

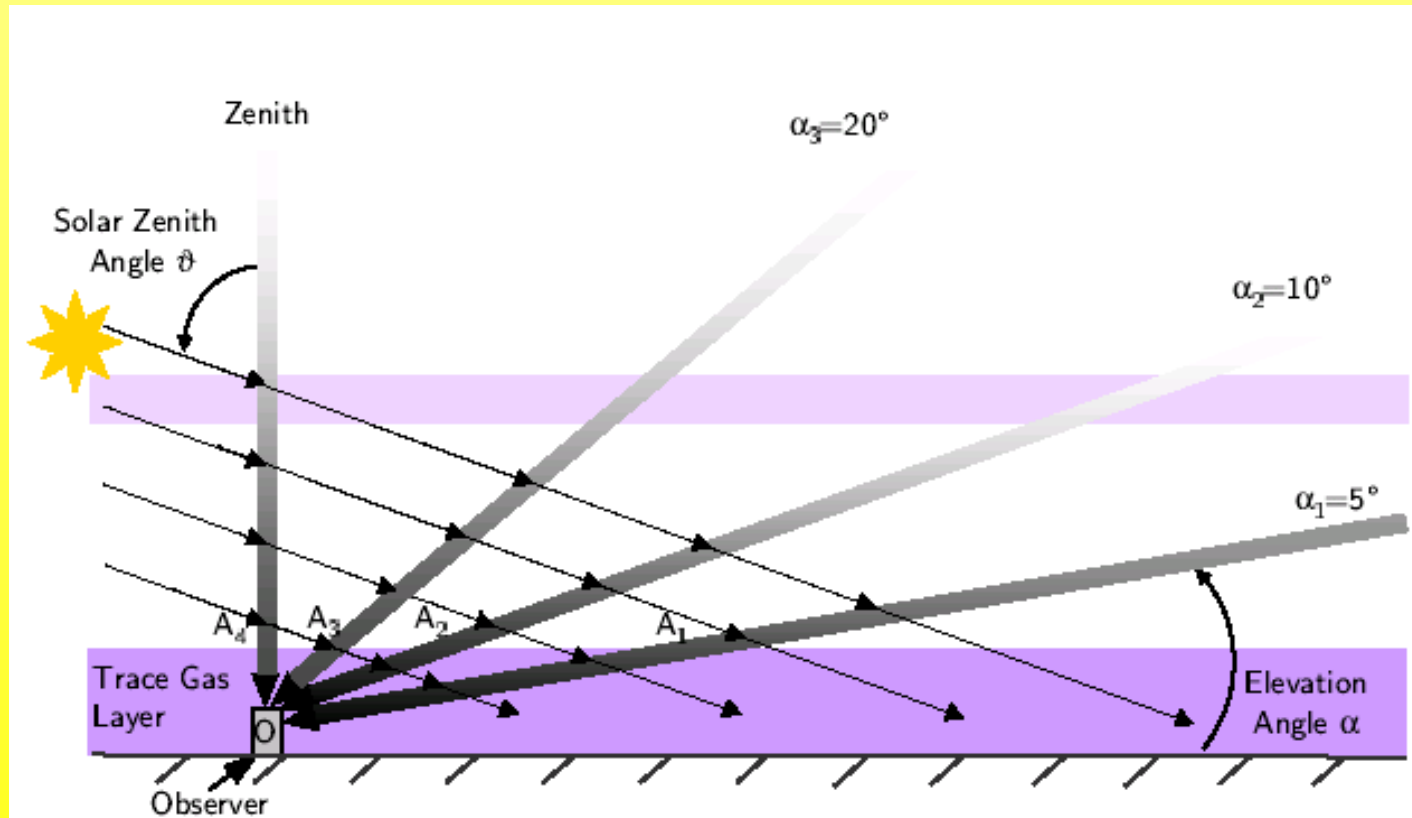


SCIAMACHY Validation with ground-based and ship-borne DOAS measurements

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- (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

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



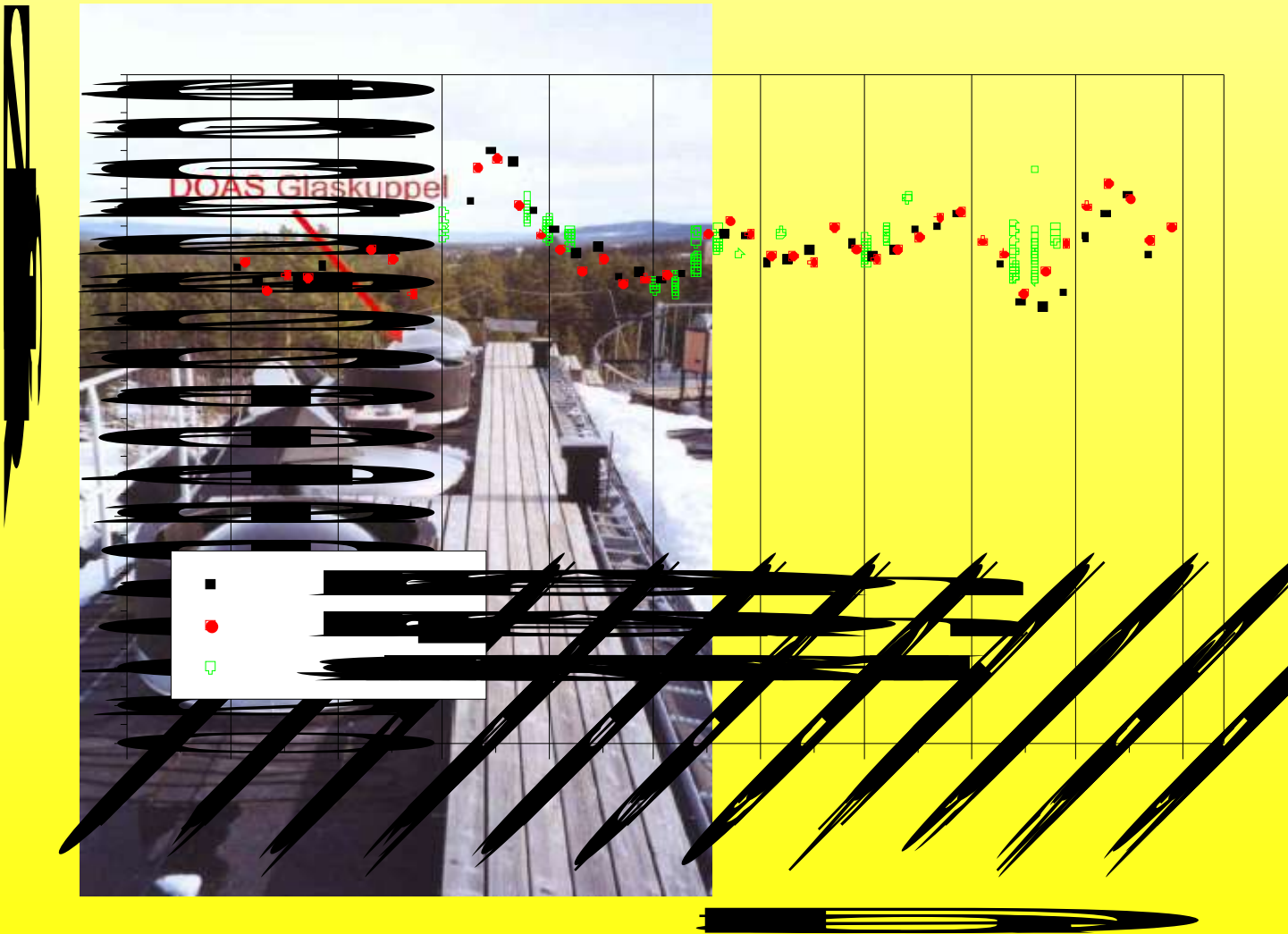
-> sensitive for tropospheric and stratospheric Absorber

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2001

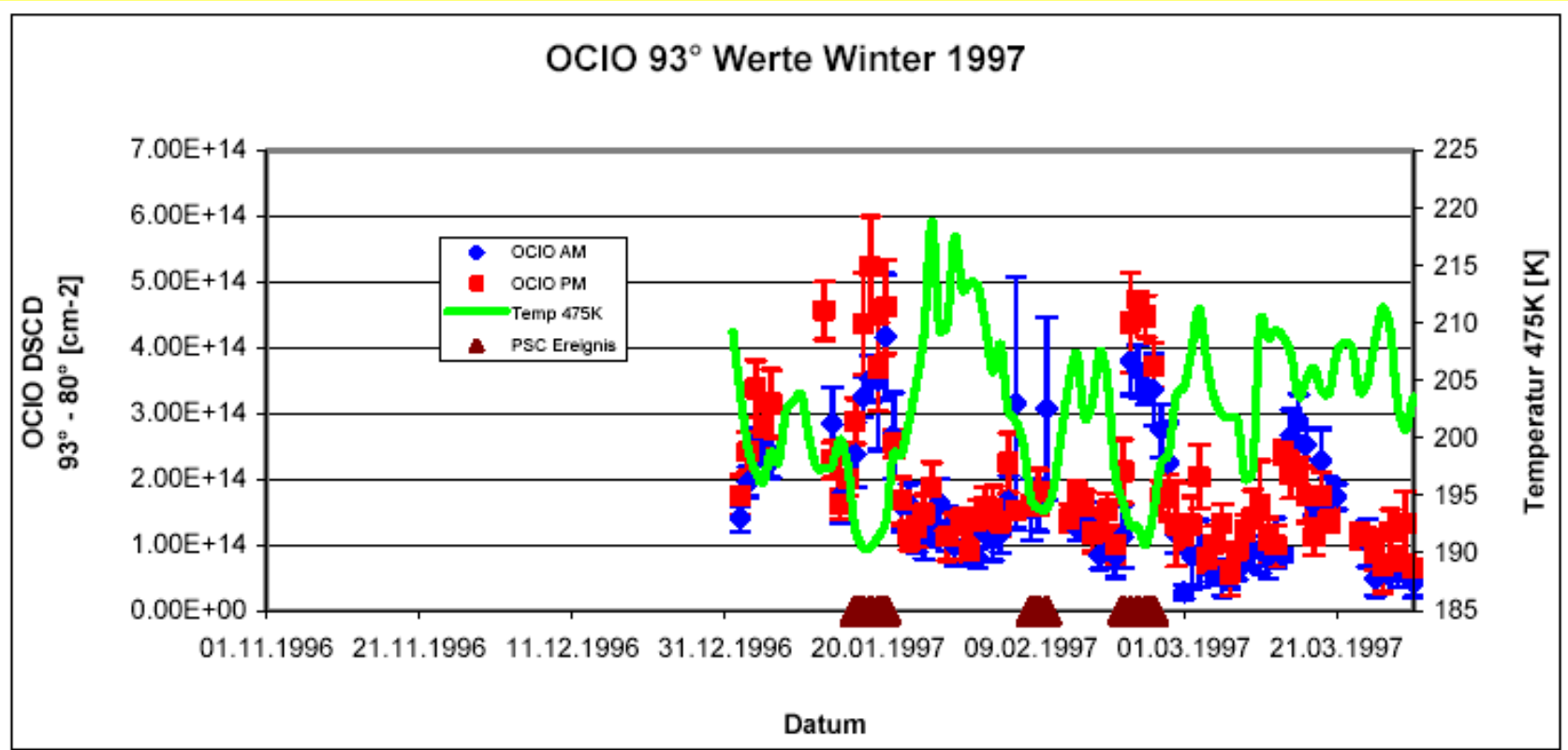


Kiruna/Sweden (68 °N, 21 °E) : Ozone VCD



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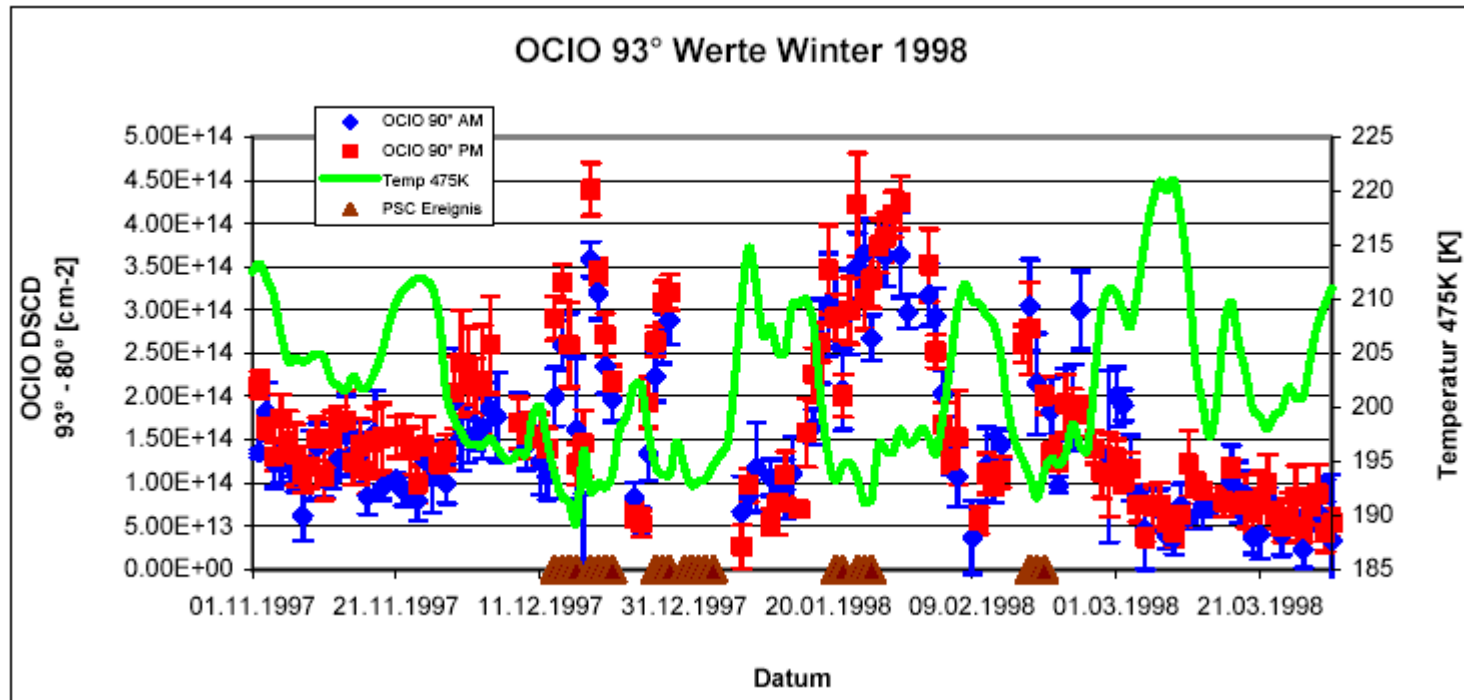
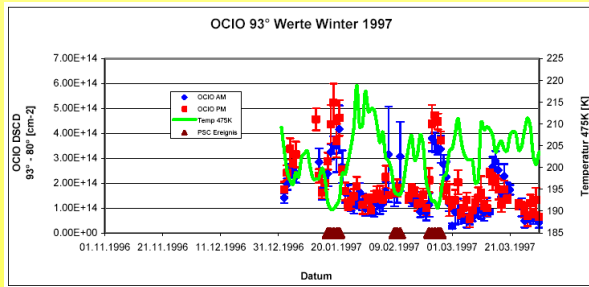
Kiruna/Sweden (68 °N, 21 °E): OClO time series winter 1997-2003



Sven Bugarski

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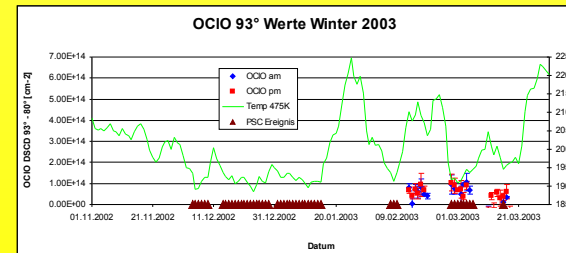
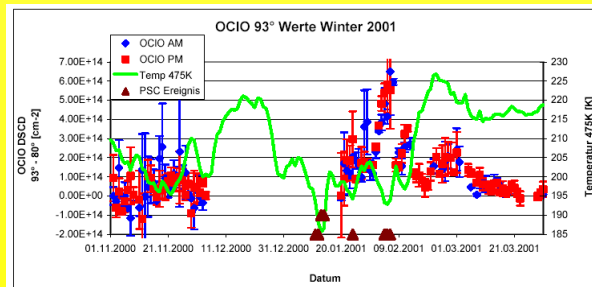
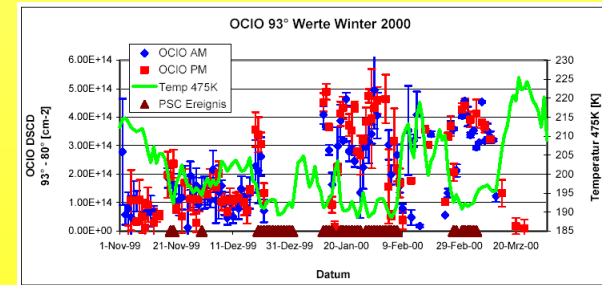
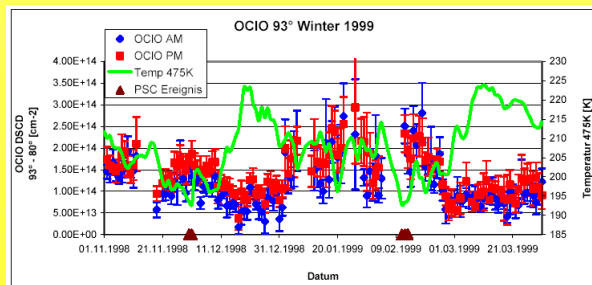
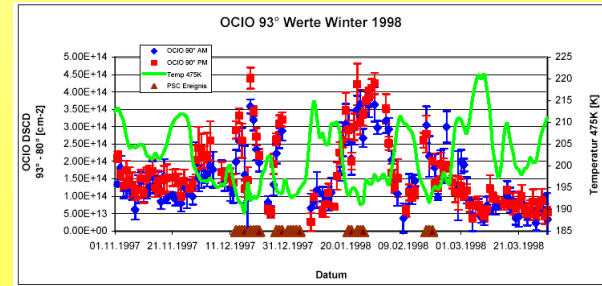
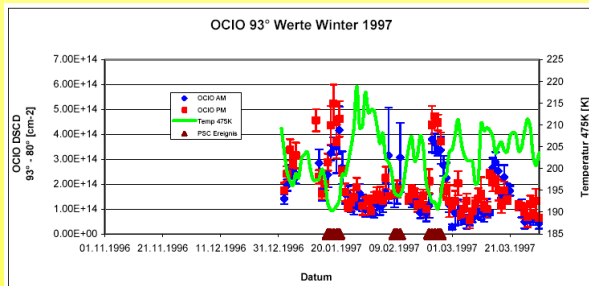
Kiruna/Sweden (68 °N, 21 °E): OClO time series winter 1997-2003



Sven
Bugarski

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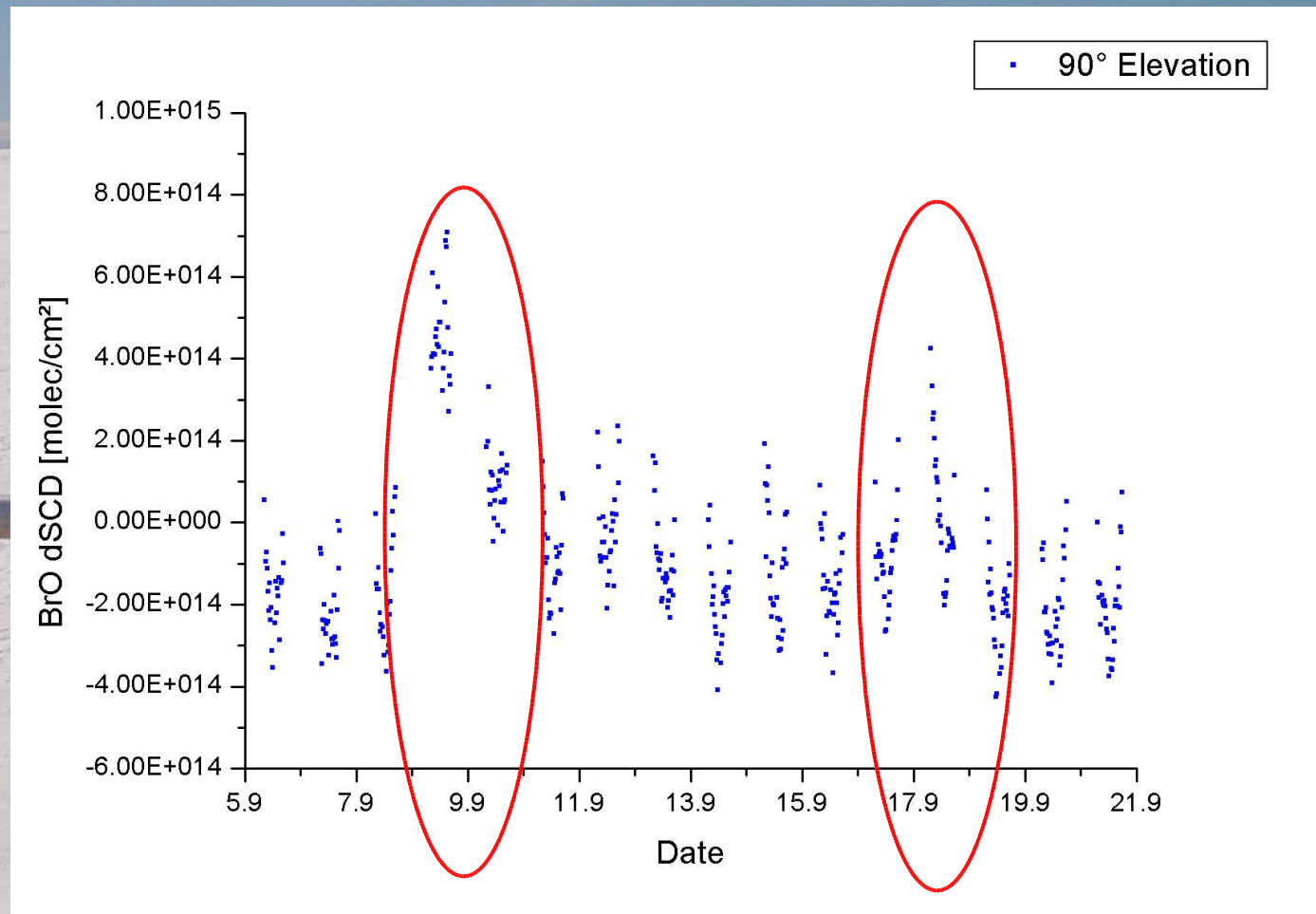
Kiruna/Sweden (68 °N, 21 °E): OCIO time series winter 1997-2003



Sven Bugarski

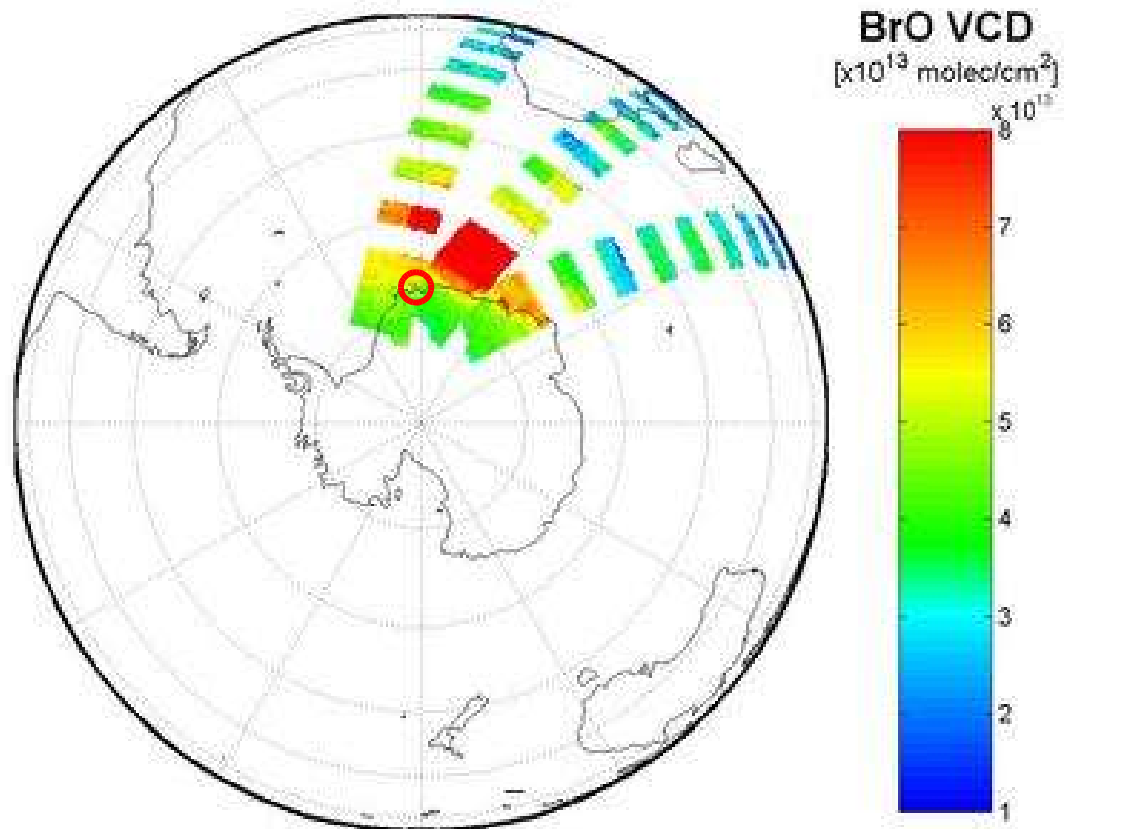
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Neumayer/Antarctica (70° N, 8° W) : BrO dSCD



BrO clouds as seen by Sciamachy over Neumayer station

SCIA BrO, 19 Sep 2003

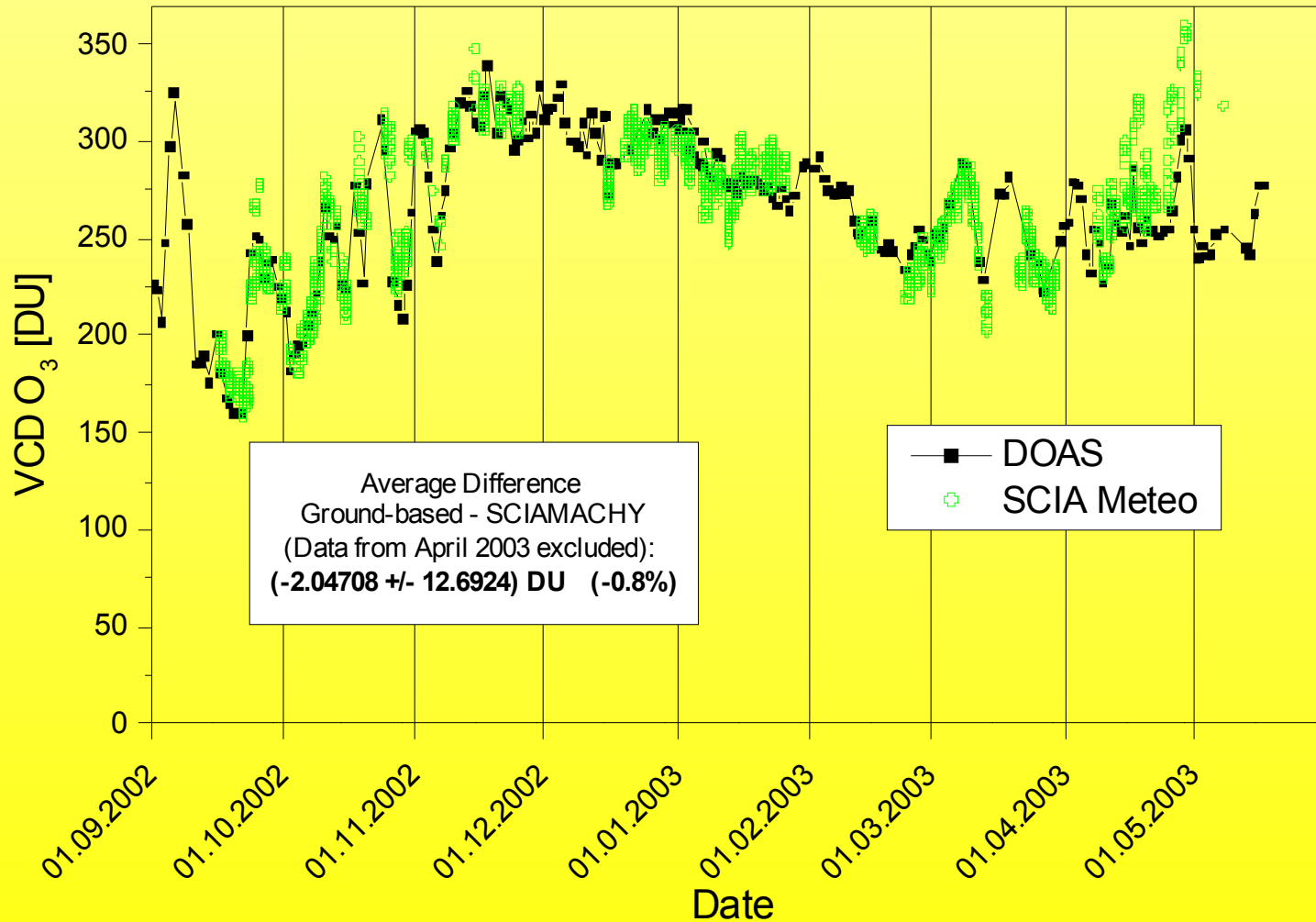


○ Georg von Neumayer-station

BIRA-IASB

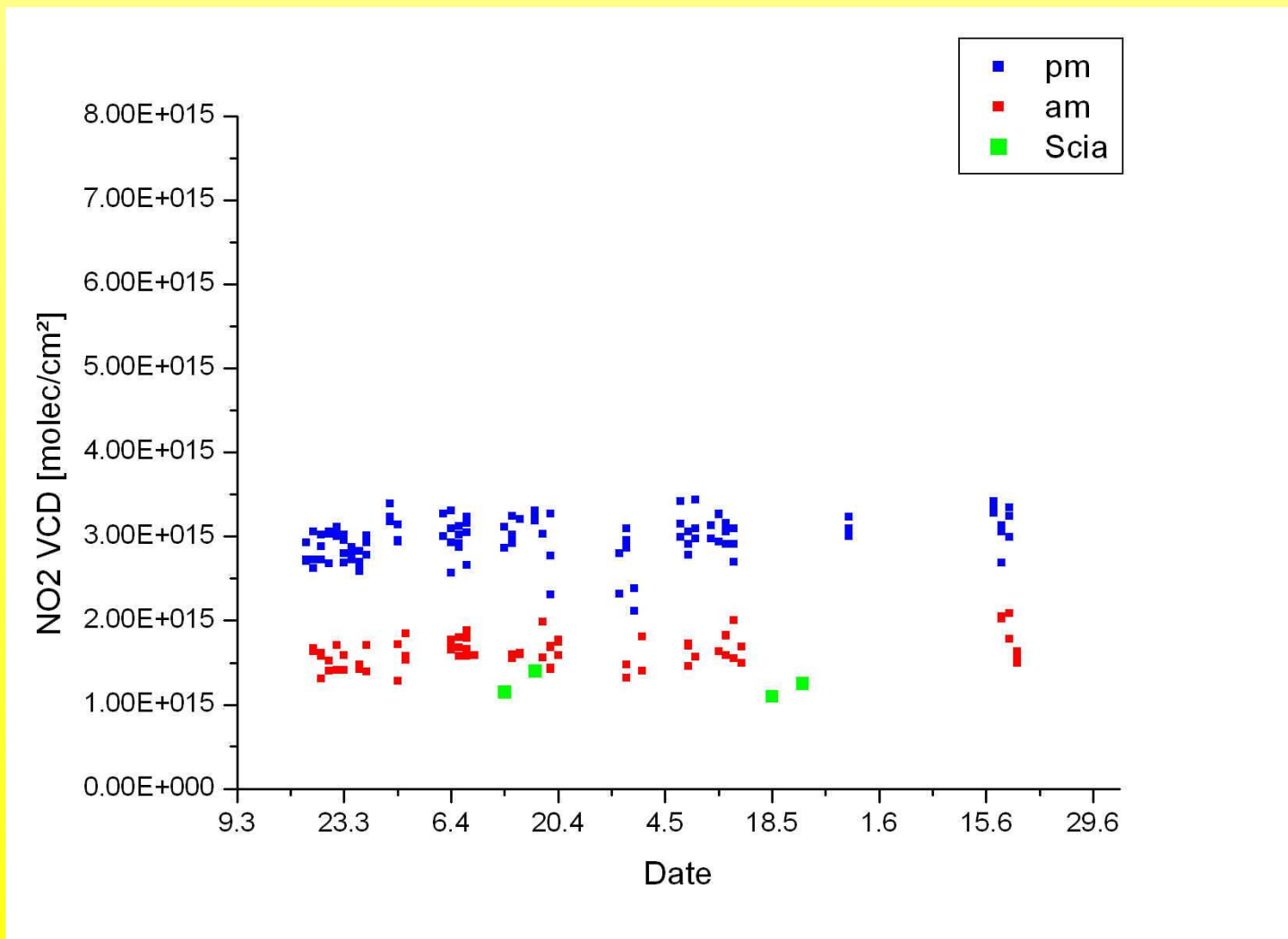
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Neumayer/Antarctica (70°N, 8°W): Ozone VCD



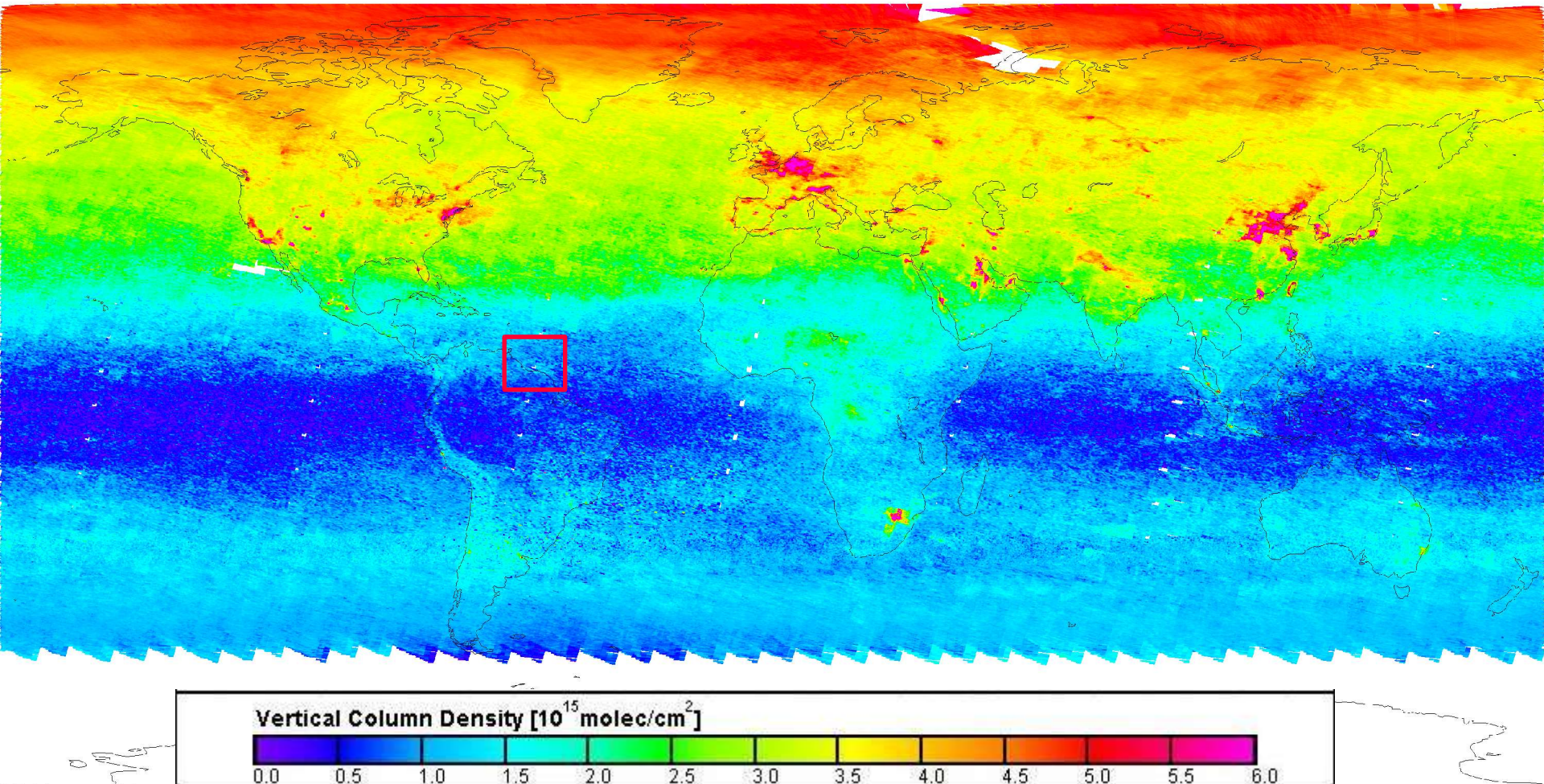
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Paramaribo/Suriname (6 °N, 55 °W): NO₂ VCD 2004



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Sciamachy NO₂ May 2004

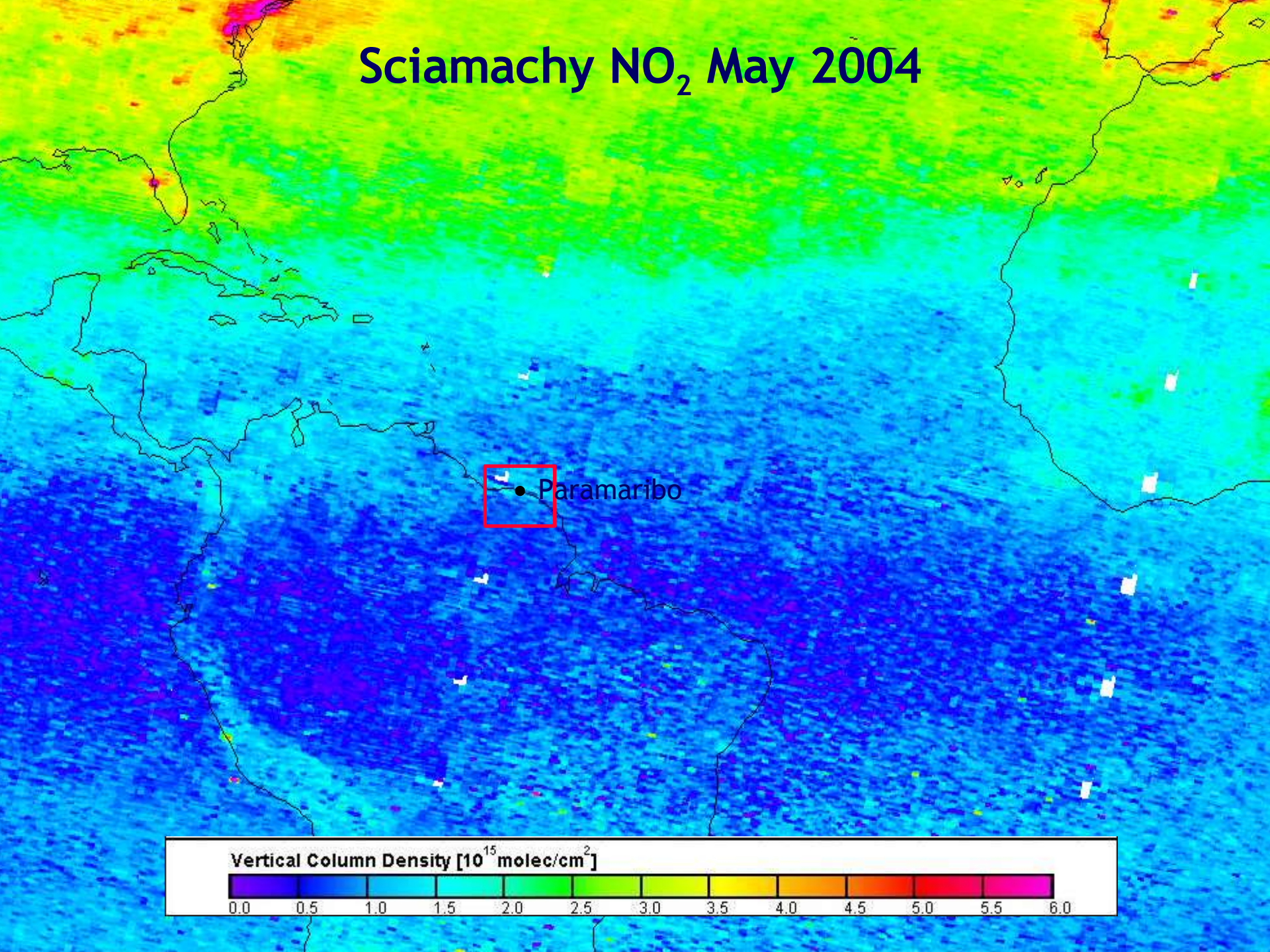


Steffen Beirle

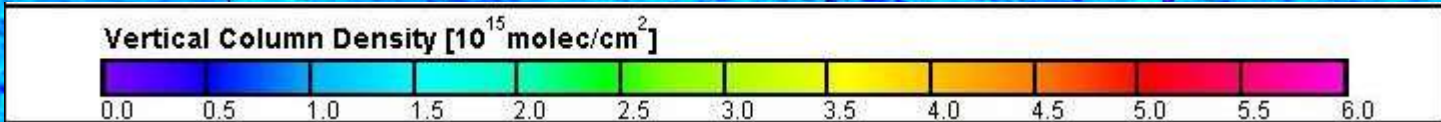
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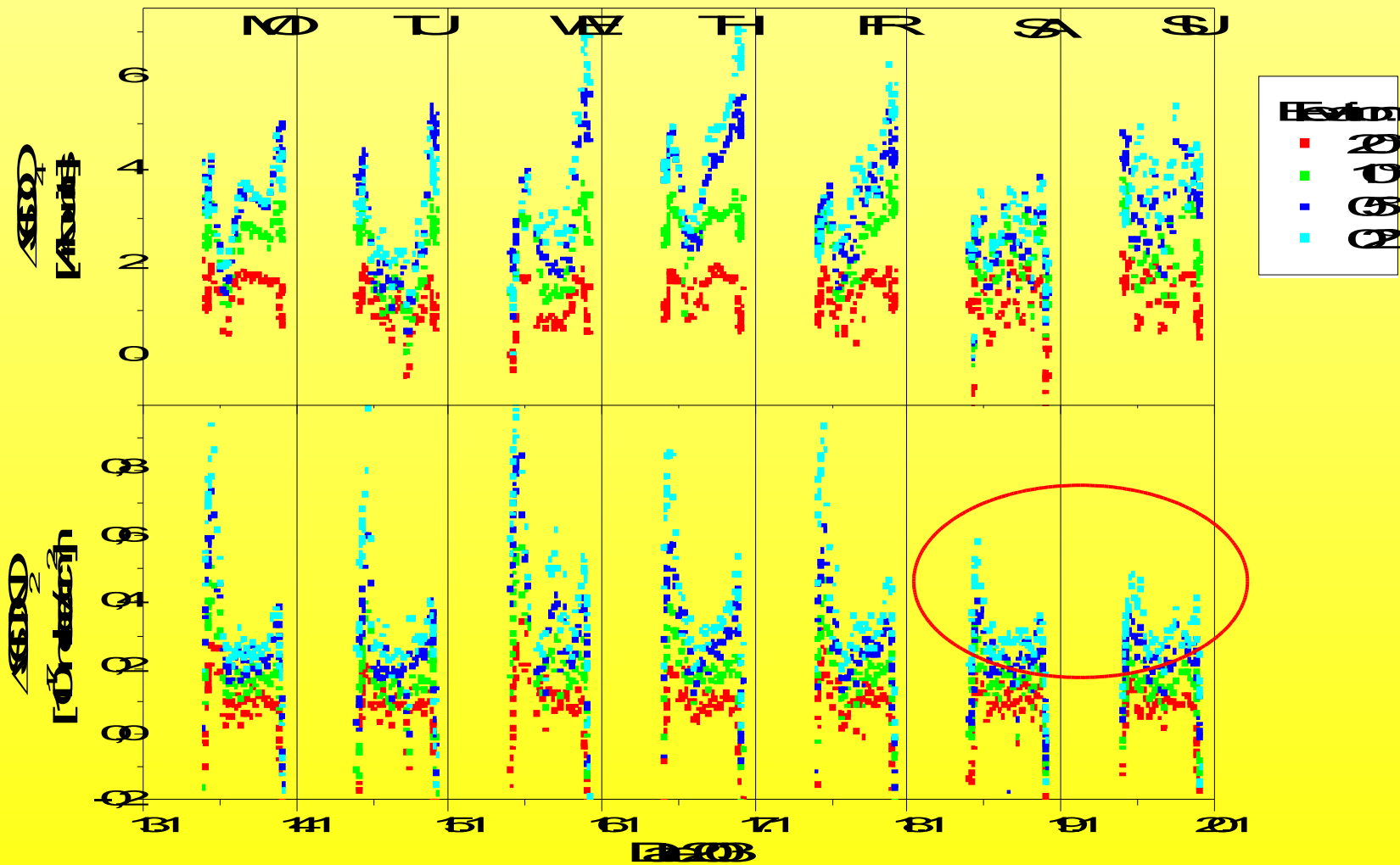
Sciamachy NO₂ May 2004



• Paramaribo

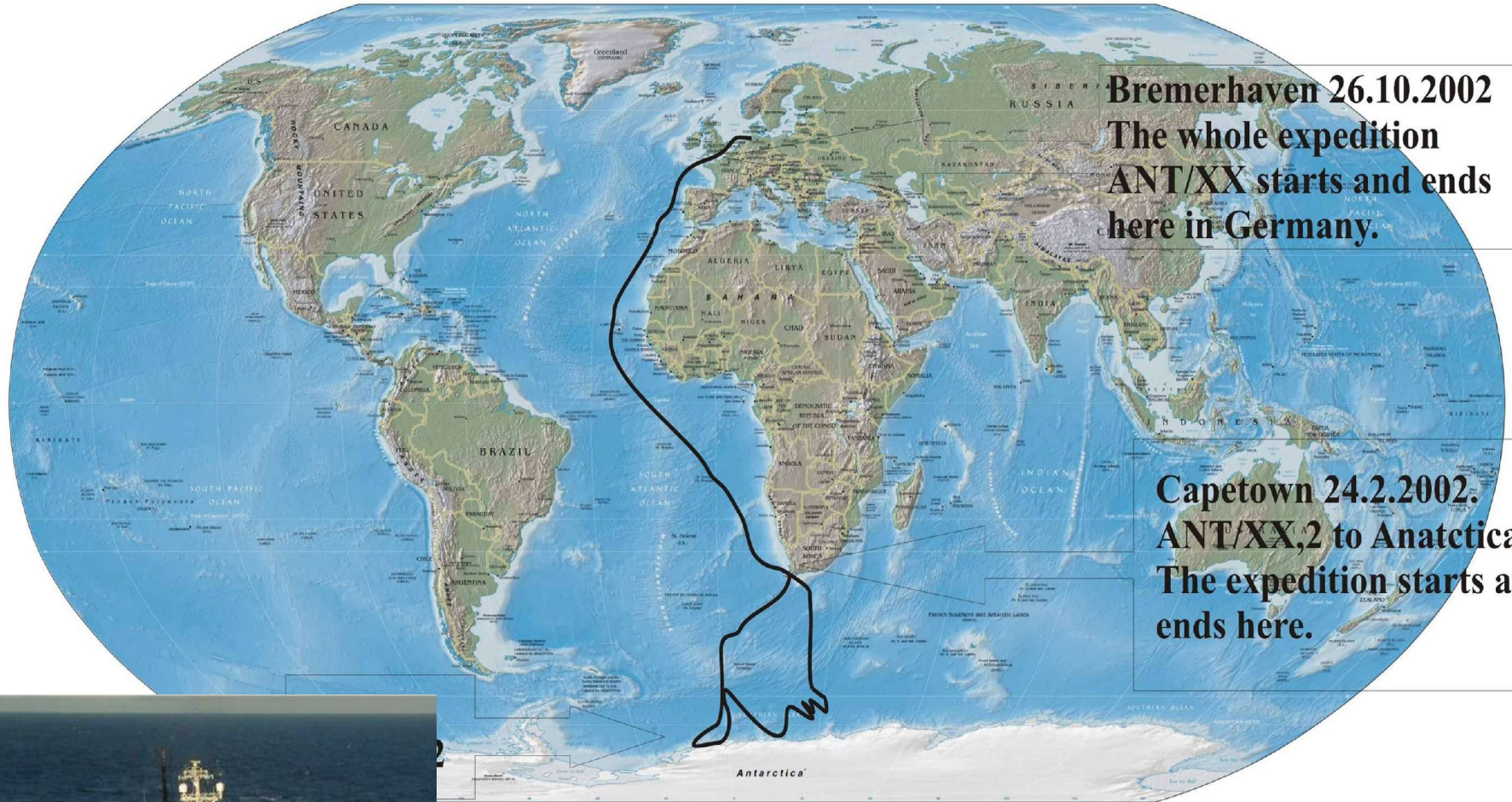


Paramaribo/Suriname:tropospheric NO₂



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Polarstern Ant XX-XXII

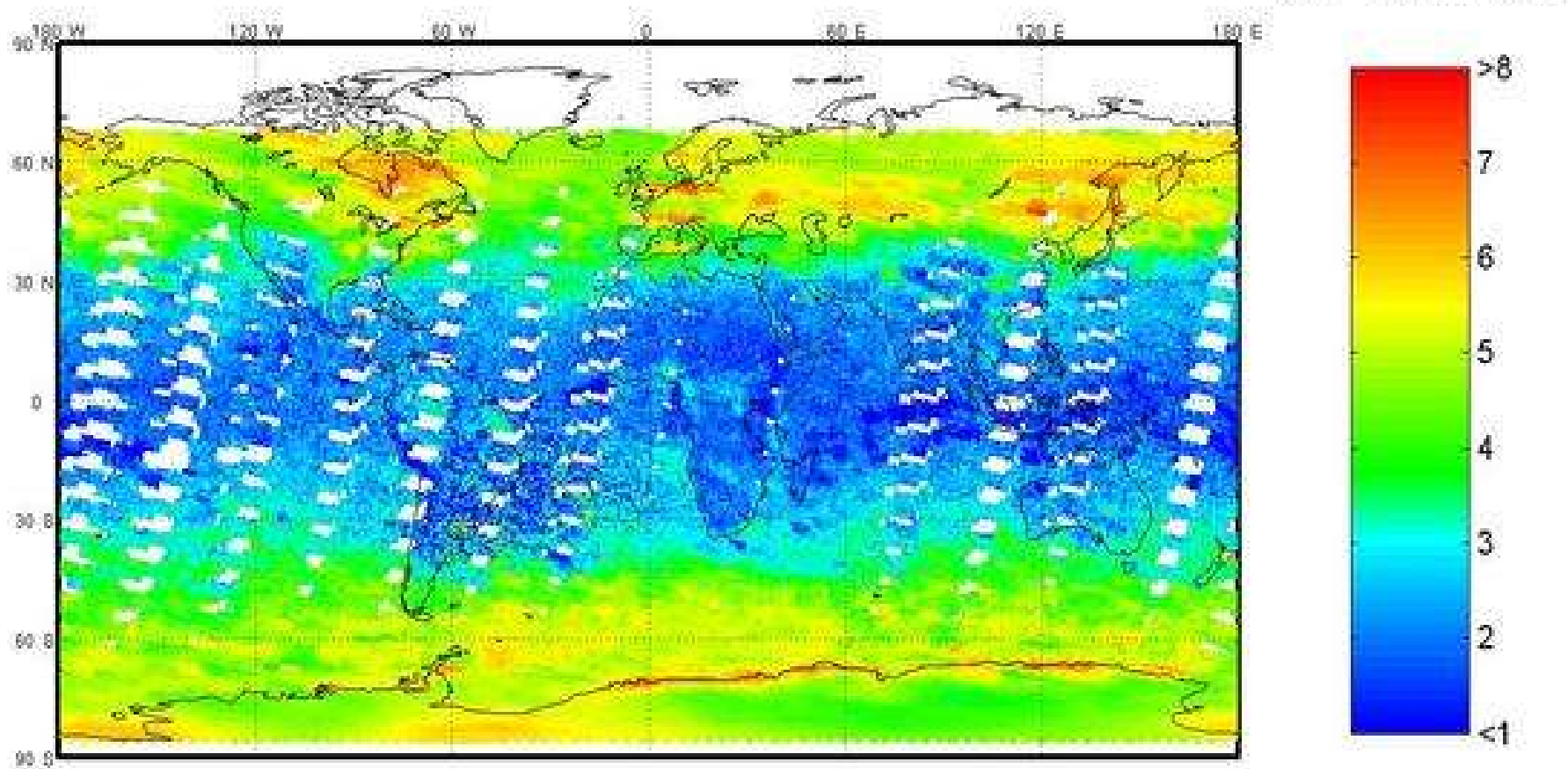


Bremerhaven 26.10.2002
The whole expedition
ANT/XX starts and ends
here in **Germany.**

Capetown 24.2.2002.
ANT/XX,2 to Antarctica.
The expedition starts and
ends here.

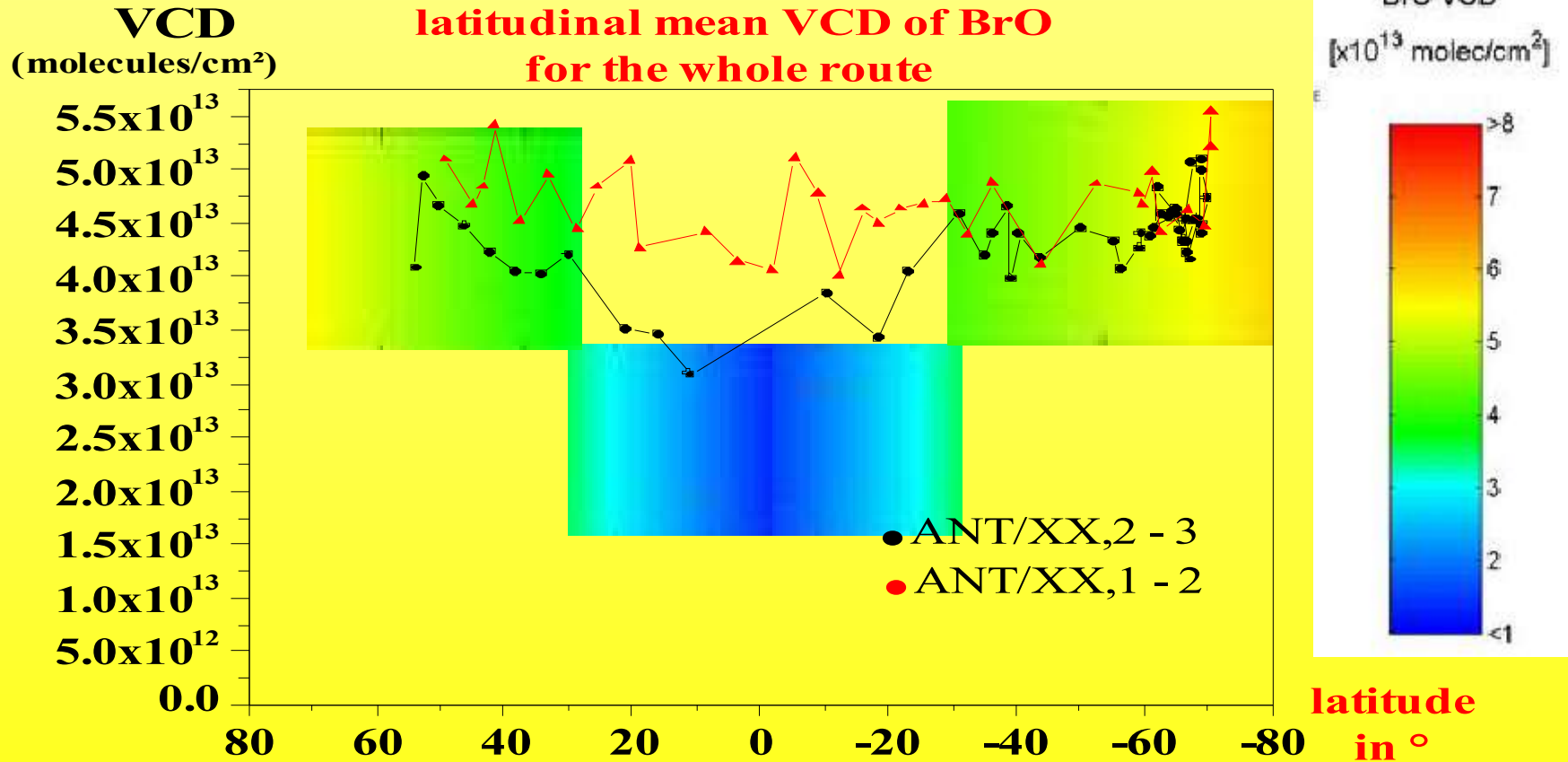


SCIA BrO VCD, Jan 2003



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Polarstern Ant XX: lat. cross section BrO VCD



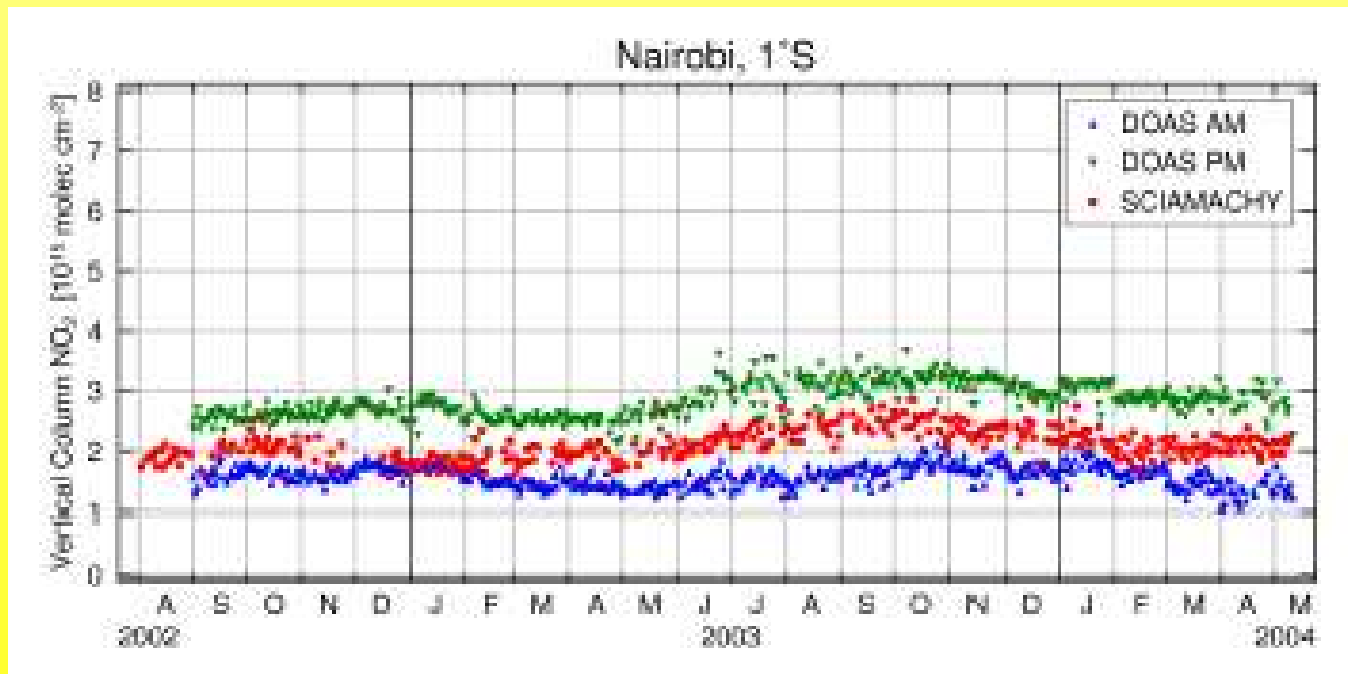
Summary

- global measurements
->coverage of all climatic zones
- validation of O₃ and NO₂
- additional information on e.g. H₂O and „minor“ absorbers like OClO, BrO, HCHO, SO₂
- tropospheric Sensitivity

⇒ big data set for further validation/comparisons

A silhouette of an offshore oil platform is visible on the left side of the image, set against a vibrant sunset sky. The sky transitions from a deep purple at the top to a bright orange and yellow near the horizon. The platform's structure, including its deck and various towers, is clearly outlined against the bright light of the setting sun. The foreground is dark and appears to be the surface of the ocean.

THANK YOU!



A.Richter et al.

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

Separating tropospheric from stratospheric signal using MAX-DOAS measurements

Differential slant column density

(relative to the Fraunhofer reference spectrum):

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

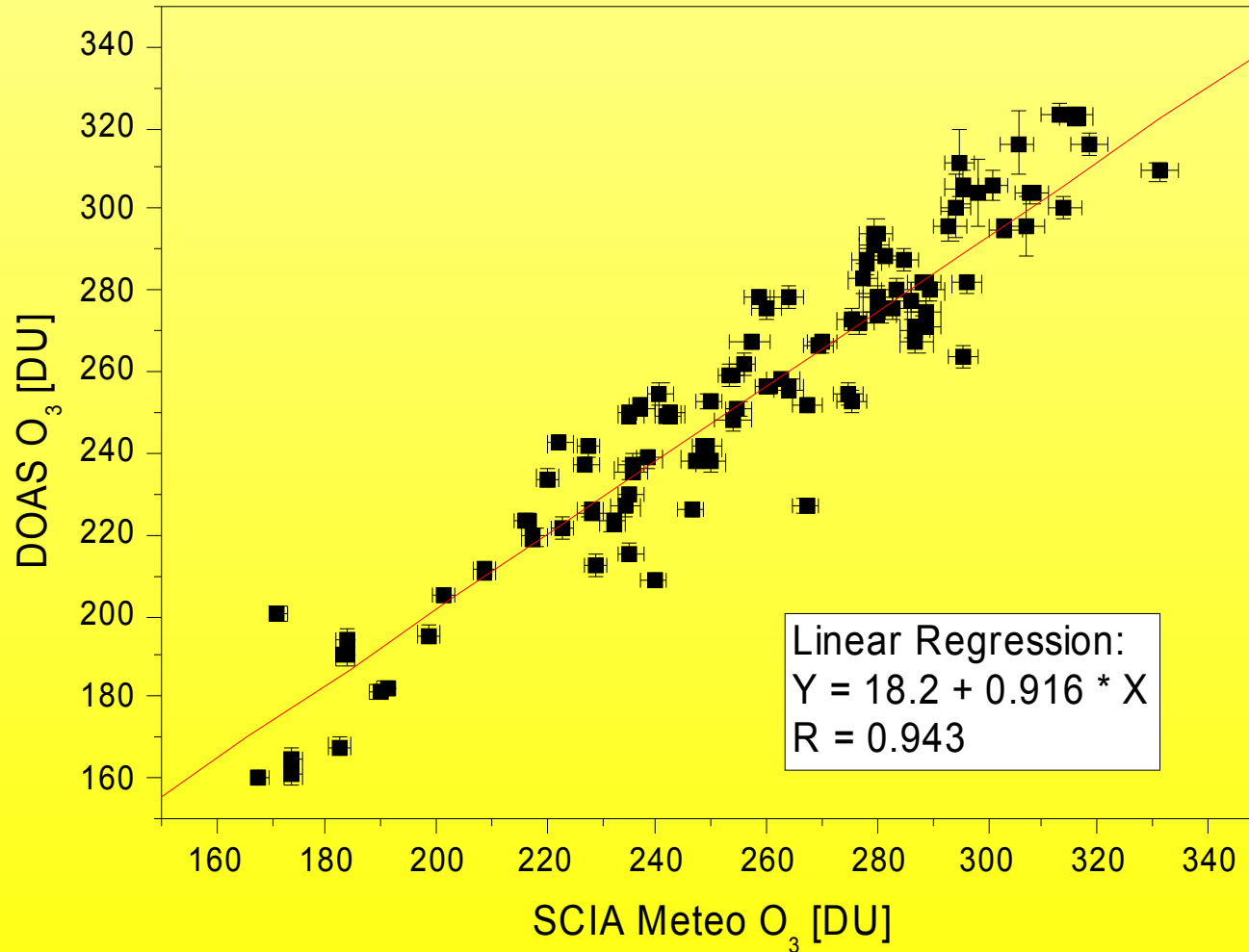
Line of sight slant column difference

(relative to the zenith observation at same SZA):

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

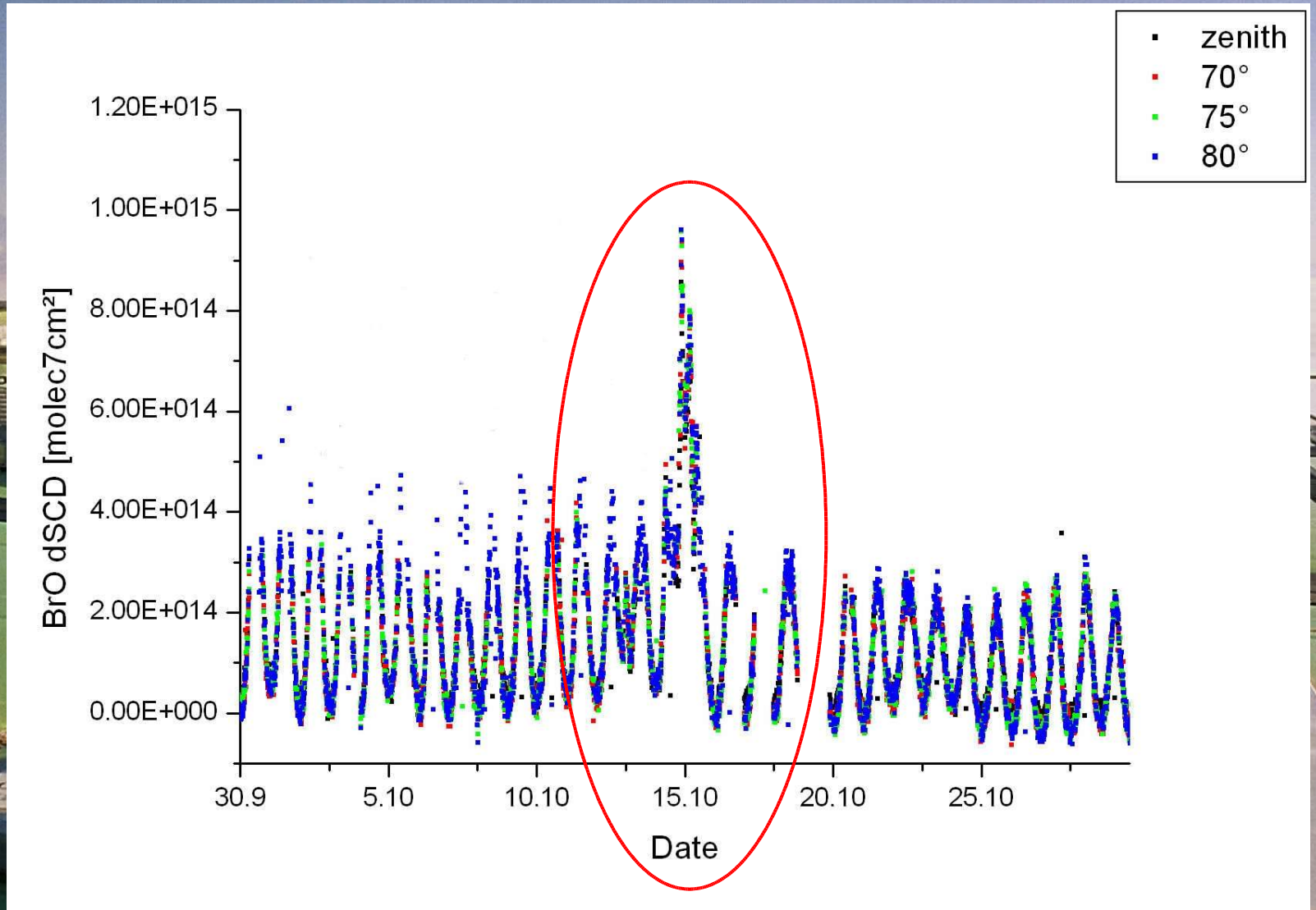
–Sensitive only to tropospheric absorption!

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



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Bremen, December 7th, 2004

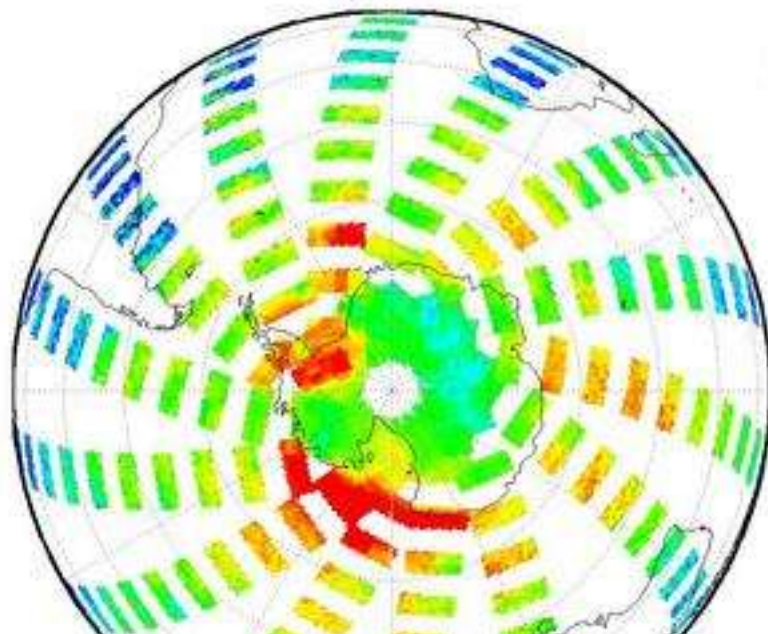
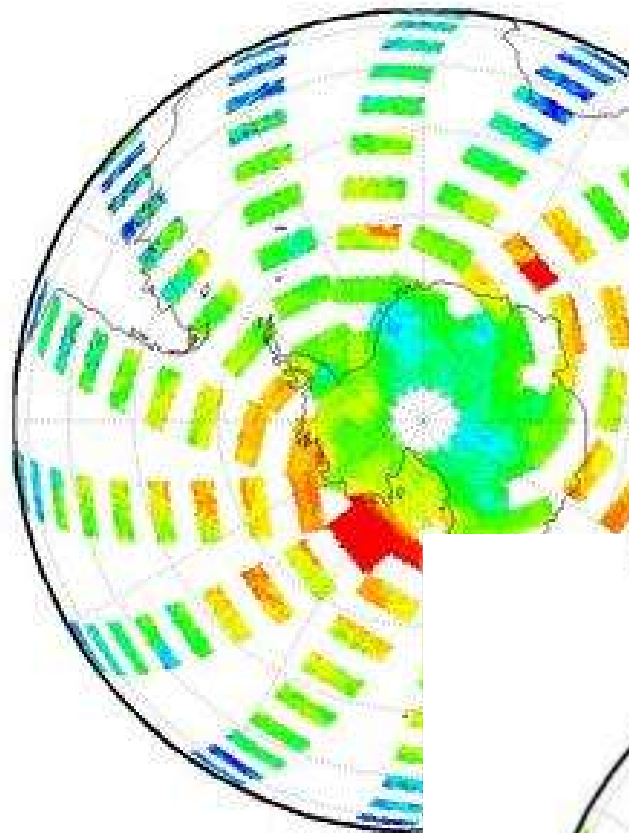
Arrival Heights/Antarctica (77° N, 166° E): BrO dSCD



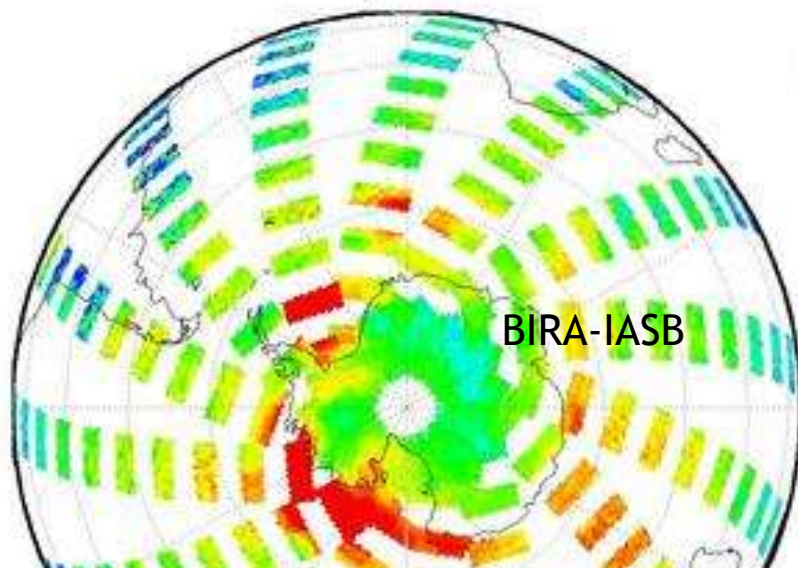
BrO clouds as seen by Sciamachy Heights/Antarctica

SCIA BrO, 16 Oct 2003

SCIA BrO, 13 Oct 2

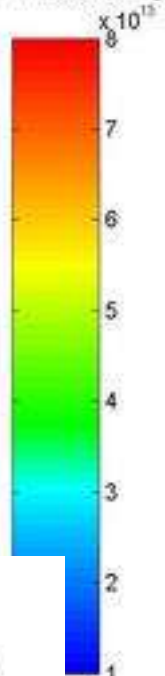


SCIA BrO, 17 Oct 2003

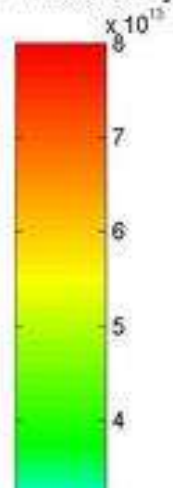


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BrO VCD
[$\times 10^{13}$ molec/cm²]



BrO VCD
[$\times 10^{13}$ molec/cm²]



5th Ge

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

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