Synergetic use of MATCH-MPIC and GOME Satellite data for the study of Tropospheric NOx over Asia

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INTRODUCTION

The tropics play a key role in the chemistry of the global troposphere. The region is chemically very active due to high levels of solar insolation and humidity. Anthropogenic emissions of O3 precursor trace gases such as NOx and hydrocarbons are significant and rapidly growing, especially in Asia. There is a significant uncertainty in these emissions, as well as in natural sources of NOx, such as the production by microbial processes in soils and by lightning.

MATCH-MPIC
(Model of Atmospheric Transport and Chemistry- Max Planck Institute for Chemistry version.)

OBJECTIVES
1. To understand tropospheric NOx over south Asia, especially India and the Indian Ocean, by using MATCH-MPIC & GOME satellite observations.
2. To analyse the uncertainties in the estimation of regional NOx emission strength from MATCH-MPIC and GOME.

MATCH
(Global Ozone Monitoring Experiment)
Spatial resolution: 15-30 km. 
Wavelength range: 230-350 nm.
Spectral resolution: 0.190 nm.
Cloud screening: PiGPS cloud cover < 0.1

GOME
Comparison of annual average of NOx column (in 10^14 molecules/cm^2) from MATCH and GOME for India, Indonesia, North Asia and China. The general magnitude of NOx is generally in agreement in all the regions. Over India the month-to-month variations are not very well reproduced, while over the other regions the seasonal cycles and interannual variability are in much better agreement, although MATCH tends to underestimate the pronounced maxima during the biomass burning periods, especially over North Asia and China.

REFERENCES
4. Su et al. (2000).

CONCLUSIONS
The model results for the Indian monsoon indicate that the scaled sensitivity to changes in the local NOx source is 60-70% for lower tropospheric NOx, and only 10-25% for tropospheric NOx, indicating that moderate reductions in NOx emissions are not expected to lead to large changes in regional NOx levels.


The troposphere is a key region in the global climate system, as it significantly influences the Earth’s radiation budget and the distribution of atmospheric chemicals.

For further details, please refer to the original publication in the journal.

Download the full article for comprehensive information on the study and its implications.