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Trends in tropospheric NO2 over megacities in the Mediterranean and Middle East from GOME and SCIAMACHY

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At the beginning of the 2010s, more than 50% of the Earth's population is living in cities. This ongoing urbanisation leads to increased growth rates of the so-called megacities. Their high traffic, energy use and industrial production make them hot-spot areas in terms of pollution.

To obtain long and consistent time series of atmospheric trace gases with global coverage, satellite instruments provide a useful tool. They prove to be invaluable to study the temporal evolution of pollution proxies, as they allow to apply identical measurement methods to all investigated regions, yielding comparable results.

In this study, we focus on tropospheric NO2 as a proxy for pollution over megacities. We provide a first investigation of tropospheric NO2 trends over megacities of the Mediterranean and Middle East regions in the time period from 1996 until 2009, making use of a combined dataset spanning the GOME and SCIAMACHY instruments. Improved stratospheric correction and air mass factor databases are employed.

We observe very diverse trends over the considered cities, ranging from decreases of a few percent per year (e.g. some western European cities) to increases of more than 10% per year (e.g. some Arabic and northern African cities), whereas some cities show no clear trend at all.

Notably, our findings show differing inter-annual patterns for the western and eastern Mediterranean regions, suggesting a strong impact of regional meteorological conditions on tropospheric NO2 values. Further consideration is given to the seasonality of these trends as well as the possible correlations to population and economic growth.