Institute of Environmental Physics
University of Heidelberg

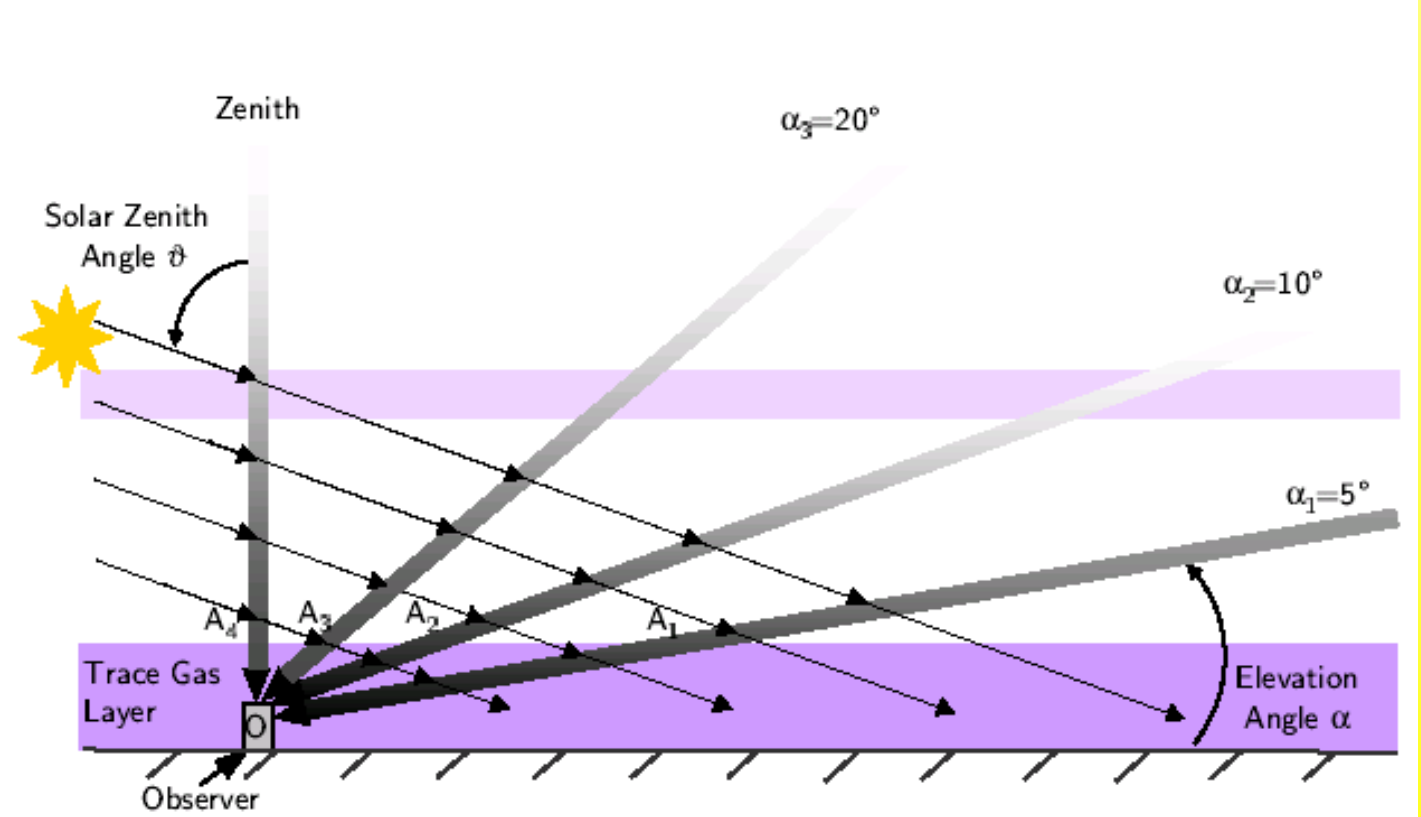
SCIAMACHY Validation with ground-based and ship-borne DOAS measurements

B. Dix[1], C. Becker[2], S. Beirle[1], C.F. Enell[3], U. Frieß[4], M. Halasia[1], O. Ibrahim[1], K. Kreher[5], R. Sinreich[1], T. Wagner[1] and U. Platt[1]

(1) Institute for Environmental Physics, University of Heidelberg, Germany
(2) Meteorological Office of Suriname, Paramaribo, Suriname
(3) Institute for Space Physics, Kiruna, Sweden
(4) Space Research Centre, University of Leicester, UK
(5) National Institute of Water and Atmosphere, Lauder, New Zealand

5th German SCIAMACHY Validation Team Meeting
Bremen, December 7th, 2004

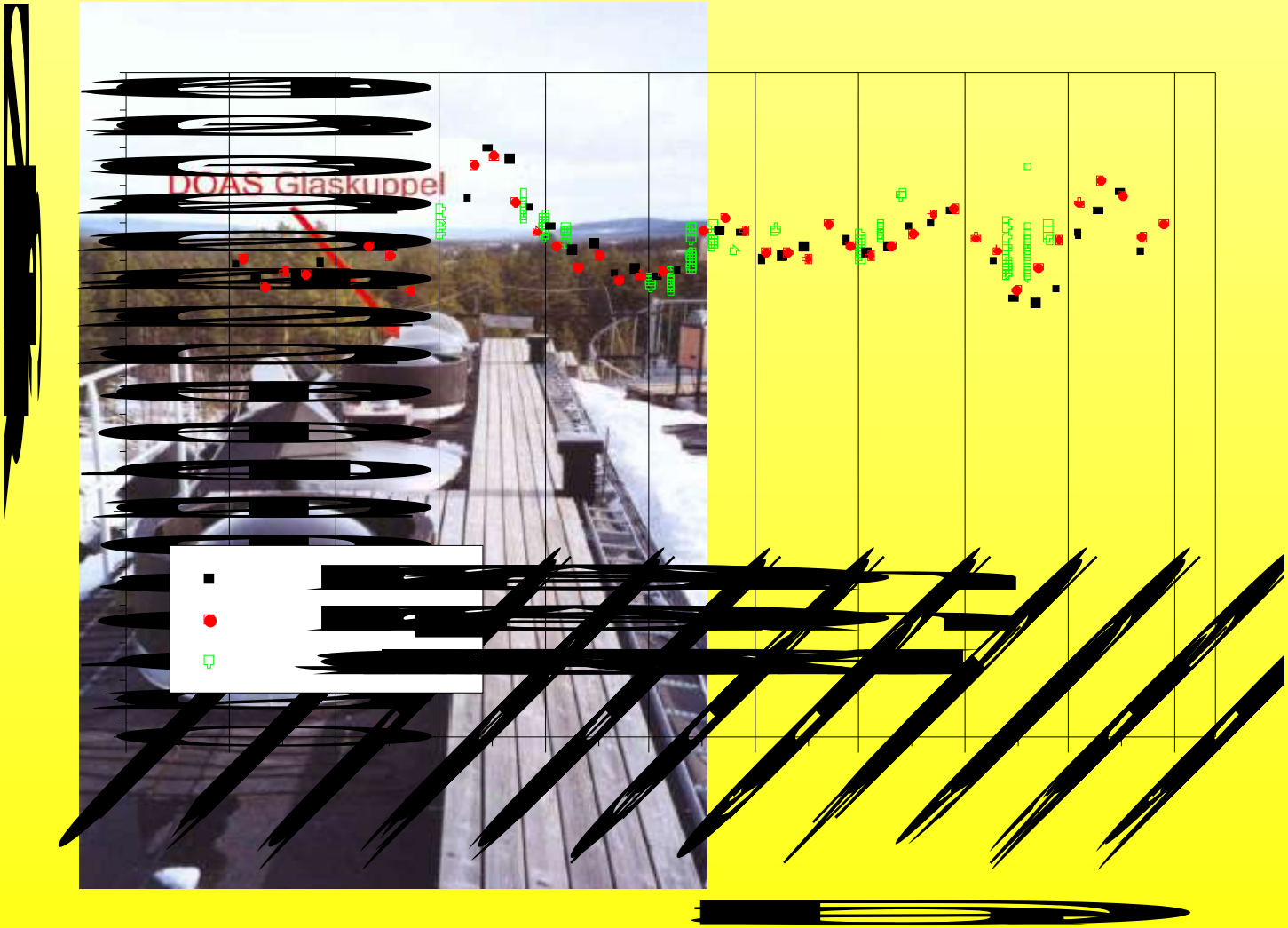
MAX-DOAS:
Multi-AXis-Differential Optical Absorption Spectroscopy



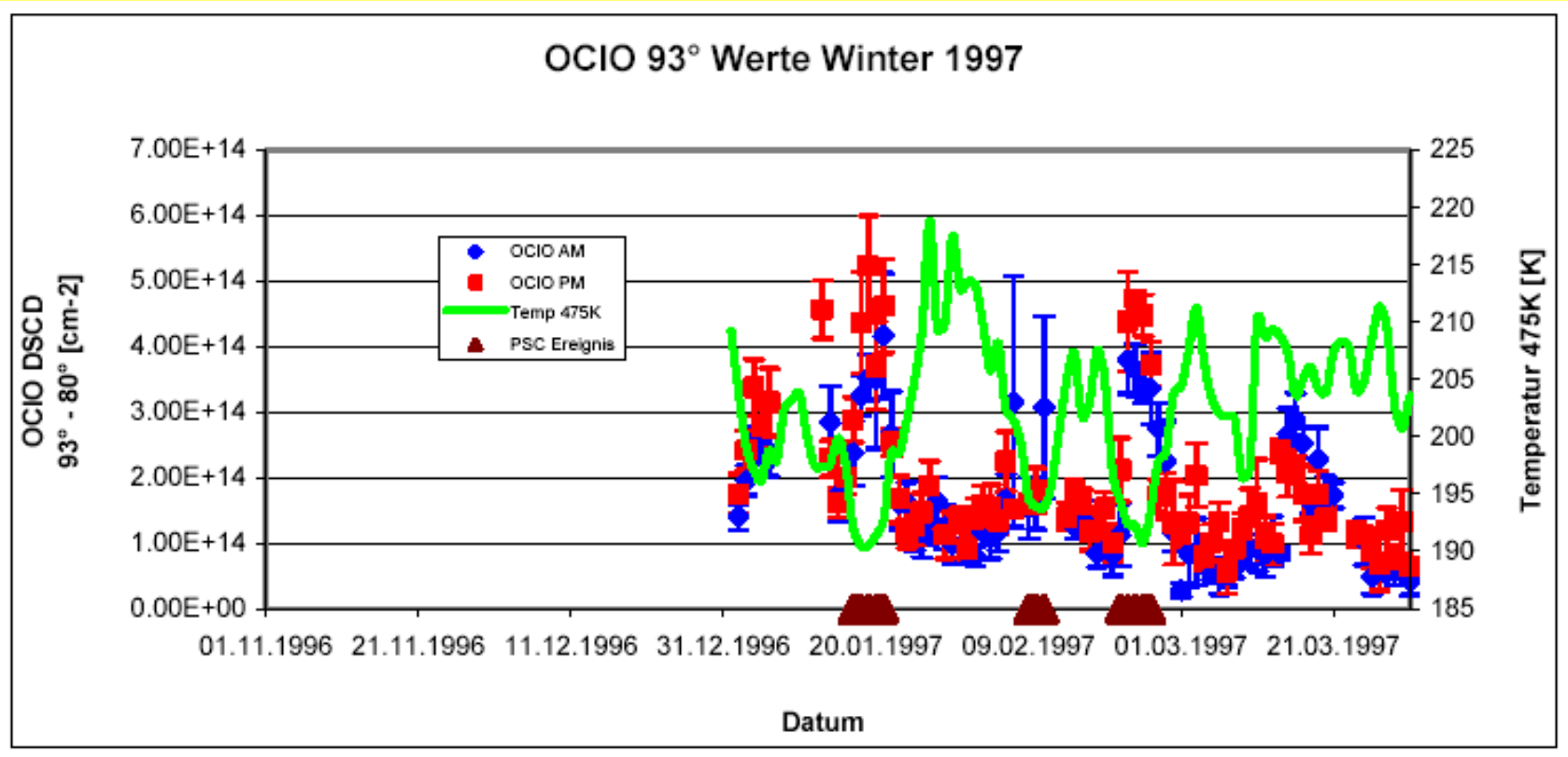
-> sensitive for tropospheric and stratospheric Absorber

2001

Kiruna/Sweden (68°N, 21°E) : Ozone VCD

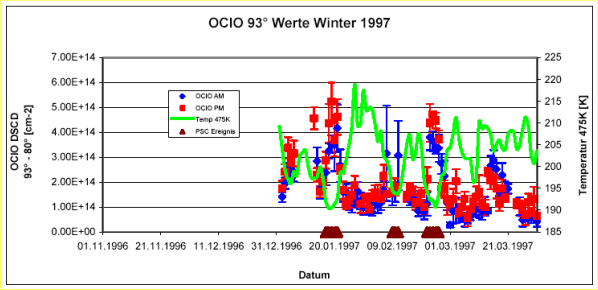


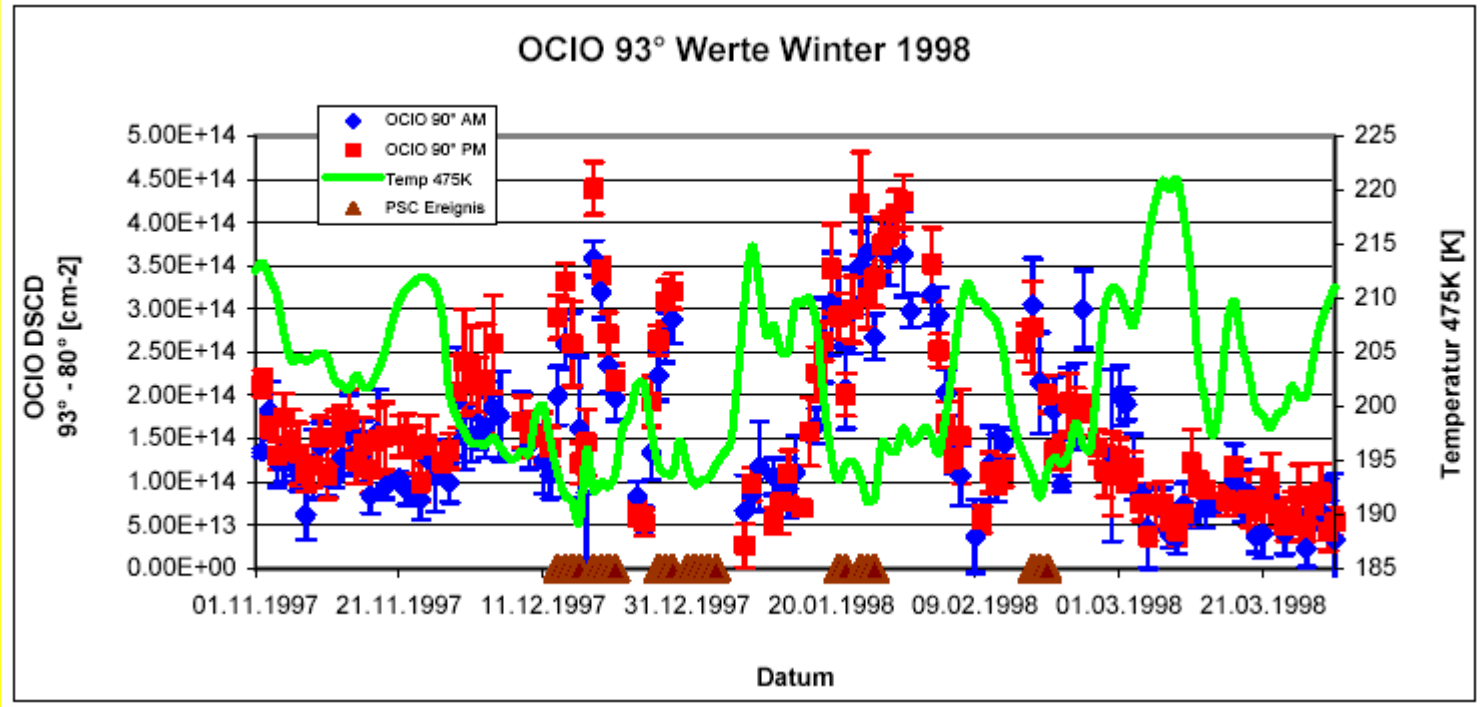
Kiruna/Sweden (68°N, 21°E): OClO time series winter 1997-2003



Sven Bugarski

Kiruna/Sweden (68°N, 21°E): OClO time series winter 1997-2003





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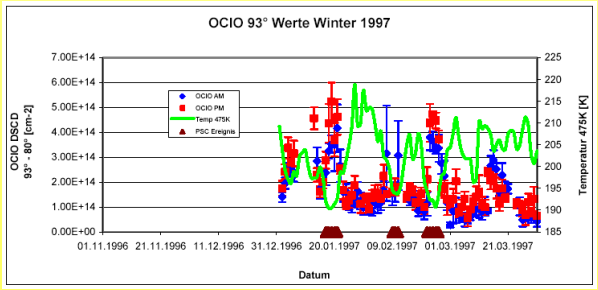
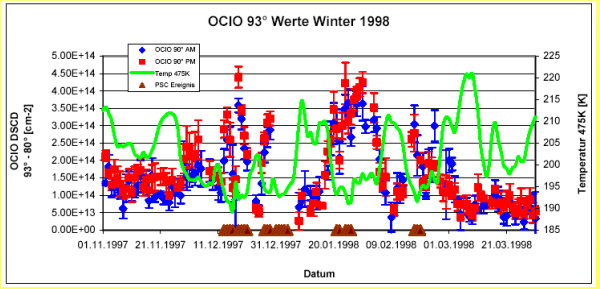
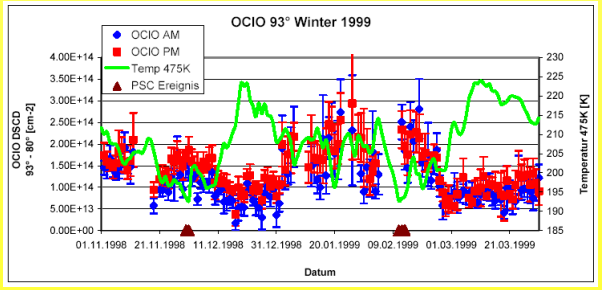
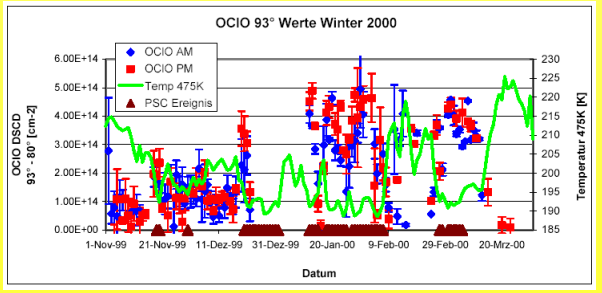
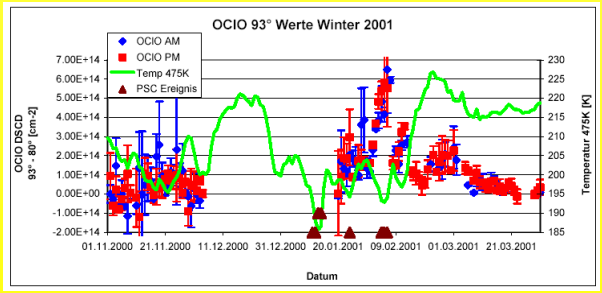
Kiruna/Sweden (68°N, 21°E): OClO time series winter 1997-2003

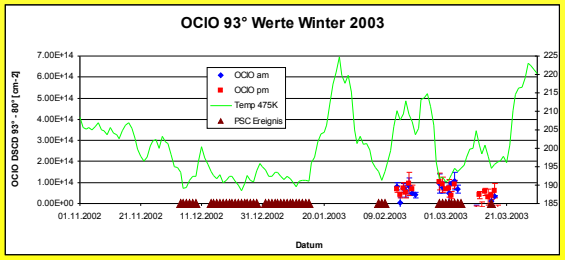






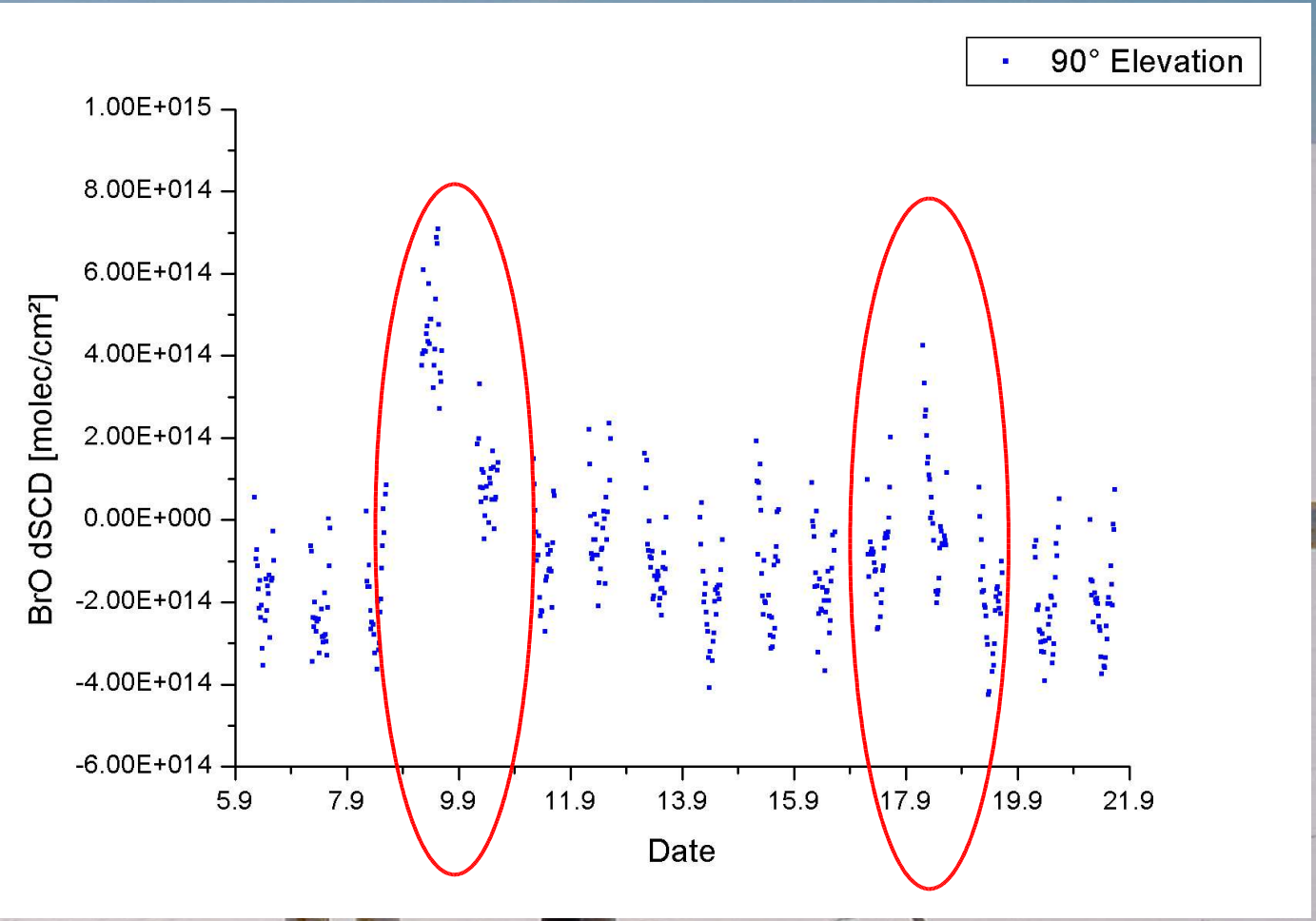




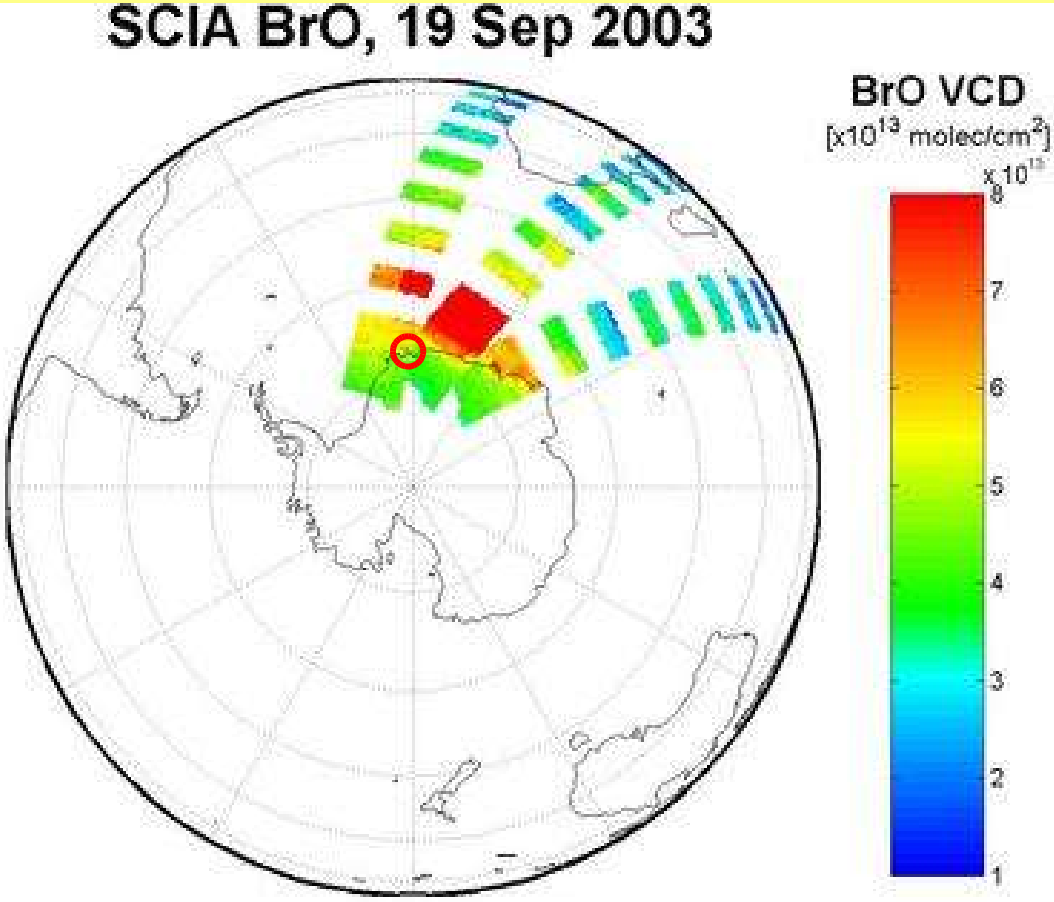


Sven Bugarski

Neumayer/Antarctica (70°N, 8°W) : BrO dSCD



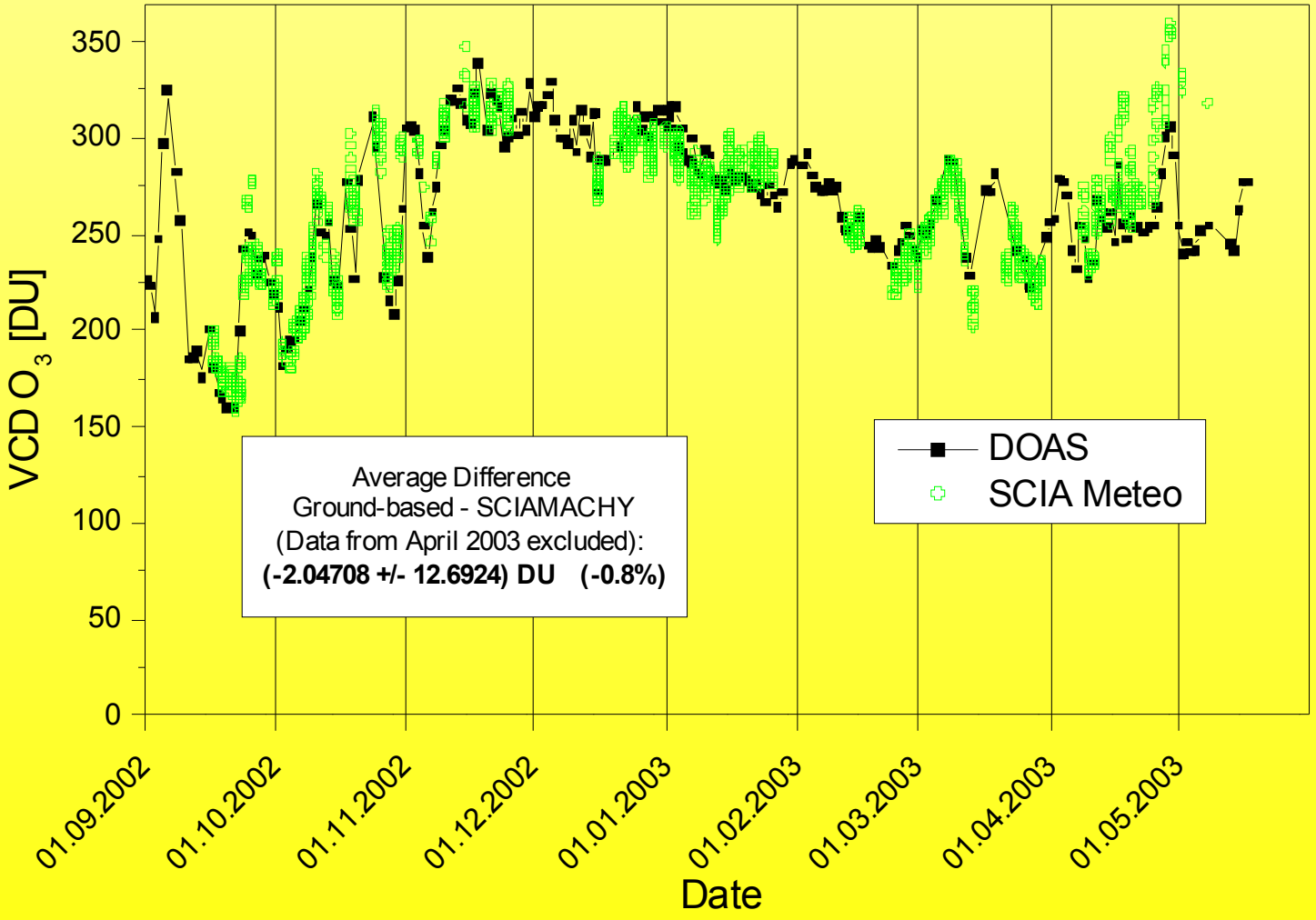
BrO clouds as seen by Sciamachy over Neumayer station



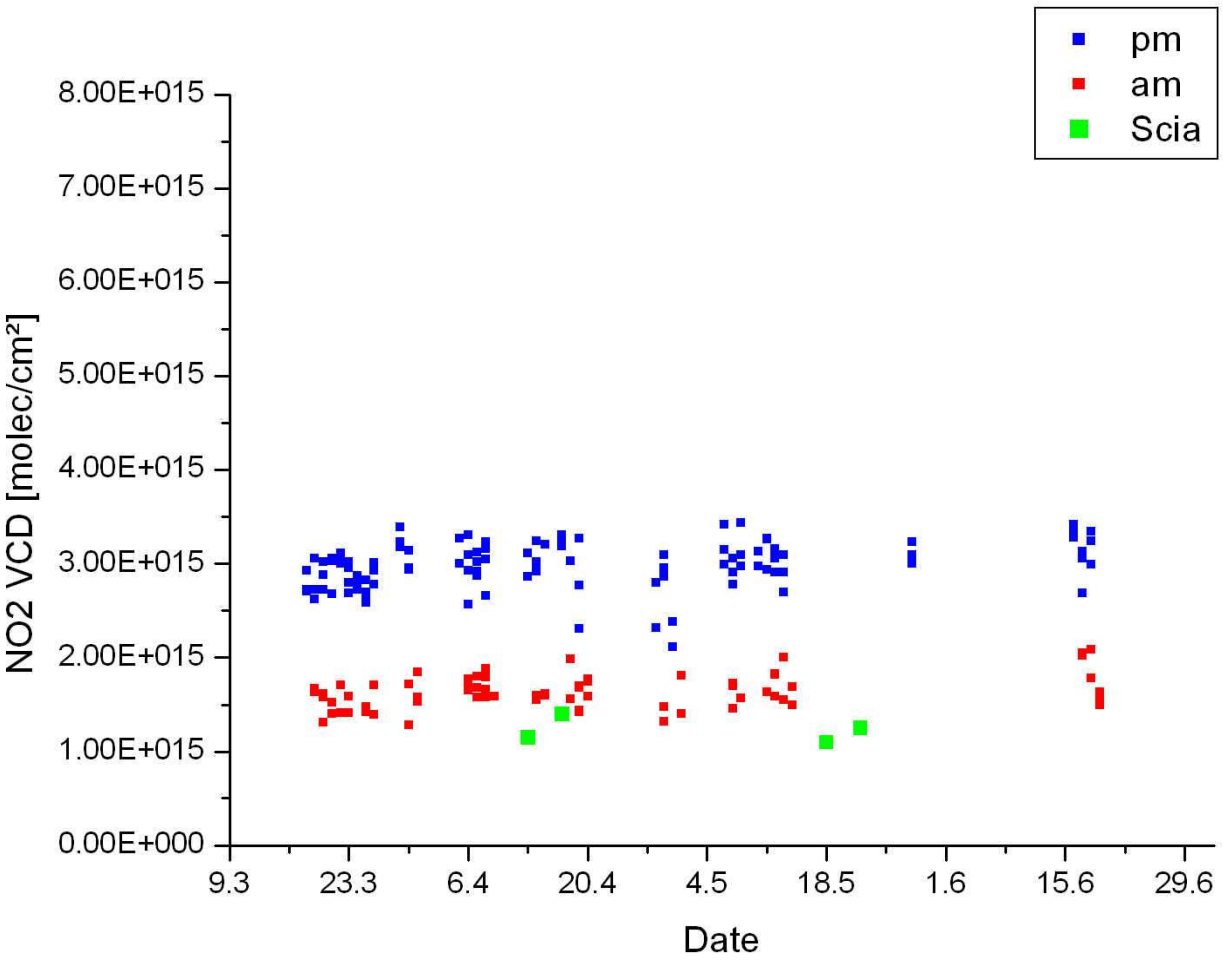
Georg von Neumayer-station

BIRA-IASB

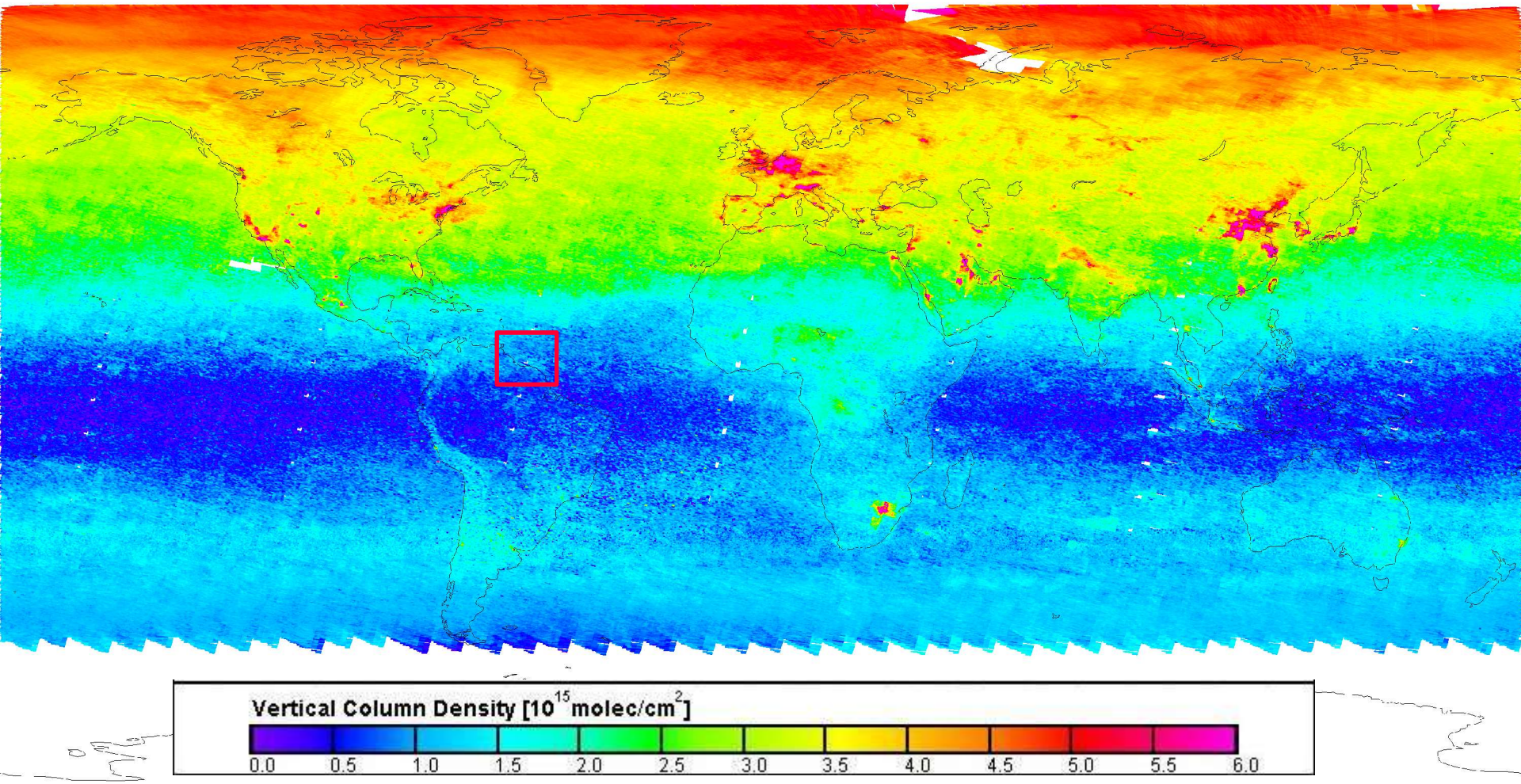
Neumayer/Antarctica (70°N, 8°W): Ozone VCD



Paramaribo/Suriname (6°N, 55°W): NO_2 VCD 2004

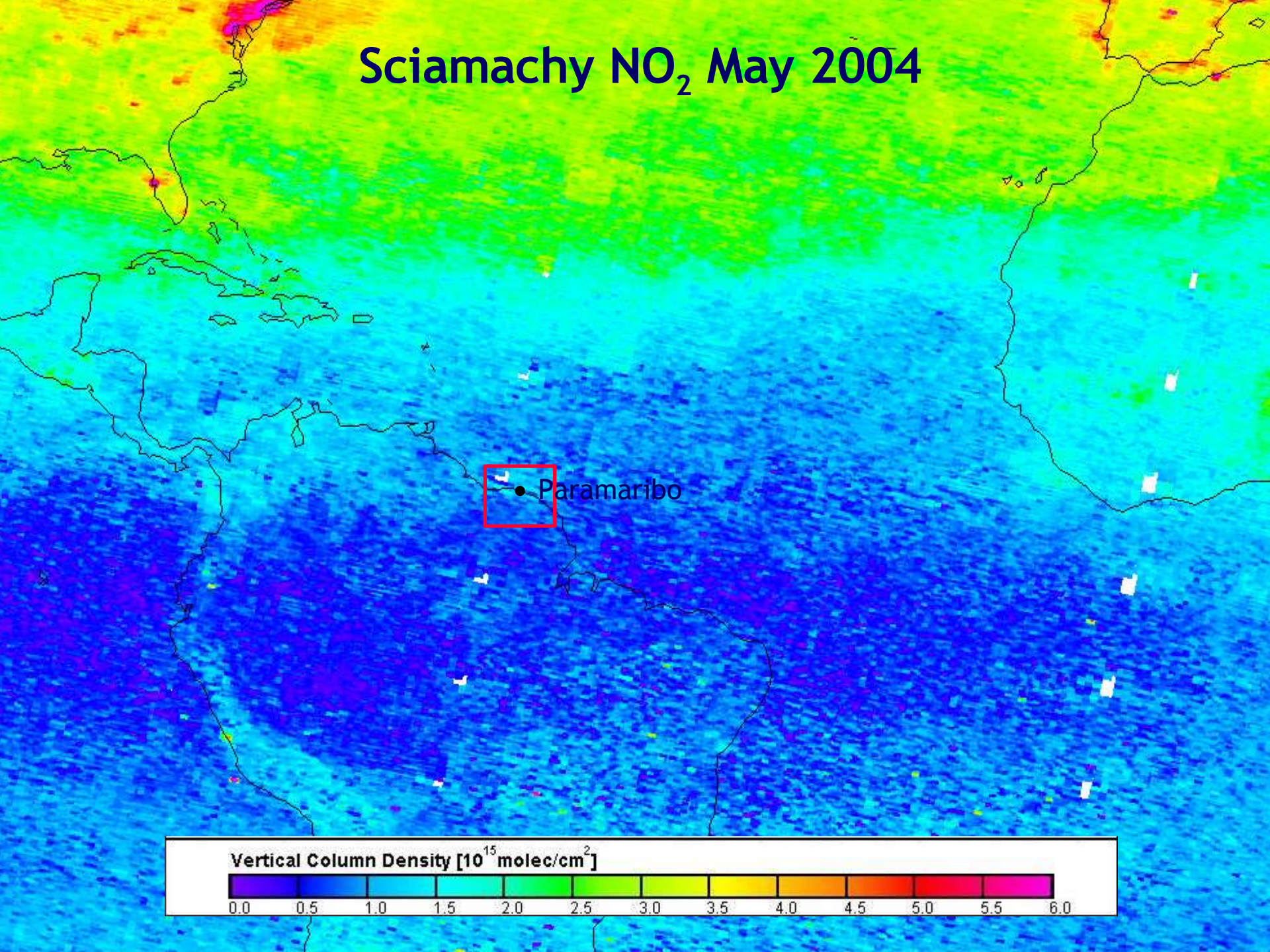


Sciamachy NO_2 May 2004

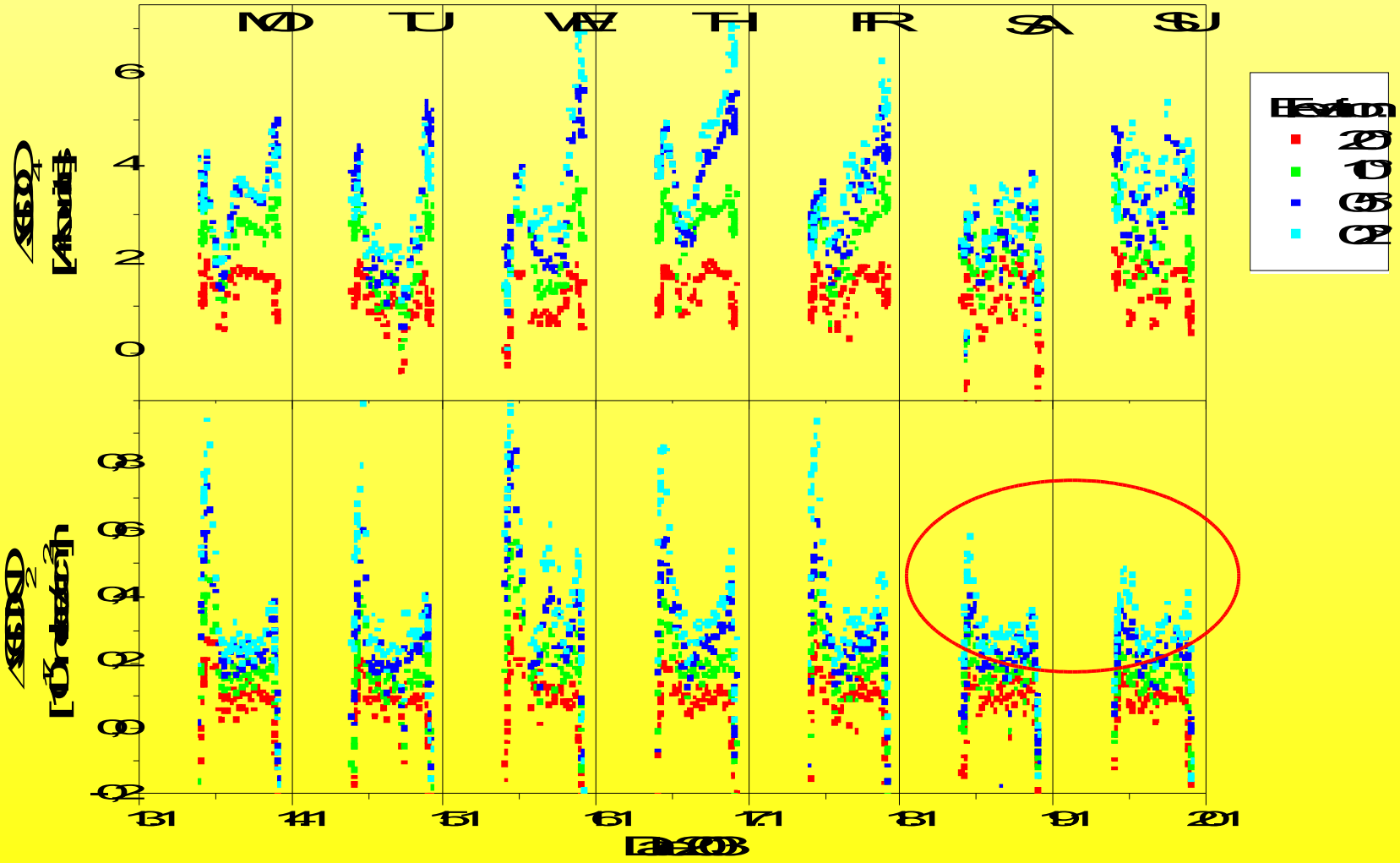


Steffen Beirle

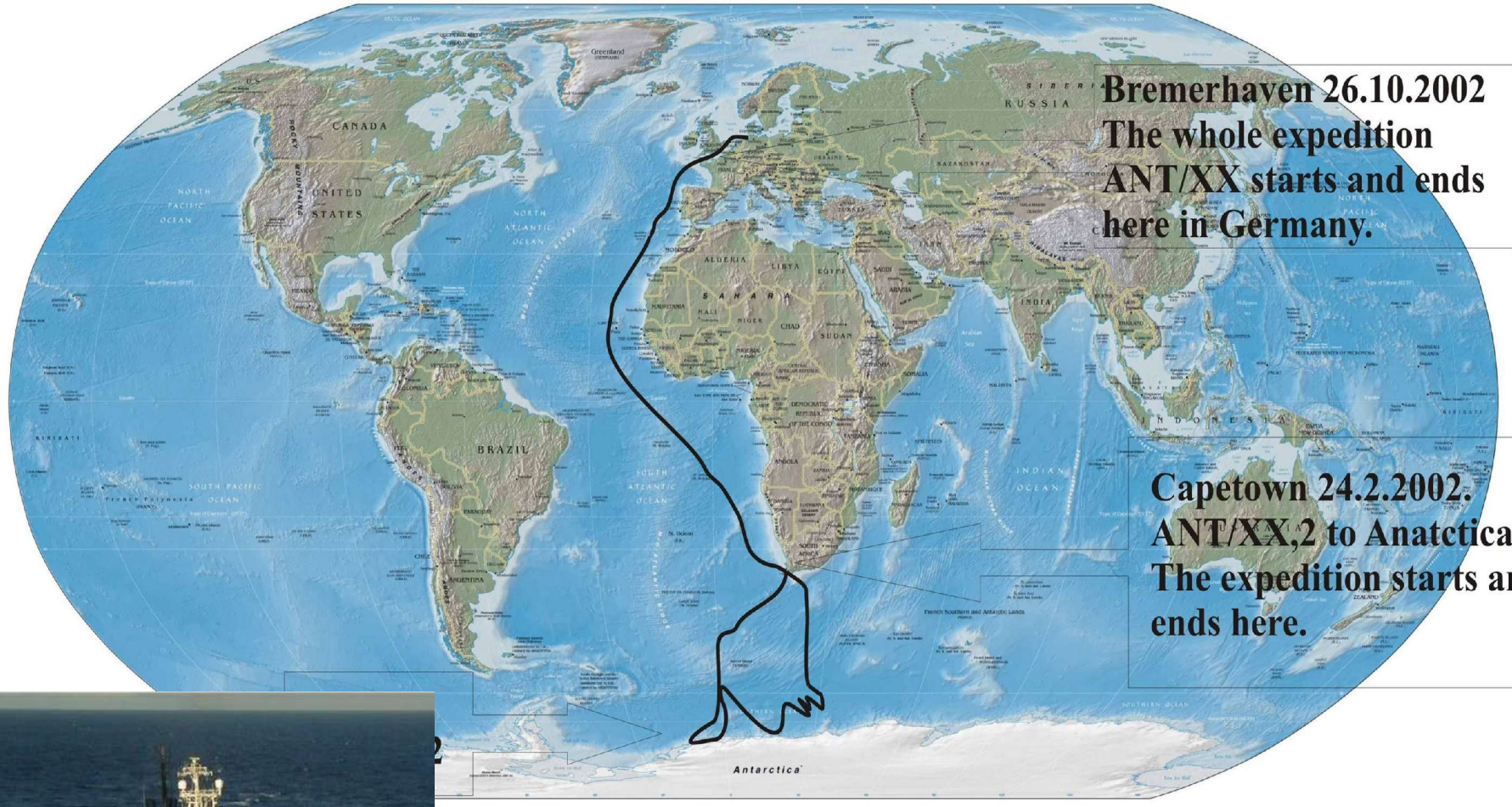
Sciamachy NO_2 May 2004



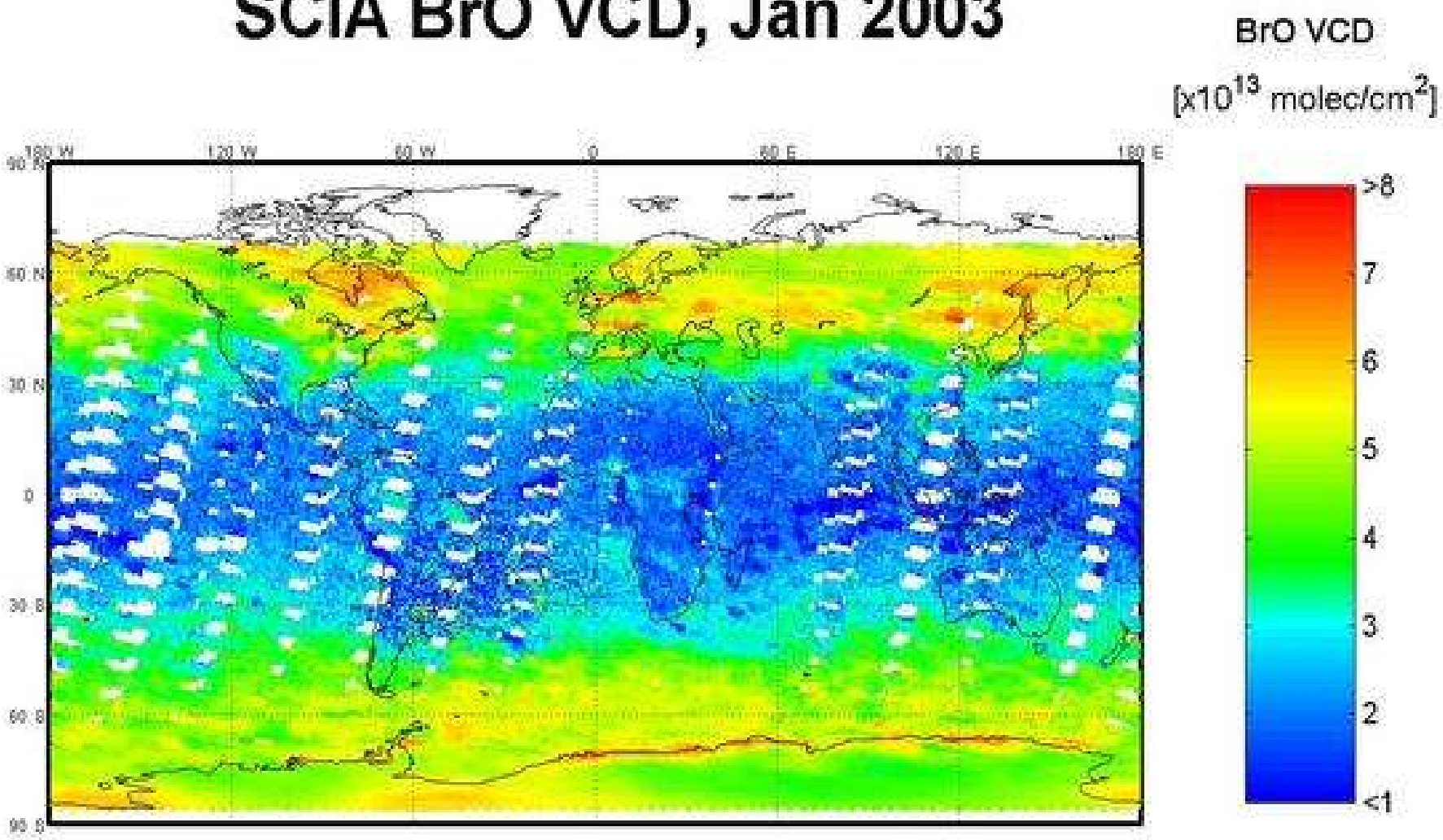
Paramaribo/Suriname:tropospheric NO_2



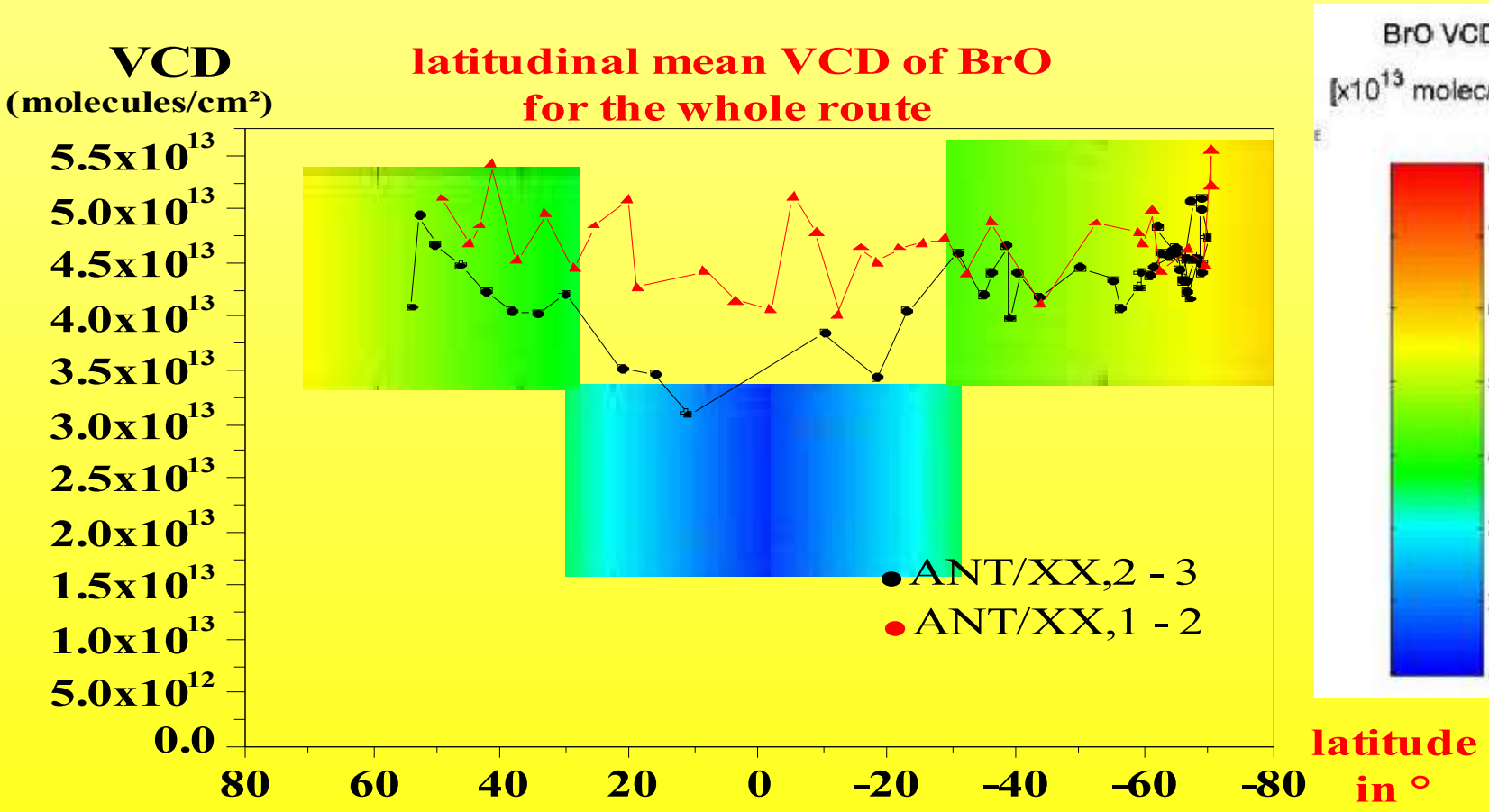
Polarstern Ant XX-XXII



SCIA BrO VCD, Jan 2003



Polarstern Ant XX: lat. cross section BrO VCD

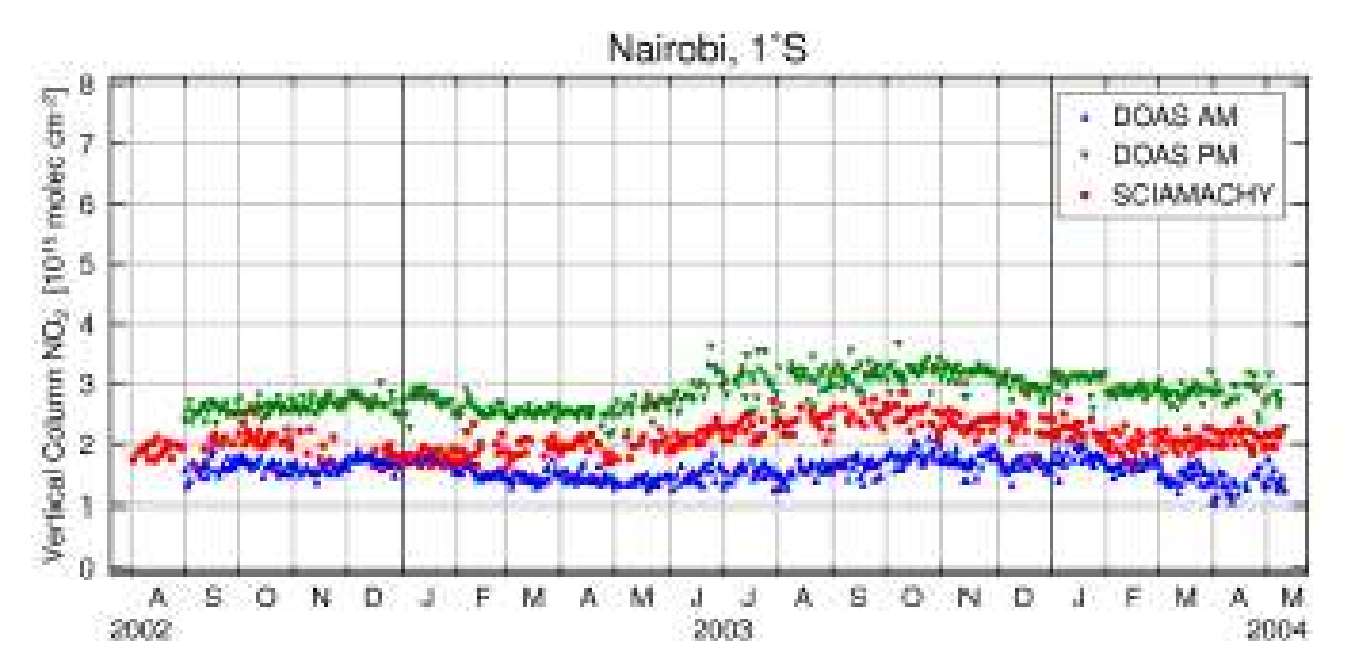


Summary

- global measurements
  ->coverage of all climatic zones
- validation of O_3 and NO_2
- additional information on e.g. H_2O and „minor“ absorbers like OClO, BrO, HCHO, SO_2
- tropospheric Sensitivty

⇒big data set for further validation/comparisons


THANK YOU!



A.Richter et al.

Separating tropopsheric from stratospheric signal using MAX-DOAS measurements

Differential slant column density

(relative to the Fraunhofer reference spectrum):

$$dSCD(\Theta,\alpha) = SCD(\Theta,\alpha) - SCD_{ref}$$

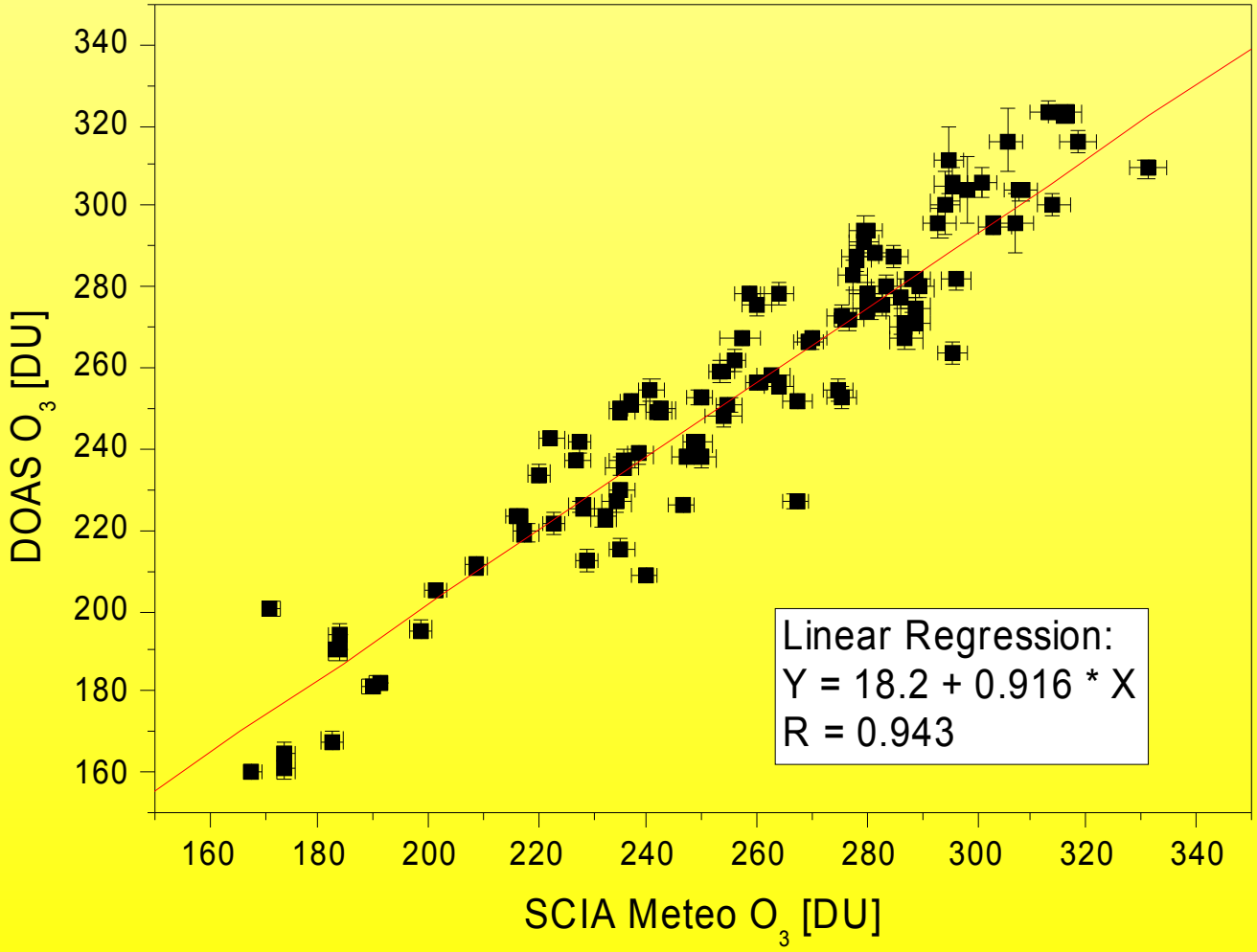
Line of sight slant column difference

(relative to the zenith observation at same SZA):

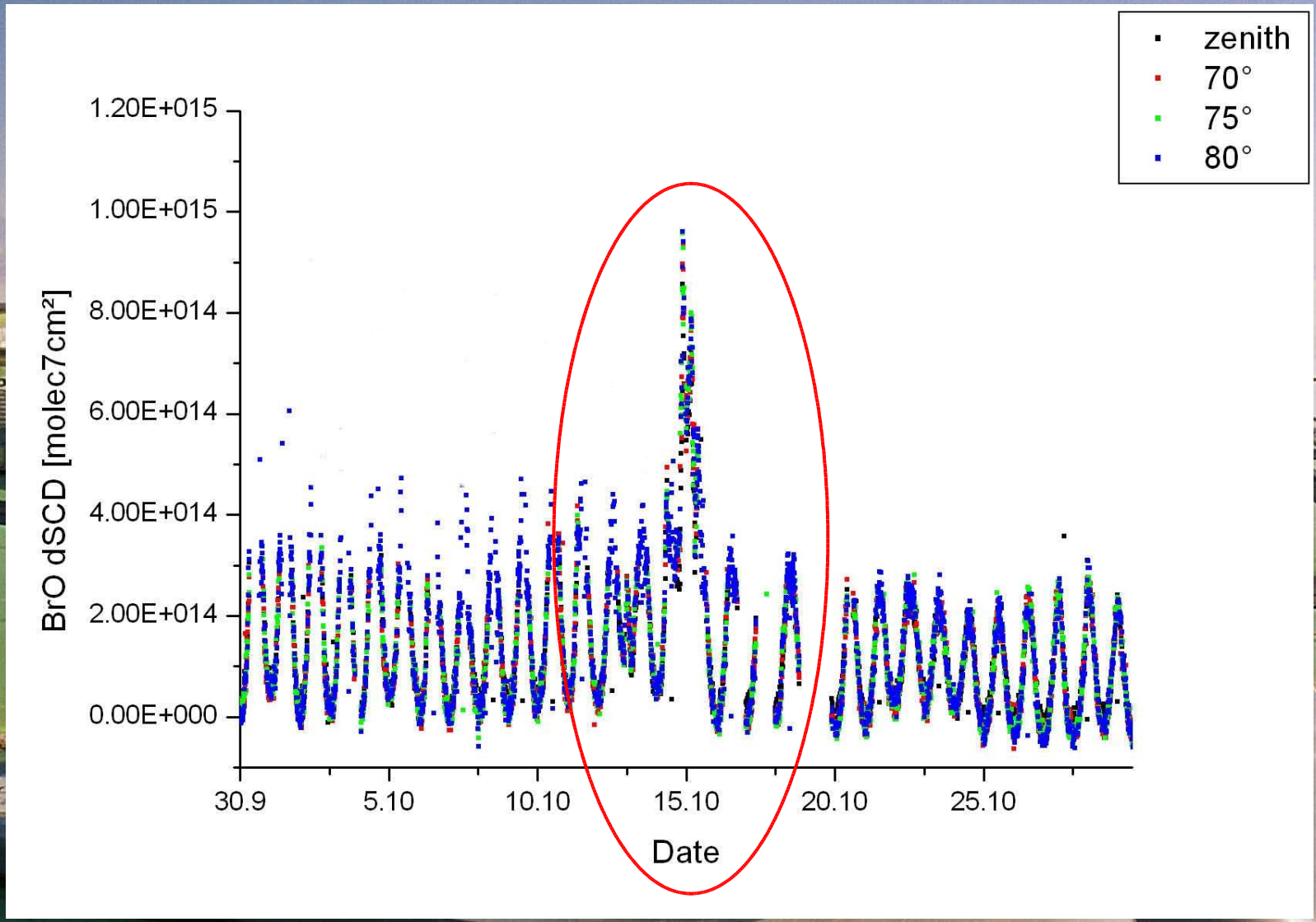
$$\begin{aligned}
\Delta SCD(\Theta,\alpha) &= dSCD(\Theta,\alpha) - dSCD(\Theta,90) \\
&\approx SCD(\Theta,\alpha) - SCD(\Theta,90) \\
&\approx \left[SCD_{trop}(\Theta,\alpha) + SCD_{strat}(\Theta,\alpha)\right] - \left[SCD_{trop}(\Theta,90) + SCD_{strat}(\Theta,90)\right] \\
&\approx SCD_{trop}(\Theta,\alpha) - SCD_{trop}(\Theta,90)
\end{aligned}$$

→ Sensitive only to tropospheric absorption!

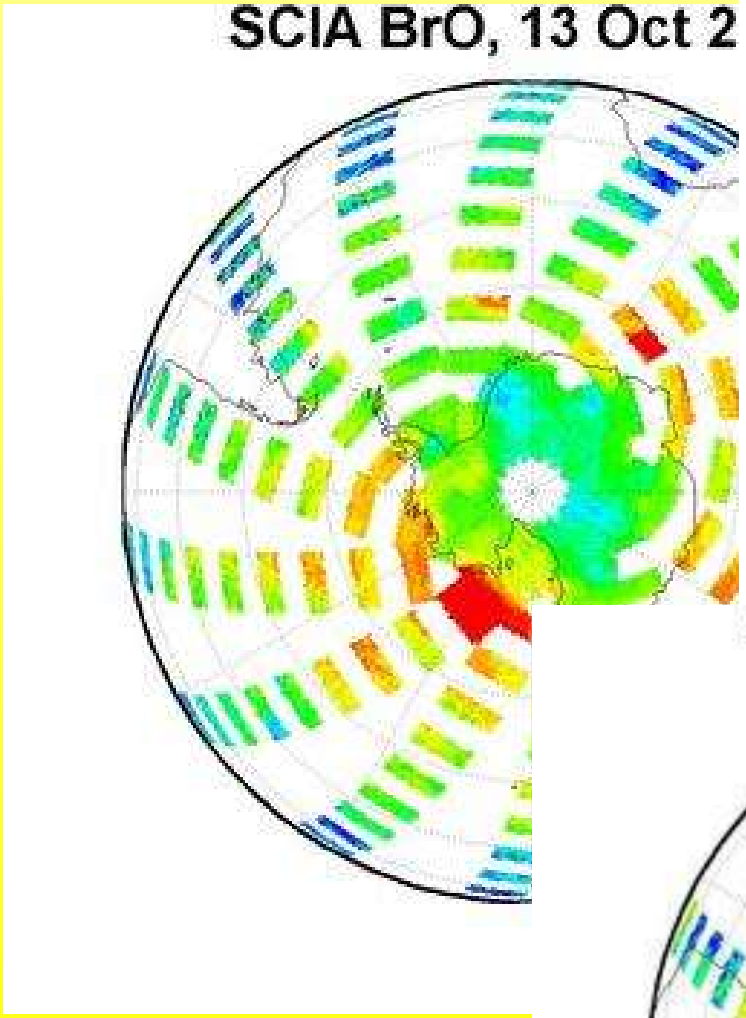
Neumayer/Antarctica (70°N, 8°W): Ozone VCD

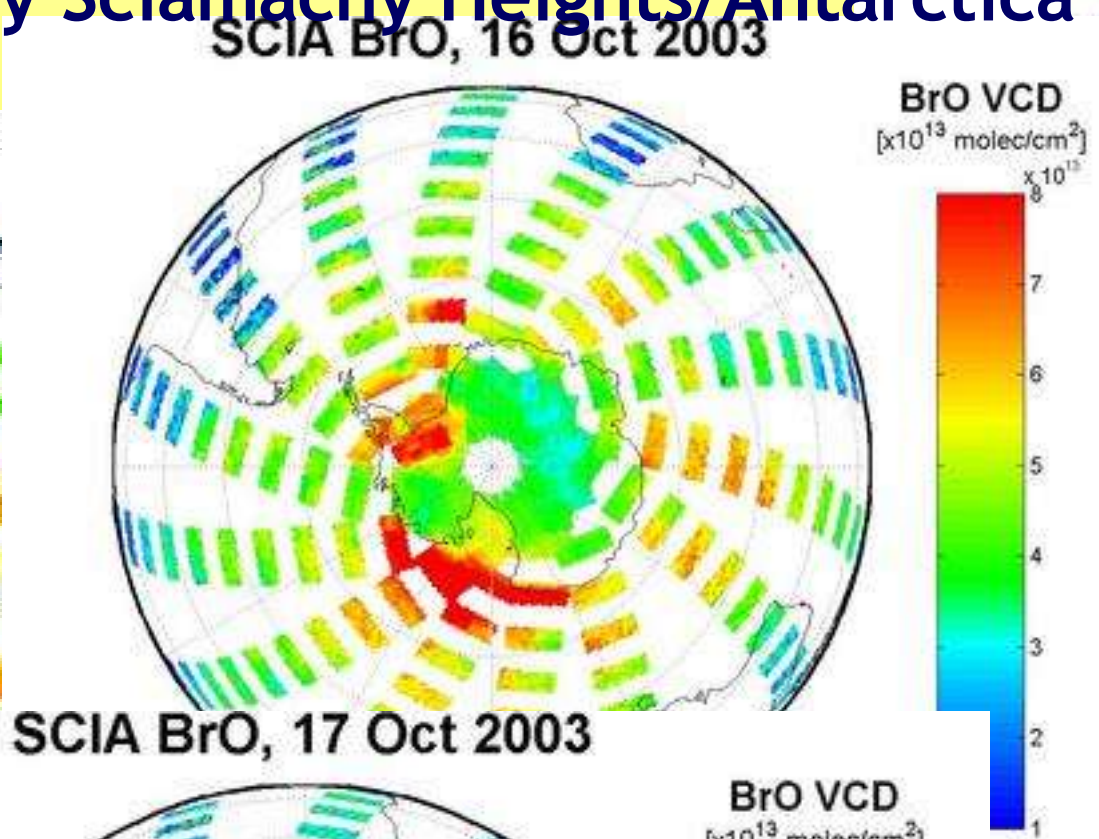


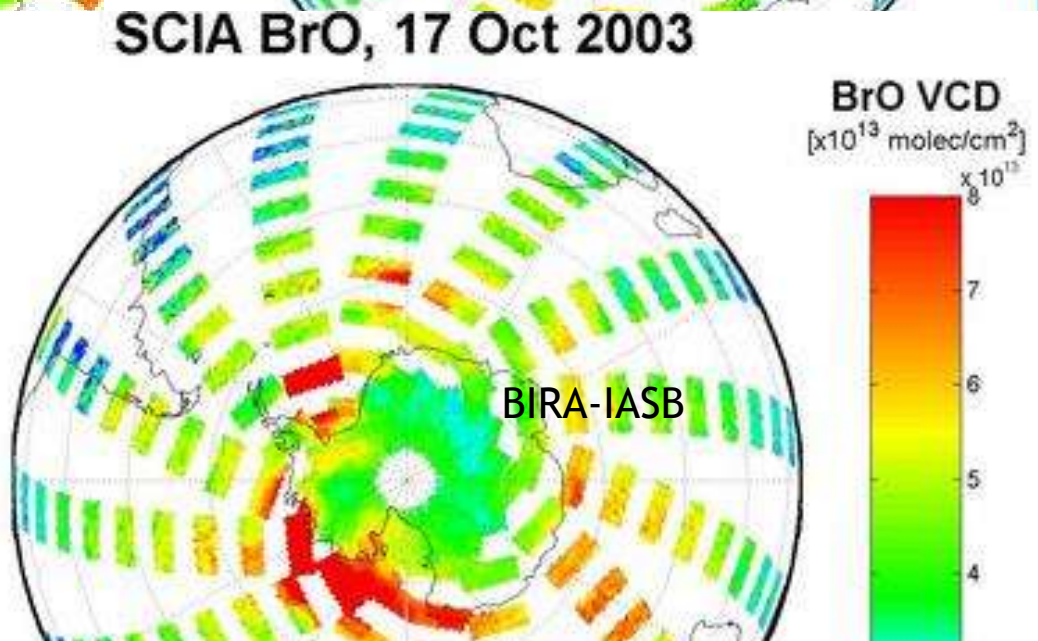
Arrival Heights/Antarctica (77°N, 166°E): BrO dSCD



BrO clouds as seen by Sciamachy Heights/Antarctica







Overview:

LOCATION	ZENITH	MULI-AXIS	START DATE
Arrival Heights		uv/vis	2000
Neumayer	(uv/vis)	uv/vis	1999/2003
Kiruna	uv/vis		1992/1996
Suriname		uv/vis	2002
Polarstern		uv/vis	2001