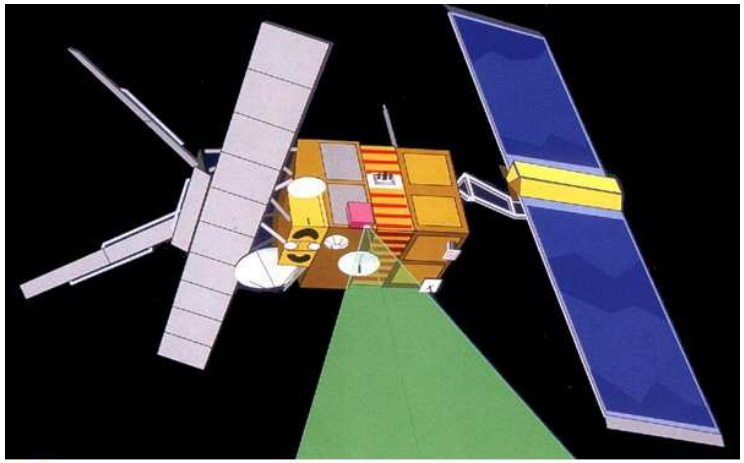
GOME / SCIAMACHY Workshop
Session: GOME Column measurements:

GOME measurements of NO_X production from lightning: A case study

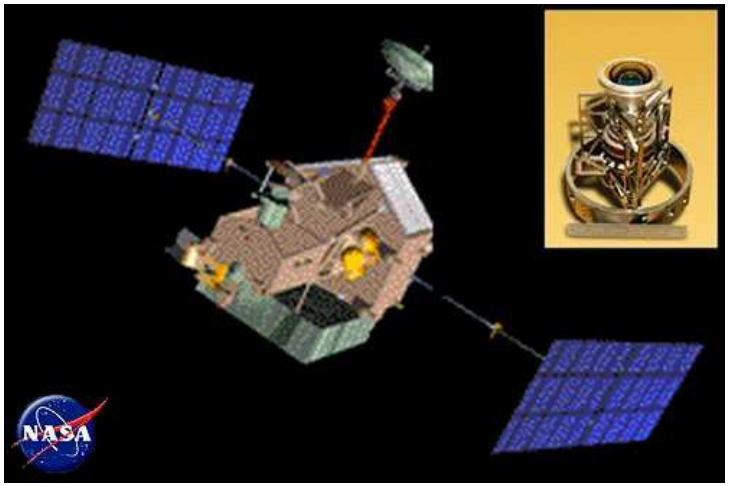
L. Hild, A. Richter, J.P. Burrows

www. doas-bremen.de

Used Satellite Experiments



Global **O**zone
Monitoring **E**xperiment
onboard
European **R**emote **S**ensing satellite - **2**

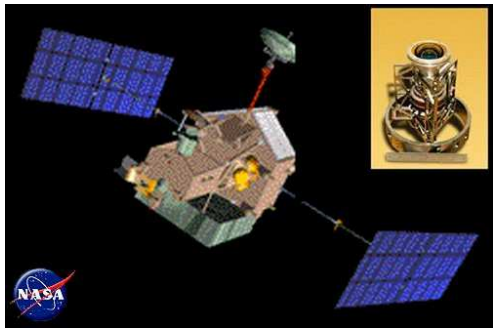


Lightning **I**maging **S**ensor
onboard
Tropical **R**ainfall **M**easuring **M**ission

Lightning Imaging Sensor

onboard

Tropical Rainfall Measuring Mission



Scan Geometry: Nadir

Start: the 28th November 1997

Orbit of TRMM: 350 km / 35° inclination

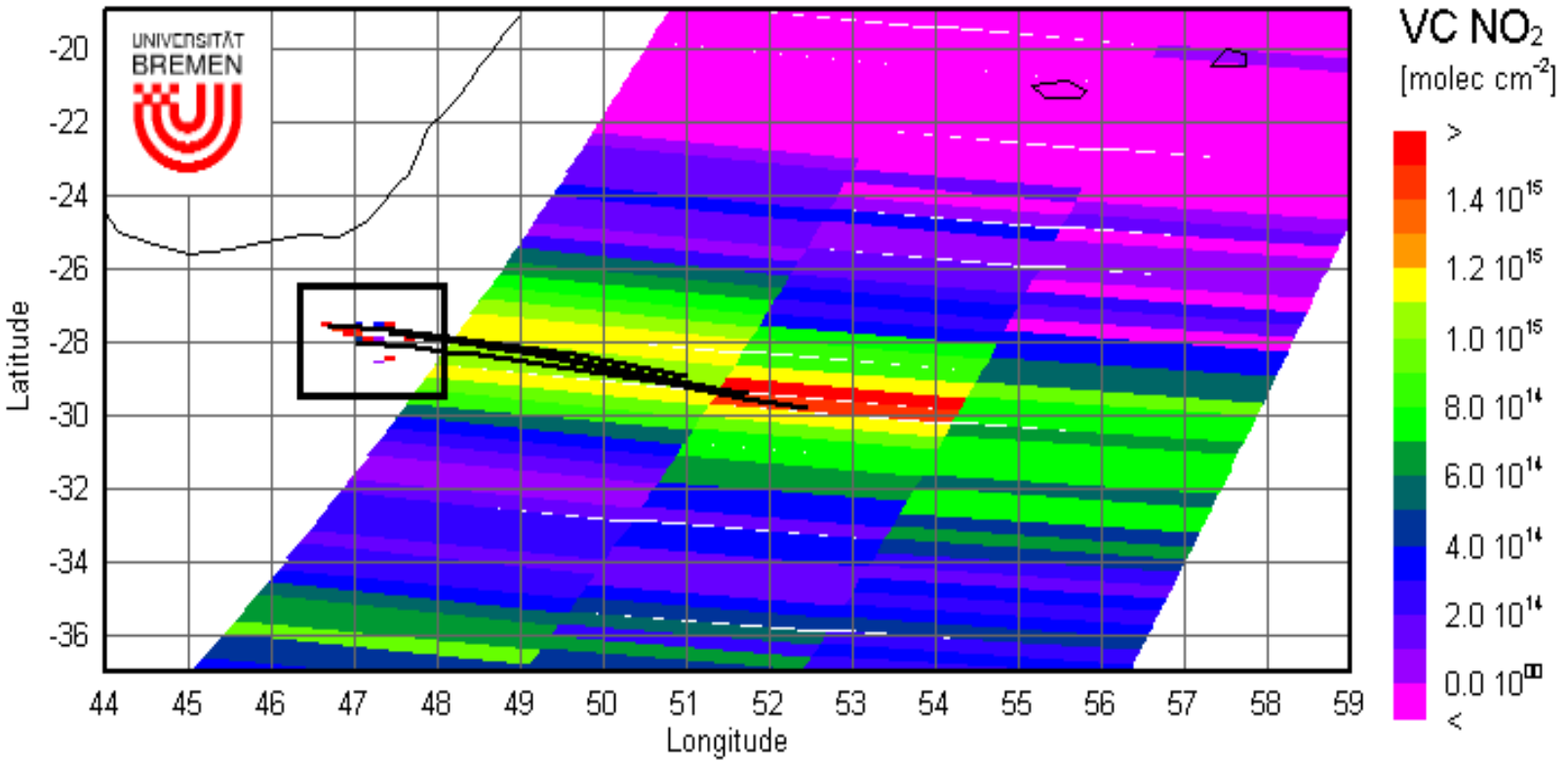
→ earth surface coverage: 35°N bis 35°S

Detector: 128x 128 charged coupled device array (CCD)

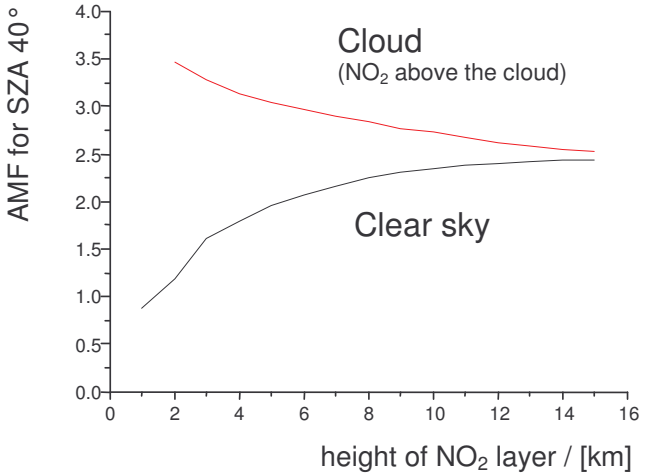
with sampling rate 500 frames/sec

Horizontal Resolution: 4 – 7km

Case Study: A Thunderstorm Close To Madagascar



Air Mass Factor for Lightning produced NO_2 (LNO_2)



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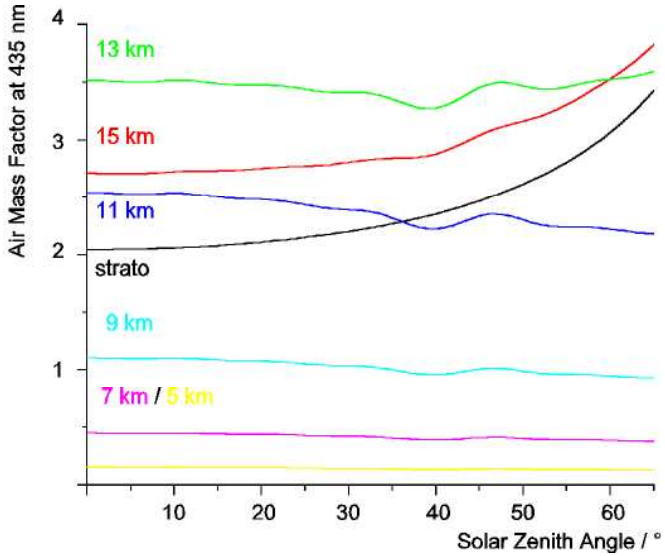
Tropospheric NO_2 above a cloud
Is easier to detect
Above a cloud than in a claer sky.

LNO_2 is best measured at the top of a cloud.



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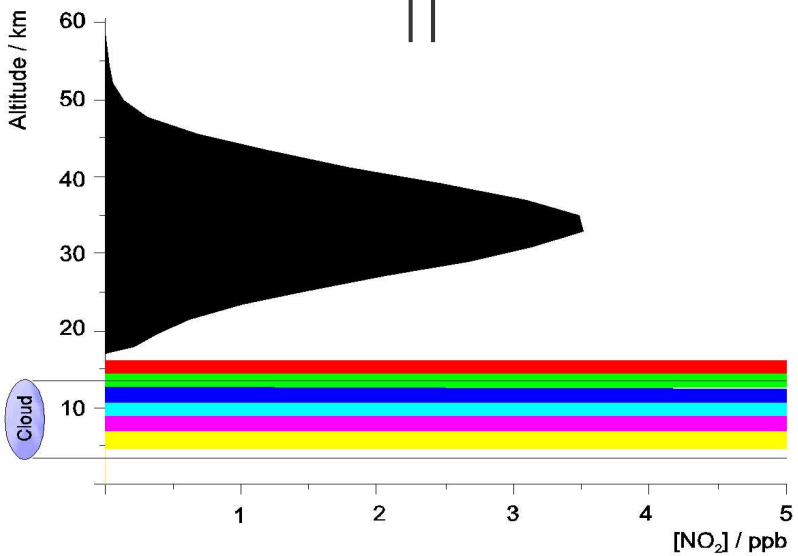
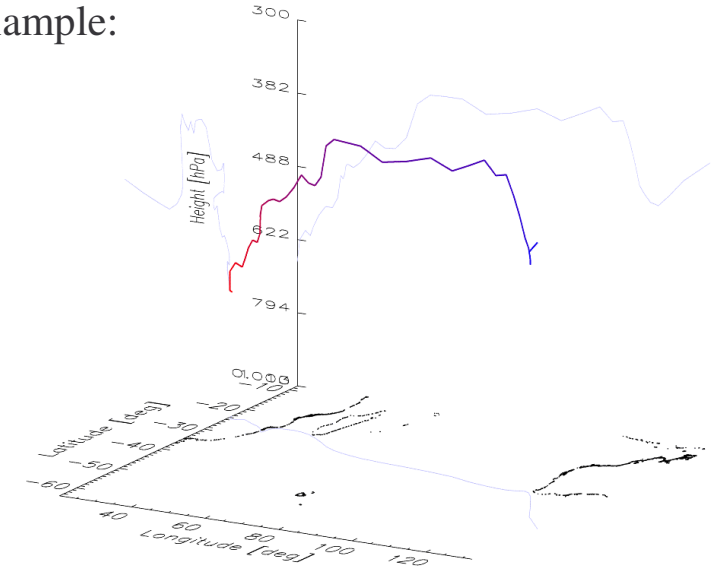
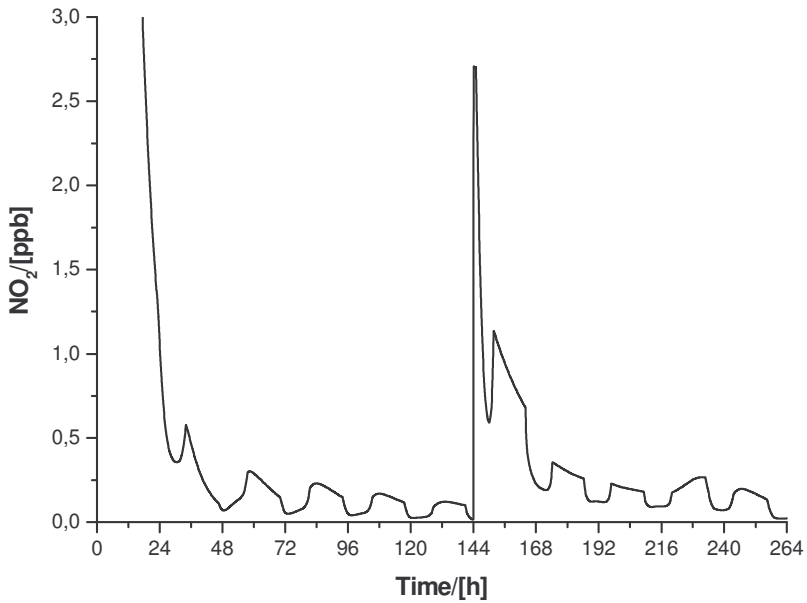


Chemical modelling along trajectories

The combination of trajectory analysis via TRAJ/ECMWF and the chemical box modelling via BRAPHO along this trajectories indicates that:

Example:





- **any NO_2 from pollution has decayed to significant values prior to entering the cloud,**
- **only limited decay of NO_2 leaving the cloud**

NO_X-Production per Flash

Assumptions used for this case study:

Flashrate: 2 flashs per sec for this intra cloud lightning

Based on model-study by [Allen, Pickering 2002]

NO_2 – lifetime: 12 hours

NO_2/NO Ratio: 2

Based on BRAPHO/TRAJ study

Preliminary result:

$[NO_X]$ per Flash = 1 – 4 * 10^{25} molecules per IC-flash