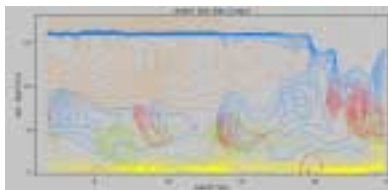
Methods

NO and NO_2 were measured by DLR using conventional chemiluminescence technique in connection with a catalytic gold converter.

PAN and CO were measured by the Max-Planck-Institute for Chemistry using mass spectrometry and tuneable diode laser technique, respectively.

The tracer analysis was provided by ECHAM 4 simulations by the Institute for Marine and Atmospheric Research.

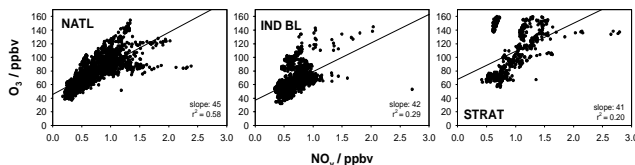
Comparison with model simulations and correlation analysis



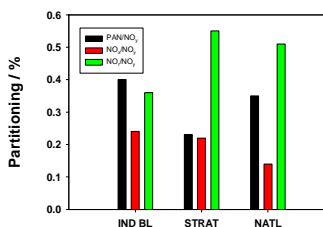
Qualitative analysis of the transport of the air masses in the European region in August 2001, based on simulations with ECHAM 4.

Concentrations of idealised model tracers as an indication for air mass origin.

Indian boundary layer: orange
 stratospheric origin: blue
 European boundary layer: yellow
 lower troposphere North America: red
 lower troposphere North Atlantic: green



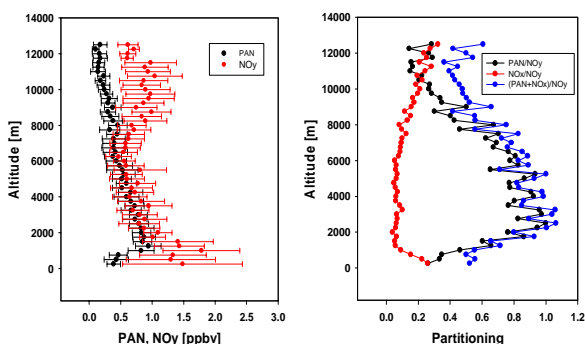
Based on the air mass classification suggested by ECHAM4, the NO_y - O_3 correlation was studied for the upper troposphere (altitude > 7 km, $\text{O}_3 < 160$ ppbv) for the region of the eastern Mediterranean. No significant difference in this correlation was found for the air masses of different origin.



The partitioning of reactive nitrogen species in the upper troposphere was studied with respect to air mass origin. $\text{NO}_y = \text{NO} + \text{NO}_2 + \text{PAN}$. Most likely NO_y is mainly made up of HNO_3 .

NO_y - Partitioning

Measured NO , PAN and NO_2 and deduced NO_y , assuming simple photo-stationary state, are used to study the partitioning of reactive nitrogen species.



Intercomparison with previous aircraft campaigns

The data set acquired during MINOS is compared to recent aircraft campaign. This comparison helps to develop an understanding of the contribution of different sources of trace species over Europe. The EXPORT campaign provides the most suitable data for comparison because it was performed at almost the same season over Central and Eastern Europe. The air mass encountered during EXPORT predominantly originated from West - Europe and North America. The data set acquired during the INCA southern hemisphere campaign offers the opportunity for comparison with the trace gas budget of a remote region with low anthropogenic impact.

Project	Region	Period	Flights
SIL 1996	NAFC*	July 1996	6
POLINAT 2	NAFC*	Sep./Oct. 1997	13
INCA - SH	Punta Arenas/Chile	March/April 2000	11
Export	Central and Eastern Europe	July/August 2000	9
INCA - NH	Prestwick/Scotland	Sep./Oct. 2000	8

* North Atlantic flight corridor

