Long-term observations of pollution from space

Introduction

- Pollution affects millions of people worldwide
- Rapid changes in pollution levels took place over the last decade as a result of population increase in cities, economic development, and environmental regulation changes
- Pollution monitoring is well established in industrialised countries, but not yet in all parts of the world
- Satellite observations provide measurements of key quantities for tropospheric pollution
- They have large uncertainties for individual observations but provide global coverage and consistent long-term data sets
- Improved spatial resolution of current instruments allows observation on regional levels
- Future instruments will provide data at resolutions enabling monitoring of pollution for individual cities

Global change of NO₂

GOME, SCIAMACHY, and GOME-2

**SCIAMACHY NO₂ change 2003 - 2010**

**GOME:**
- Launched on ERS-2 in April 1995
- Data 7.1995 - 6.2003
- 4 channel nadir viewing
- UV/visible spectrometer
- 1320 x 40 km² pixel size
- Global coverage: 3 days
- 10:00 LT equator crossing

**SCIAMACHY:**
- Launched on ENVISAT in March 2002
- Data since August 2002
- 8 channel nadir and limb viewing UV/visible/NIR spectrometer
- 60 x 30 km² pixel size
- Global coverage: 6 days
- 10:00 LT equator crossing

**GOME-2:**
- Launched on MetOp-A in October 2006
- Data since January 2007
- 4 channel nadir viewing UV/visible/spectrometer
- 80 x 40 km² pixel size
- Global coverage: 1.5 days
- 09:30 LT equator crossing

Future instruments will provide data at resolutions enabling monitoring of pollution for individual cities.

Conclusions

- Long-term satellite observations provide consistent data sets to monitor pollution
- NO₂ columns have changed significantly over the last decade, with large increases over China and in many developing cities and decreases over the US, Europe and Japan
- Environmental regulations show effect in China where the increase in SO₂ values has stopped and even reversed in 2007
- SO₂ columns also show increase, but only until 2007 when flue gas desulphurisation became mandatory for power plants

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Selected References


See also: www.iup.uni-bremen.de/doas