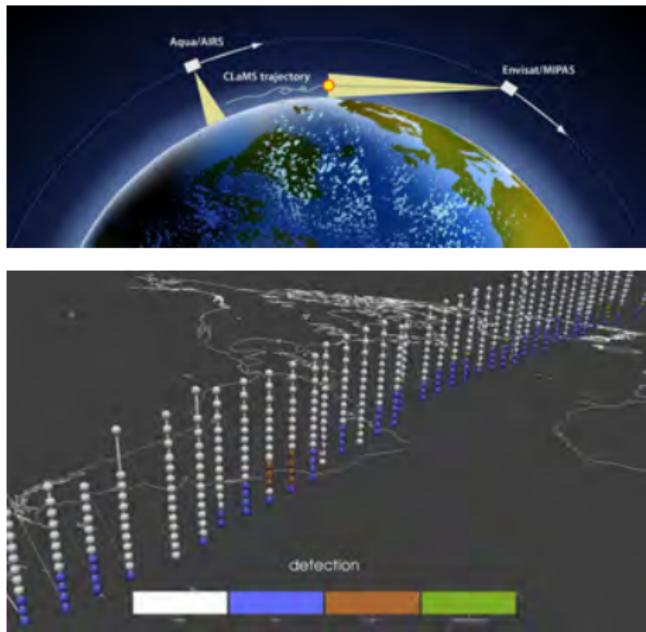


MIPAS Volcanic Sulfate Aerosol Observations of the Nabro Eruption

29 October 2013 | S. Griessbach, L. Hoffmann, R. Spang, M. von Hobe, R. Müller,
M. Riese

Envisat MIPAS



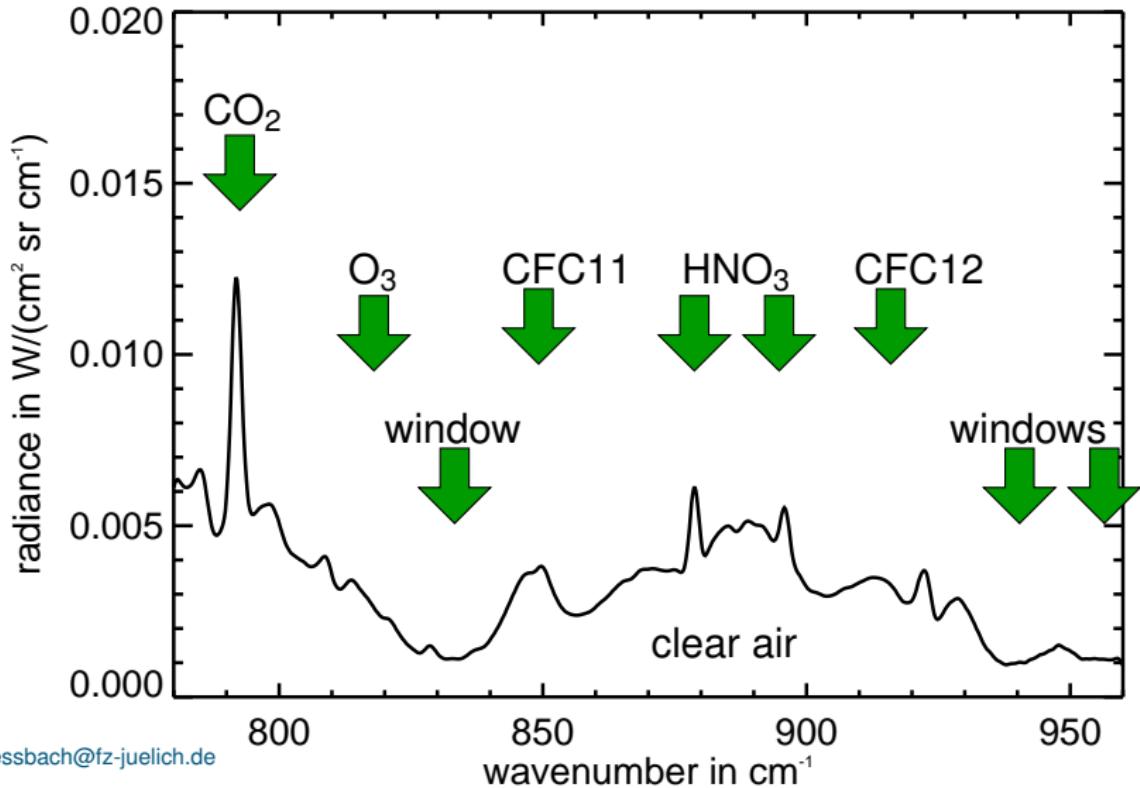
- Envisat MIPAS: 2002–2012
- infrared limb sounder
 $4–16\text{ }\mu\text{m}$ ($2410–685\text{ cm}^{-1}$)
- 14 orbits per day
- global coverage day and night
- high spectral resolution:
 0.0625 cm^{-1}
- limb geometry: 5–70 km
- 1.5 km vertical sampling in the UTLS

Figures: Bernd Hentschel

s.griessbach@fz-juelich.de

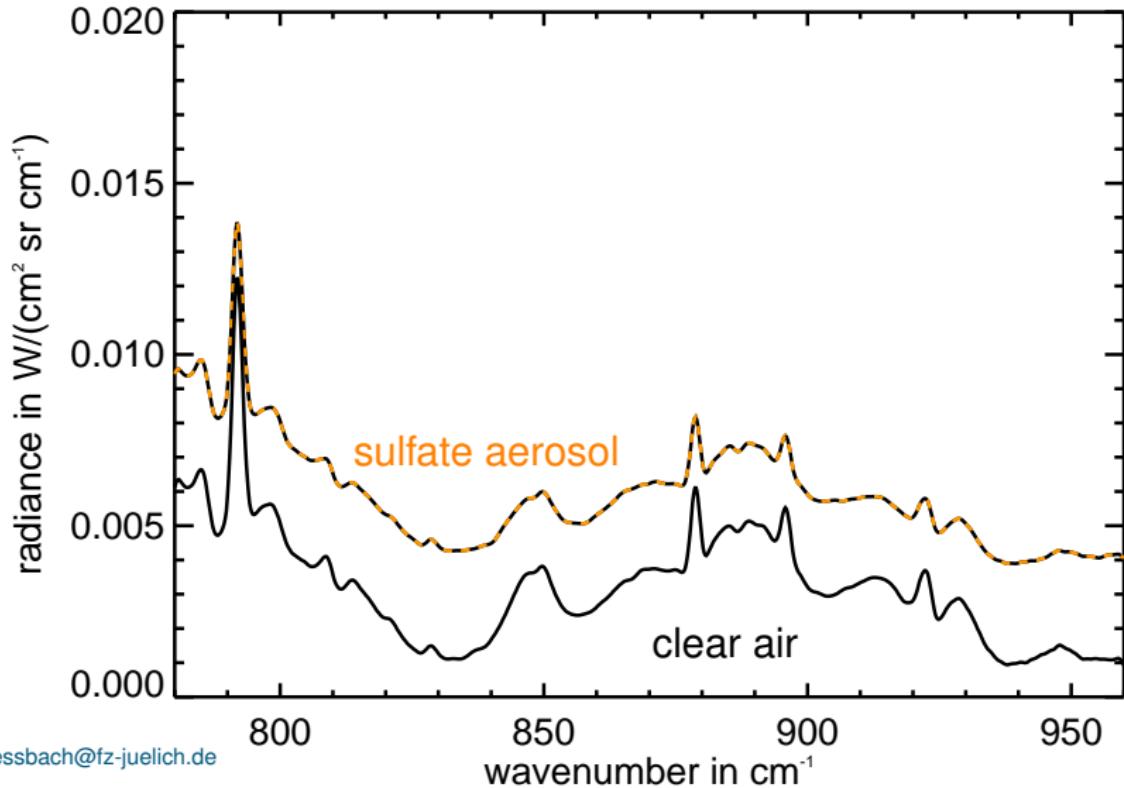
IR limb emission spectra

MIPAS 2011-06-14 @ 17 - 18km



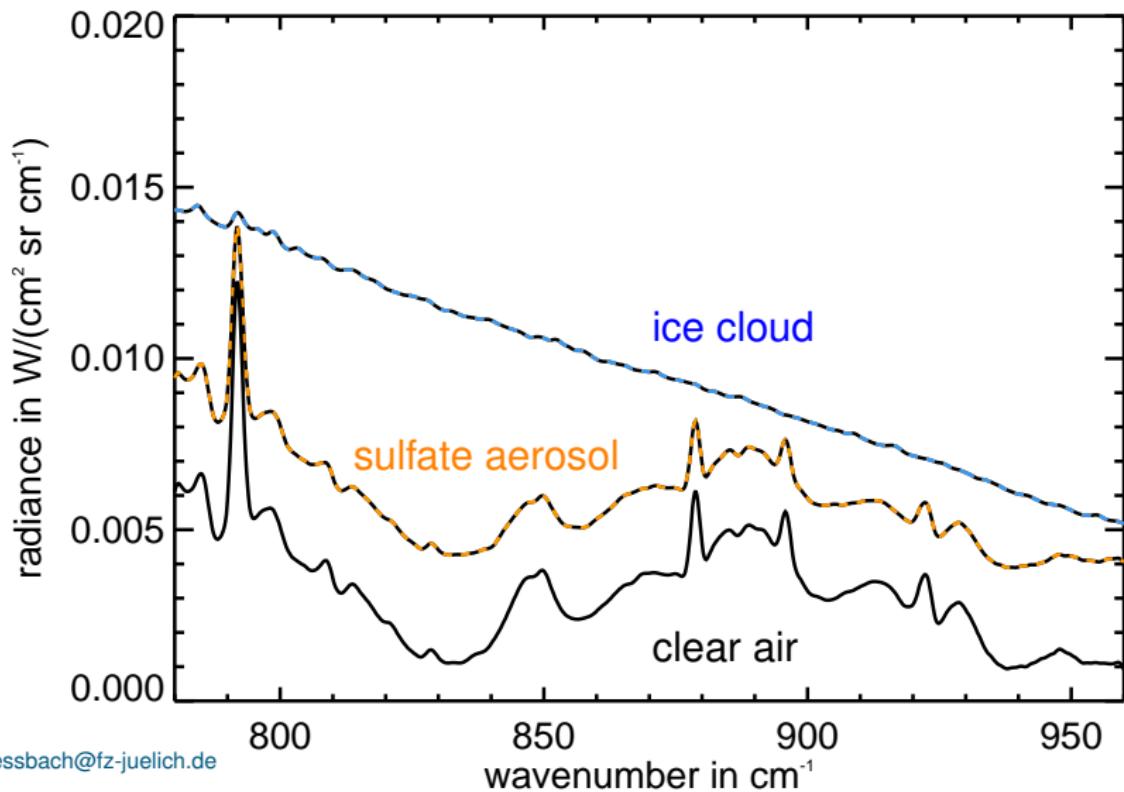
IR limb emission spectra

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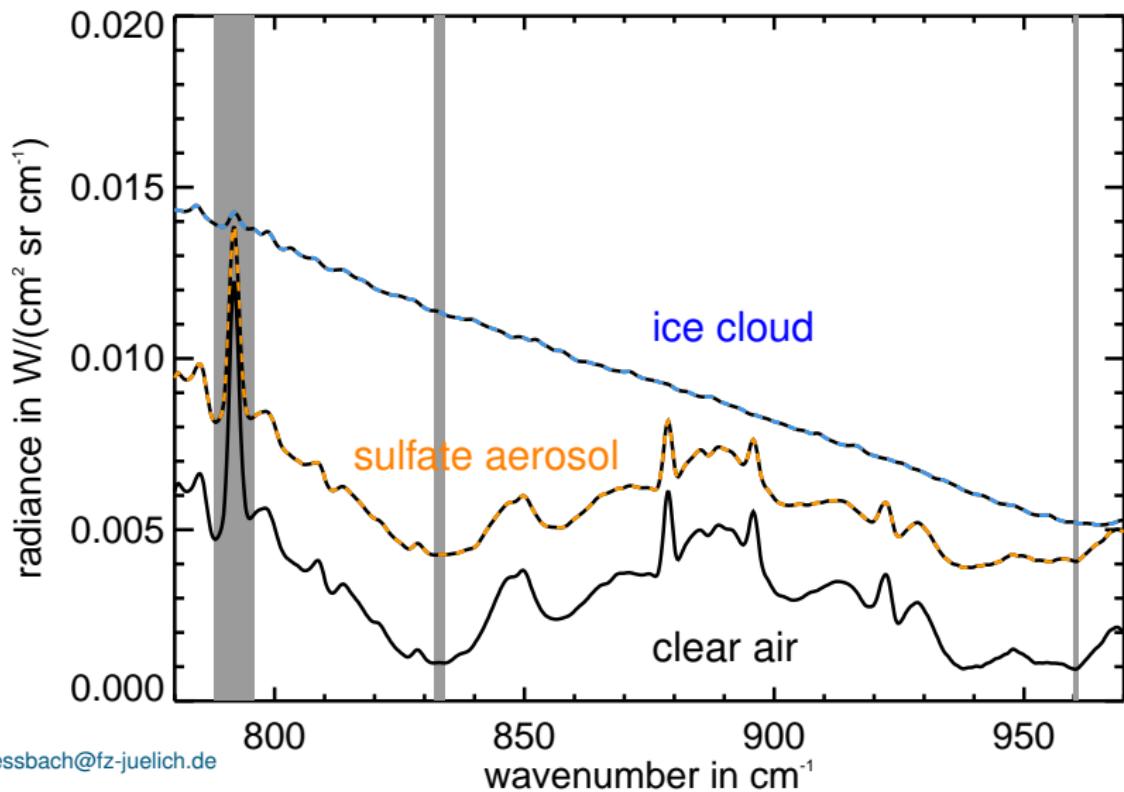
IR limb emission spectra

MIPAS 2011-06-14 @ 17 - 18km

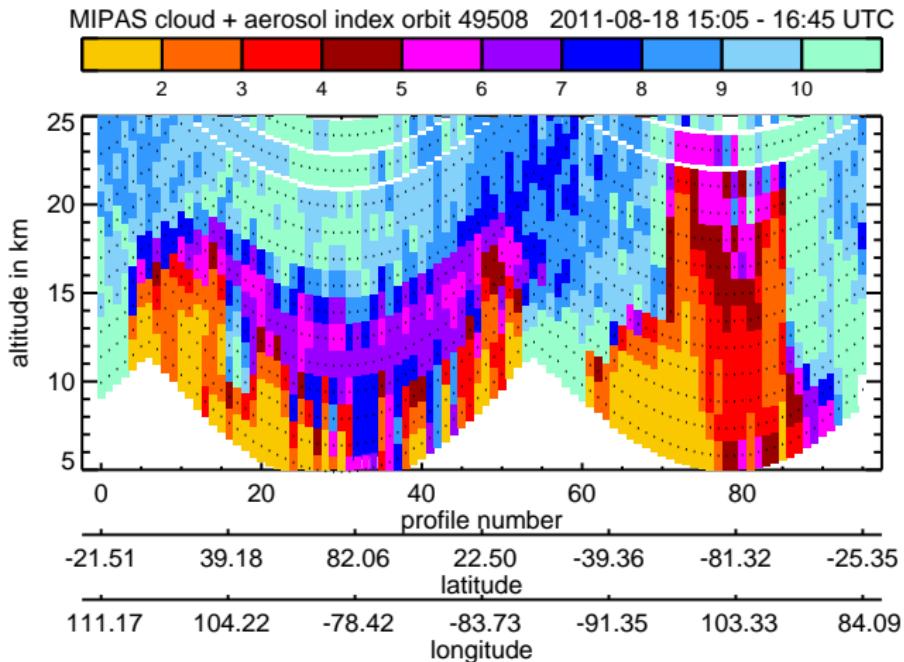


IR limb emission spectra

MIPAS 2011-06-14 @ 17 - 18km

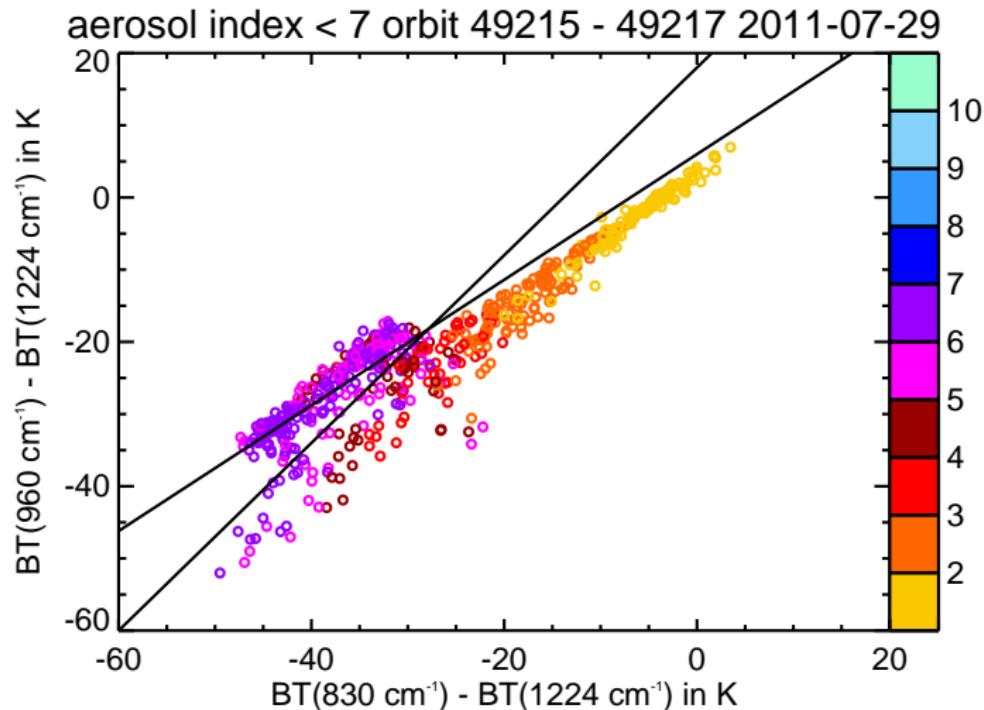


Aerosol Cloud Index

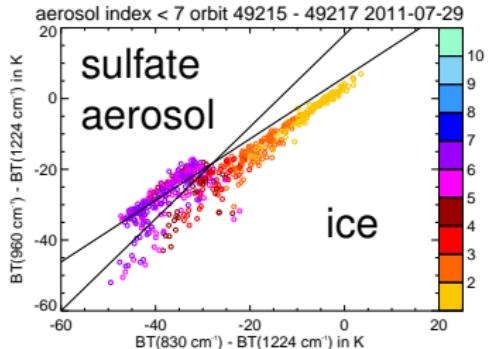


Aerosol-Cloud index values lower 7 indicate aerosol and clouds.

The New Sulfate Aerosol Filter

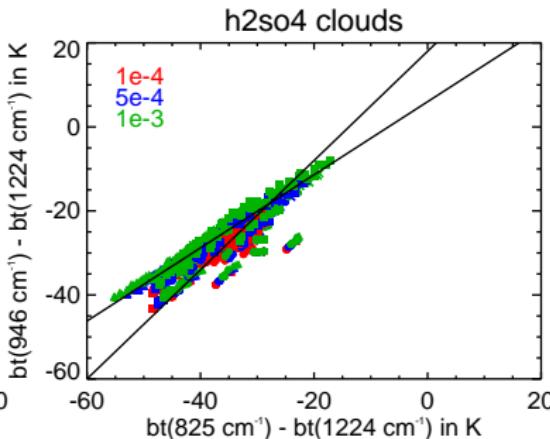
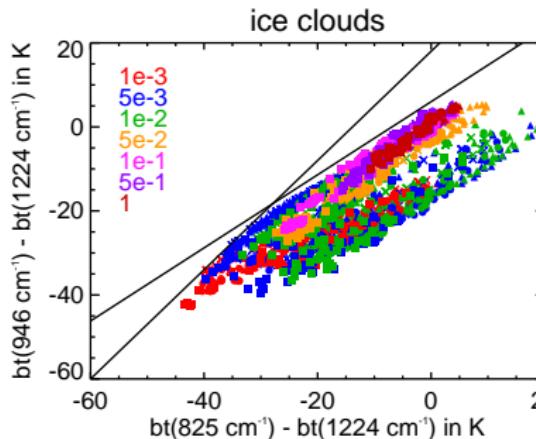


The New Sulfate Aerosol Filter



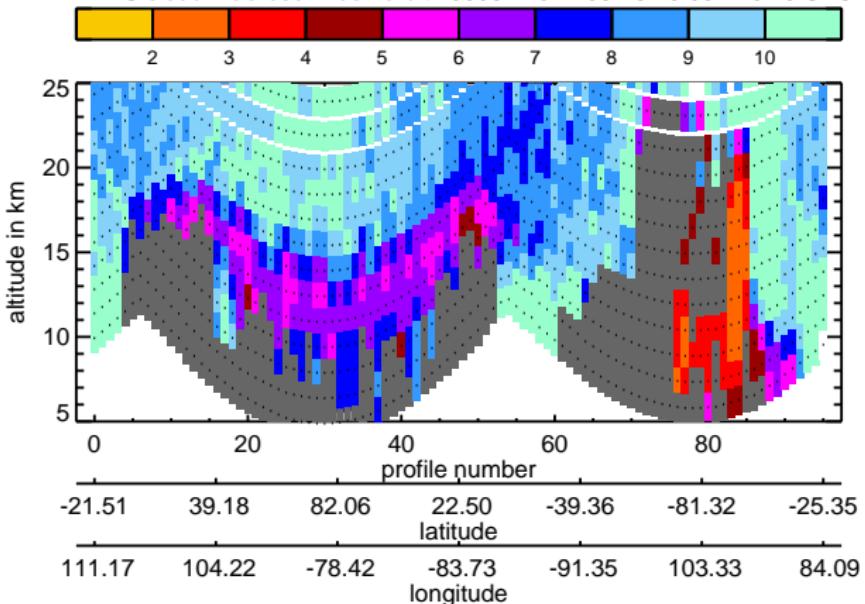
MIPAS measurements

Simulations



Sulfate Aerosol Detections

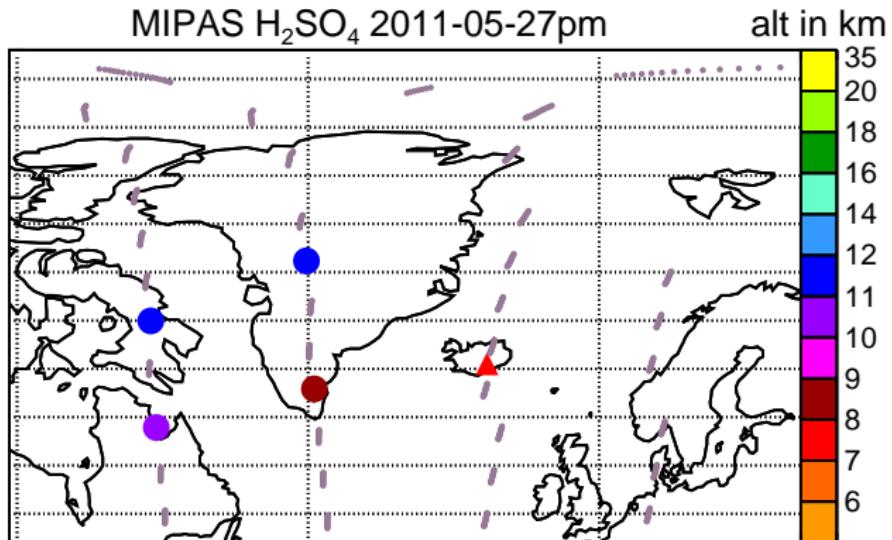
MIPAS cloud + aerosol index orbit 49508 2011-08-18 15:05 - 16:45 UTC



grey: ice
 blue: clear air
 pink/violet:
 sulfate aerosol
 orange/red:
 NAT/STS PSCs

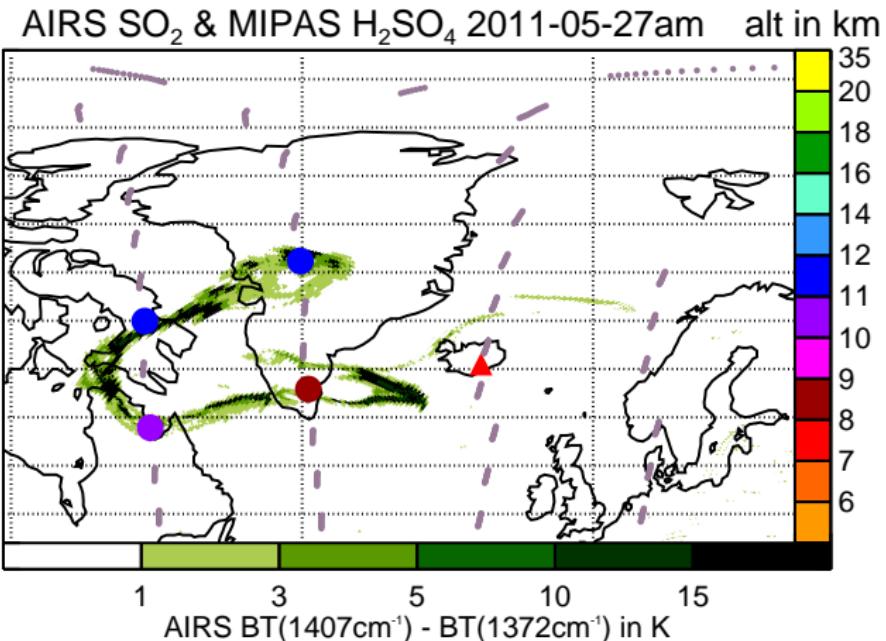
additionally filtered for volcanic ash

Method Verification - Location



MIPAS sulfate aerosol detections for Grimsvötn eruption in May 2011 in Iceland.

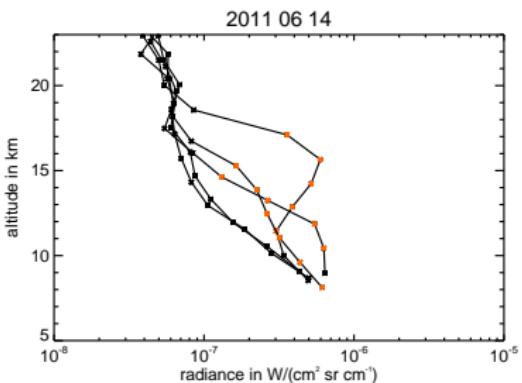
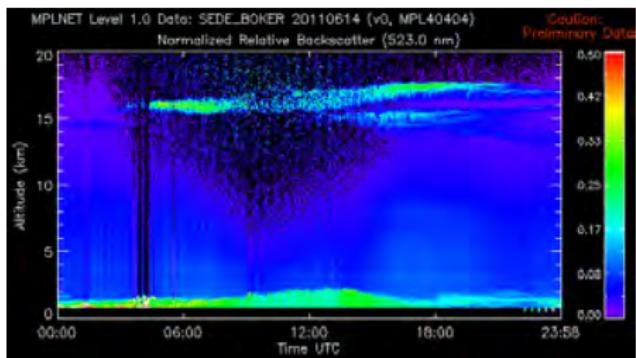
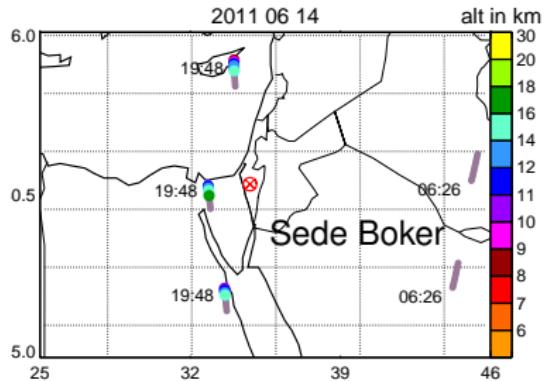
Method Verification - Location



Comparison of MIPAS sulfate aerosol and AIRS SO₂ nadir measurements.

Detections for Grimsvötn eruption in May 2011 in Iceland.

Method Verification - Aerosol Layer Top Altitude

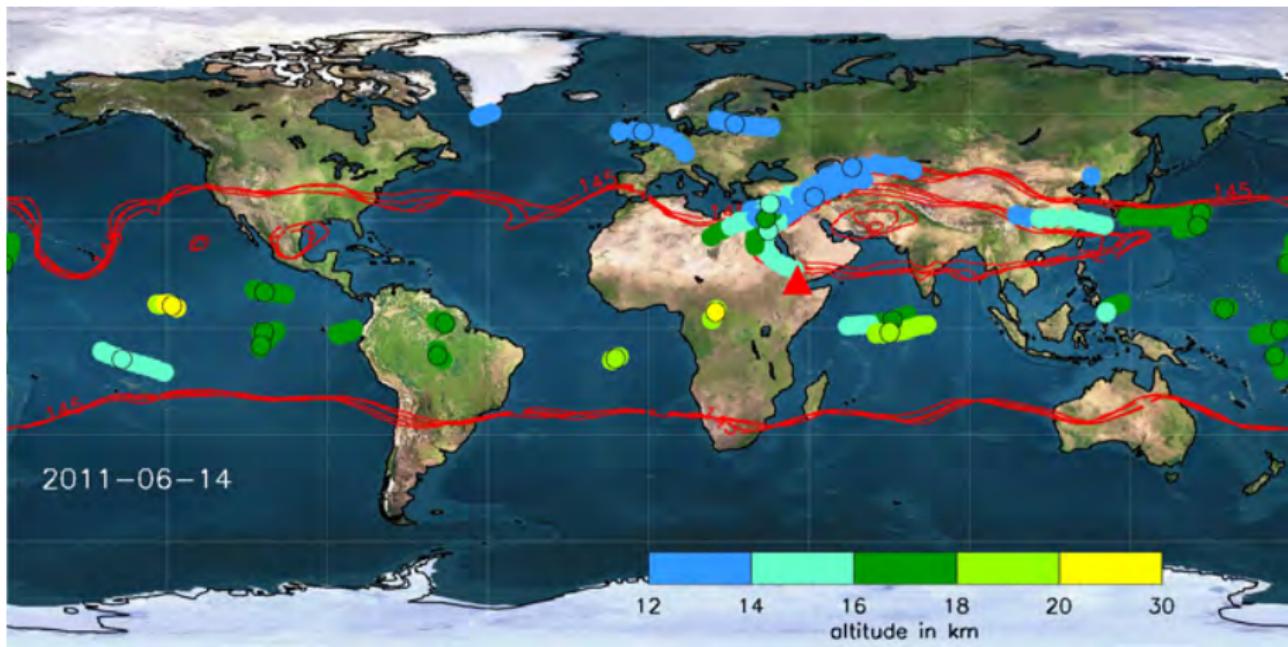


Lidar data by courtesy of Arnon Karnieli

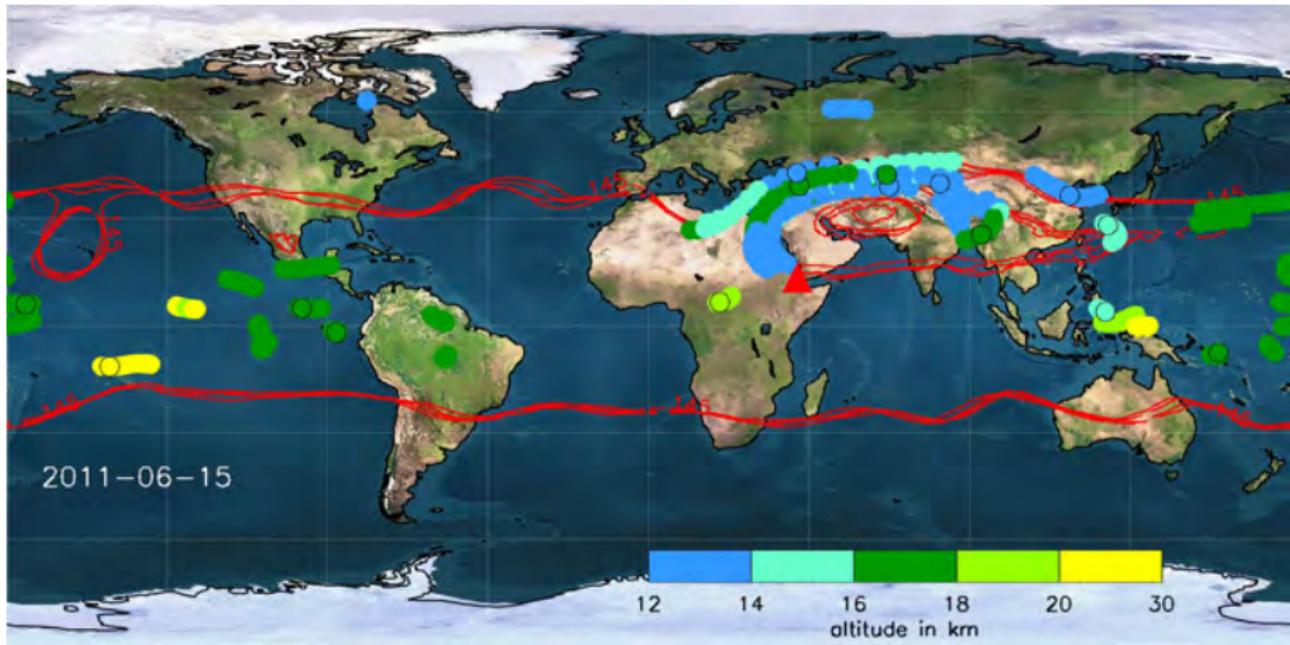
Comparison with ground based and spaceboure lidar measurements:

- aerosol top altitude overestimation lower than 100 m
- aerosol top altitude underestimation up to 1500 m

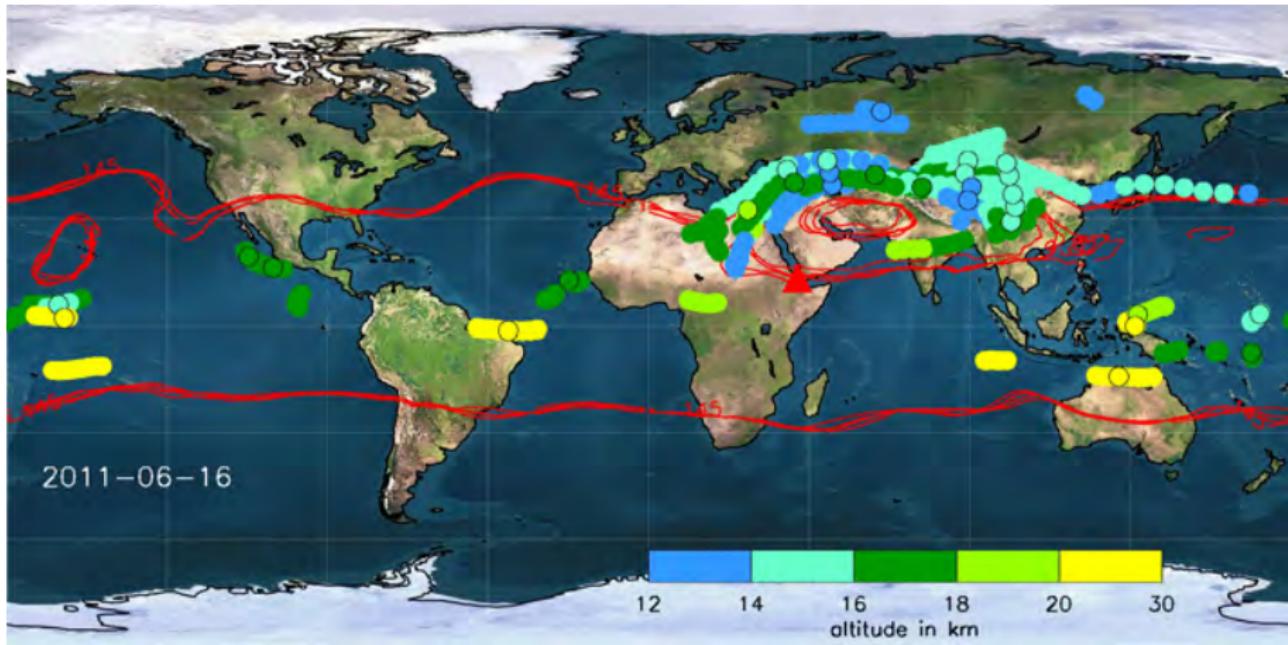
MIPAS observations of Nabro eruption



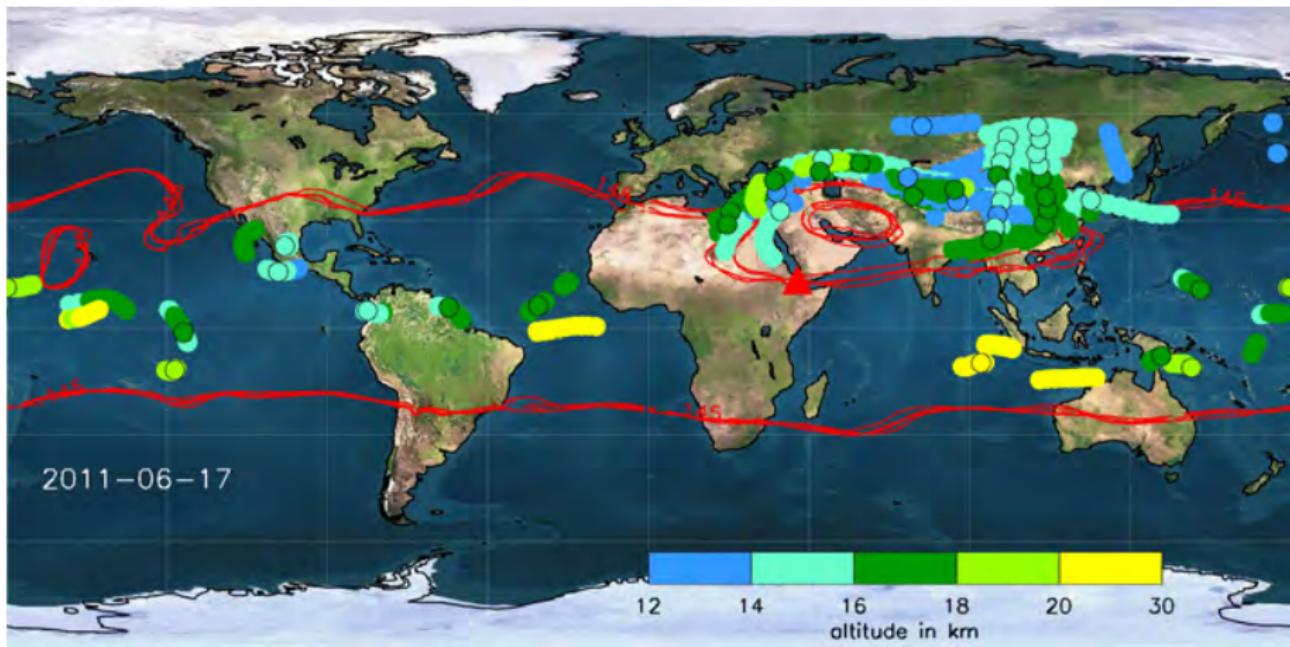
MIPAS observations of Nabro eruption



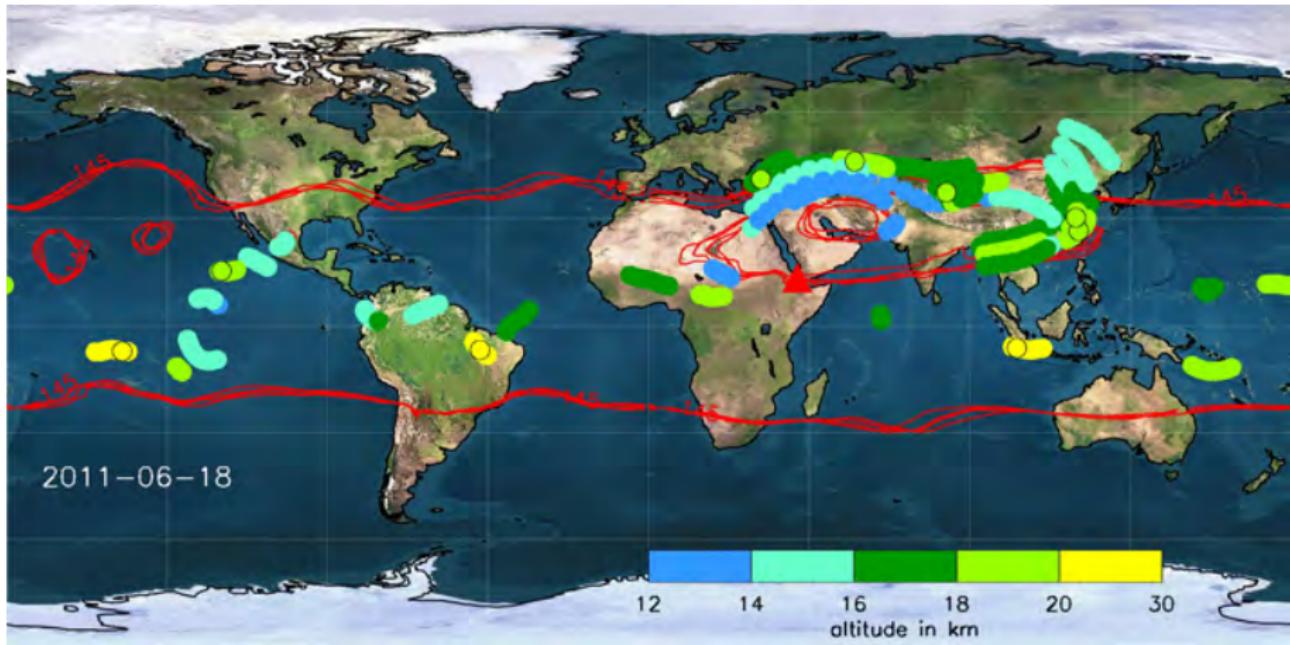
MIPAS observations of Nabro eruption



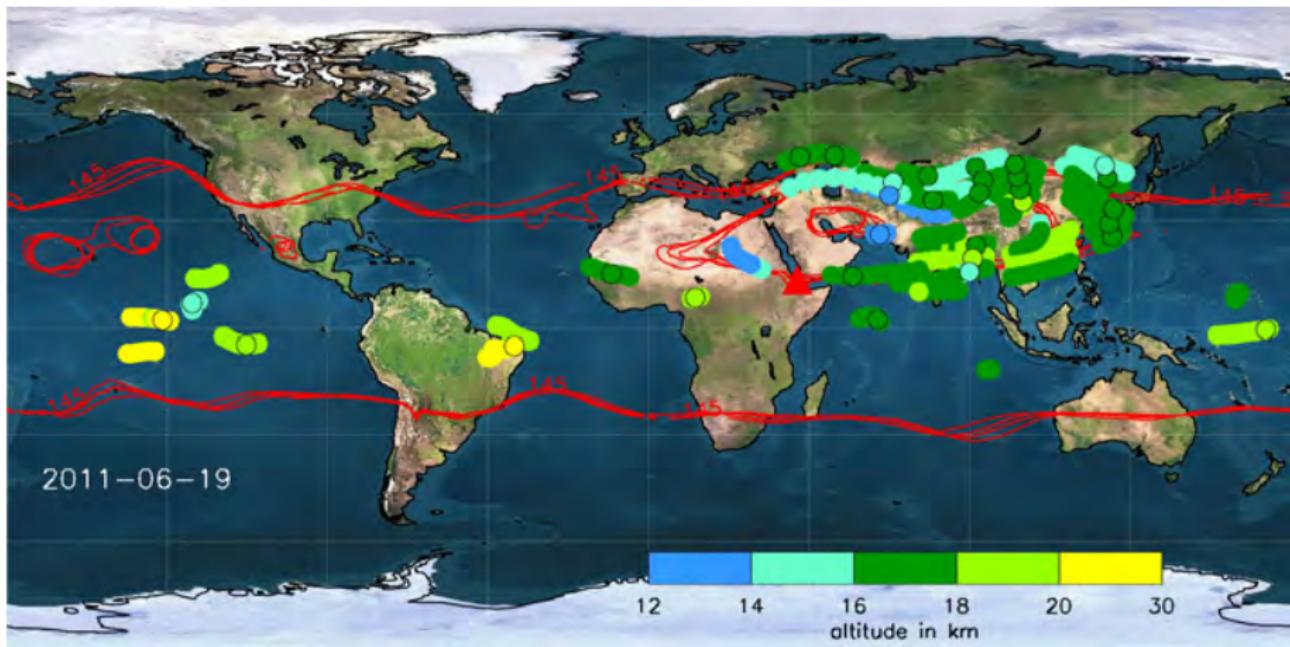
MIPAS observations of Nabro eruption



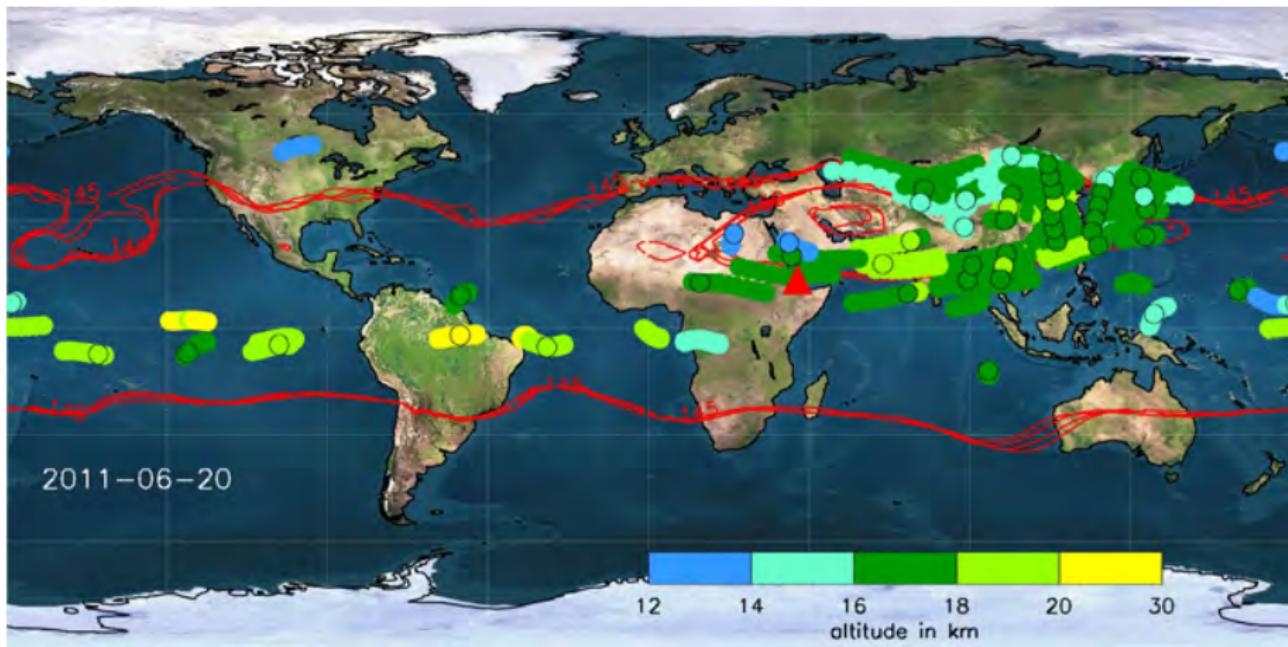
MIPAS observations of Nabro eruption



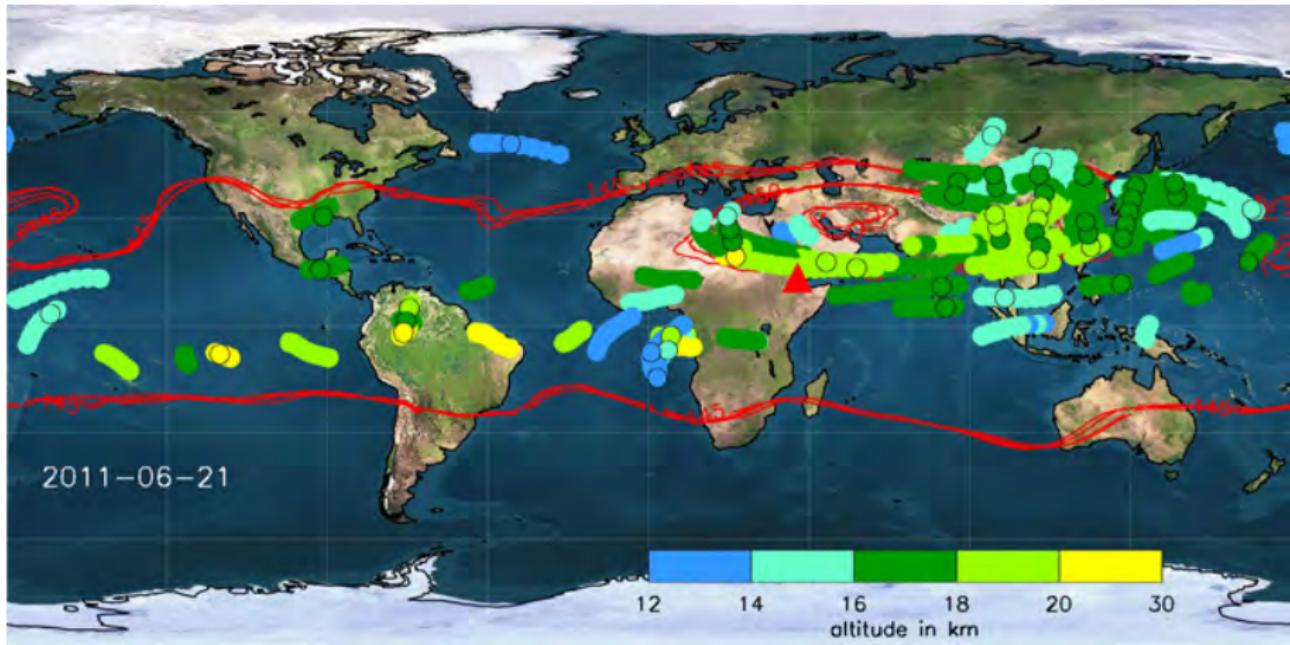
MIPAS observations of Nabro eruption



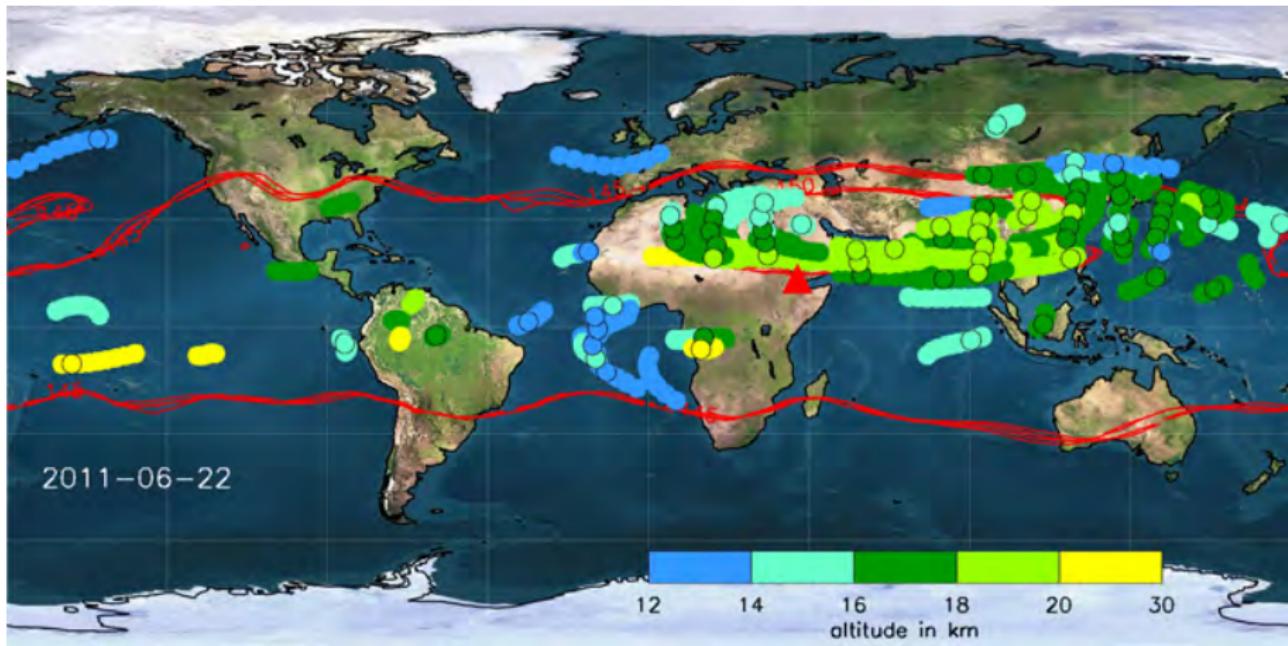
MIPAS observations of Nabro eruption



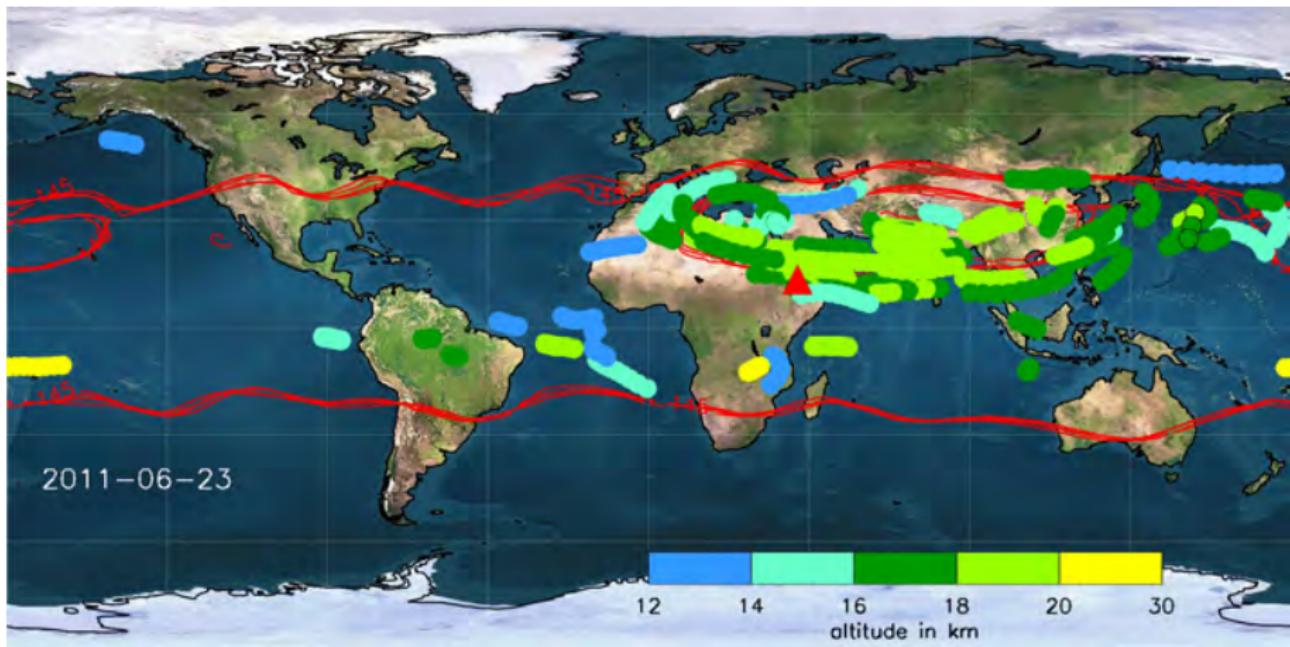
MIPAS observations of Nabro eruption



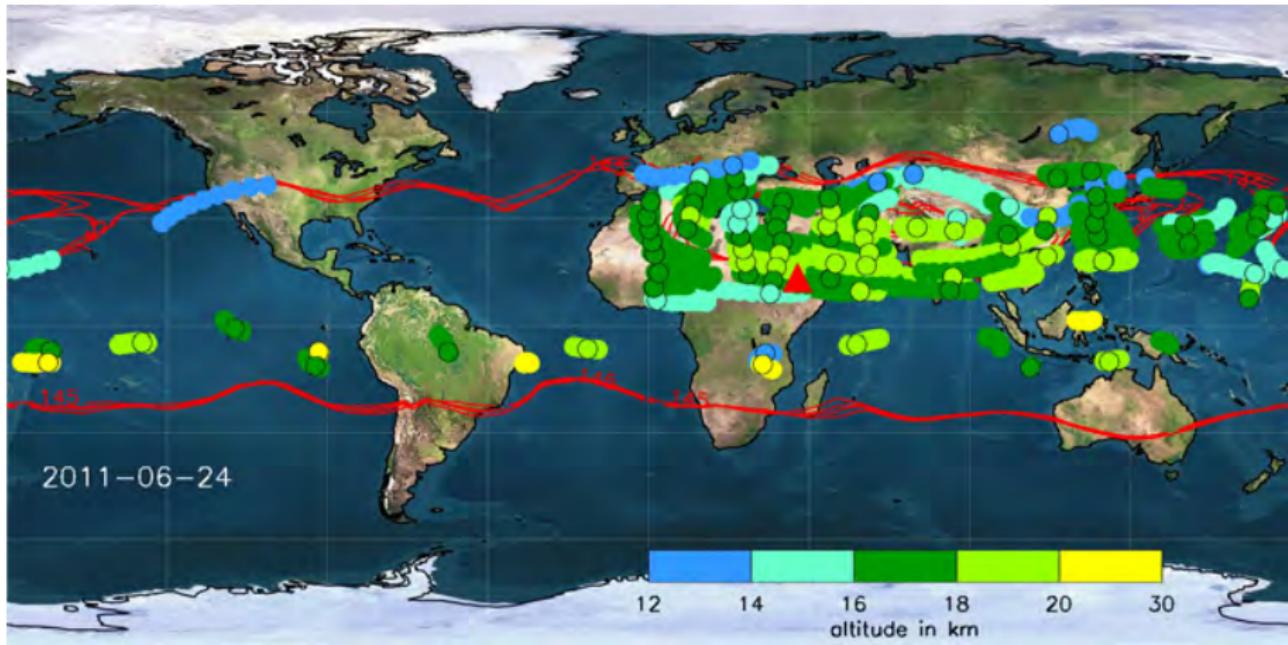
MIPAS observations of Nabro eruption



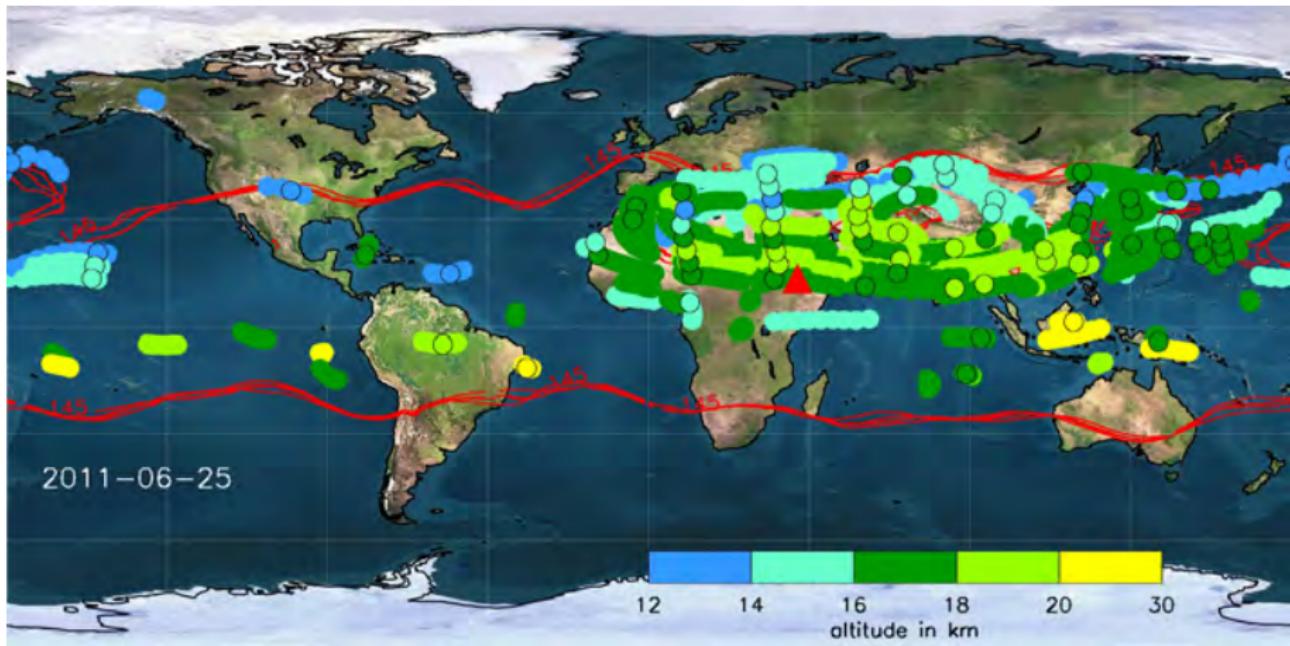
MIPAS observations of Nabro eruption



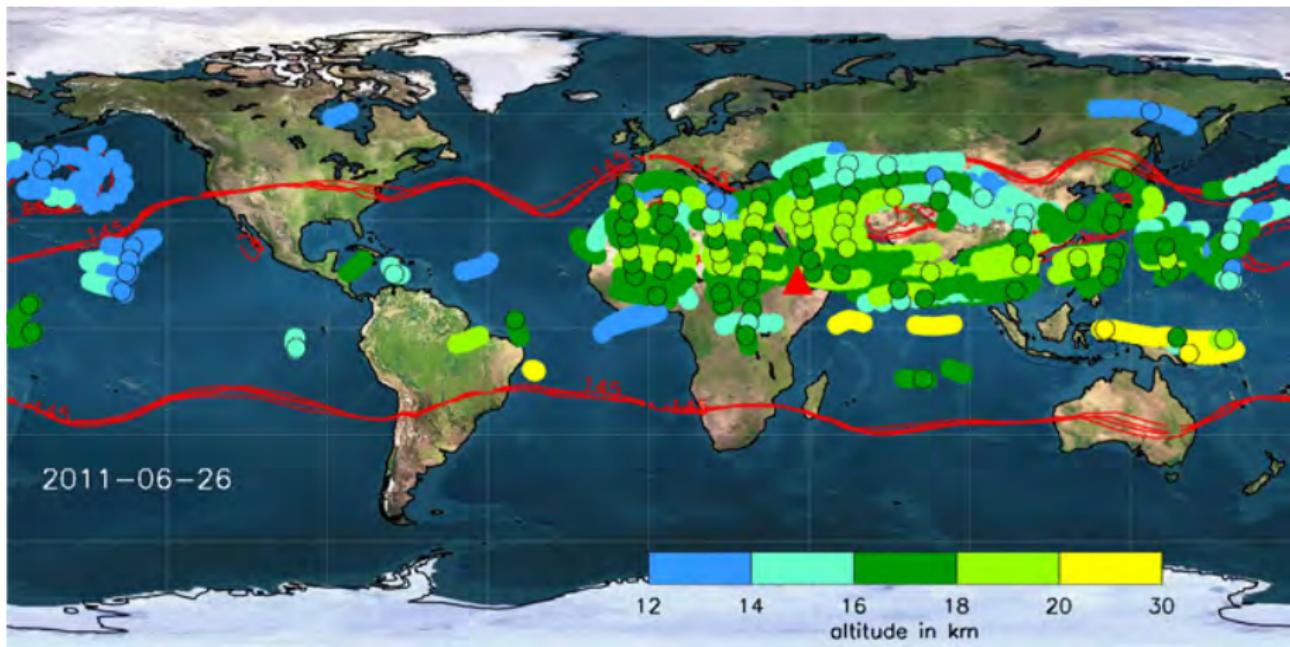
MIPAS observations of Nabro eruption



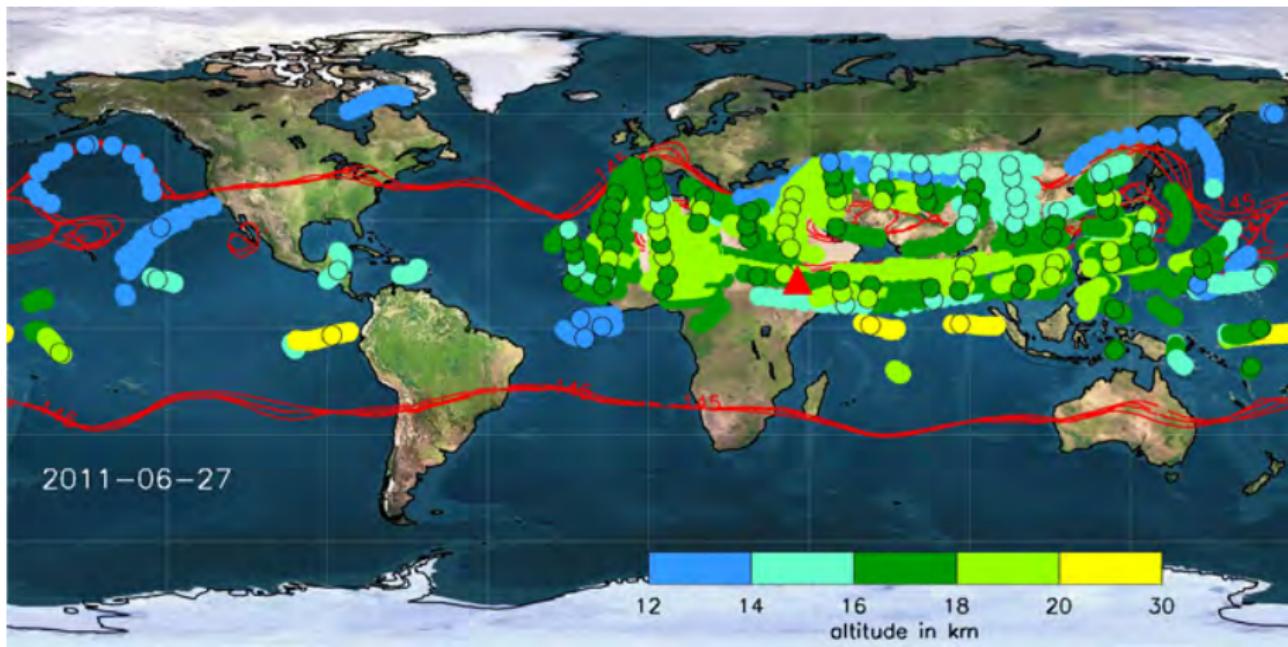
MIPAS observations of Nabro eruption



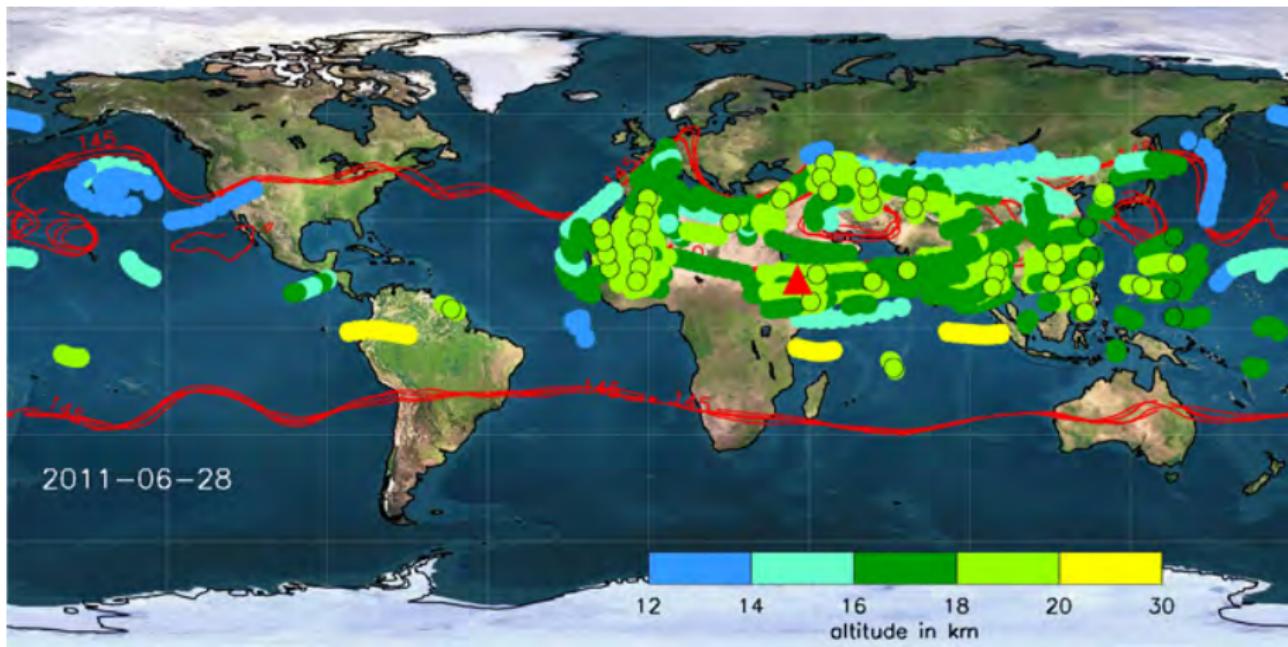
MIPAS observations of Nabro eruption



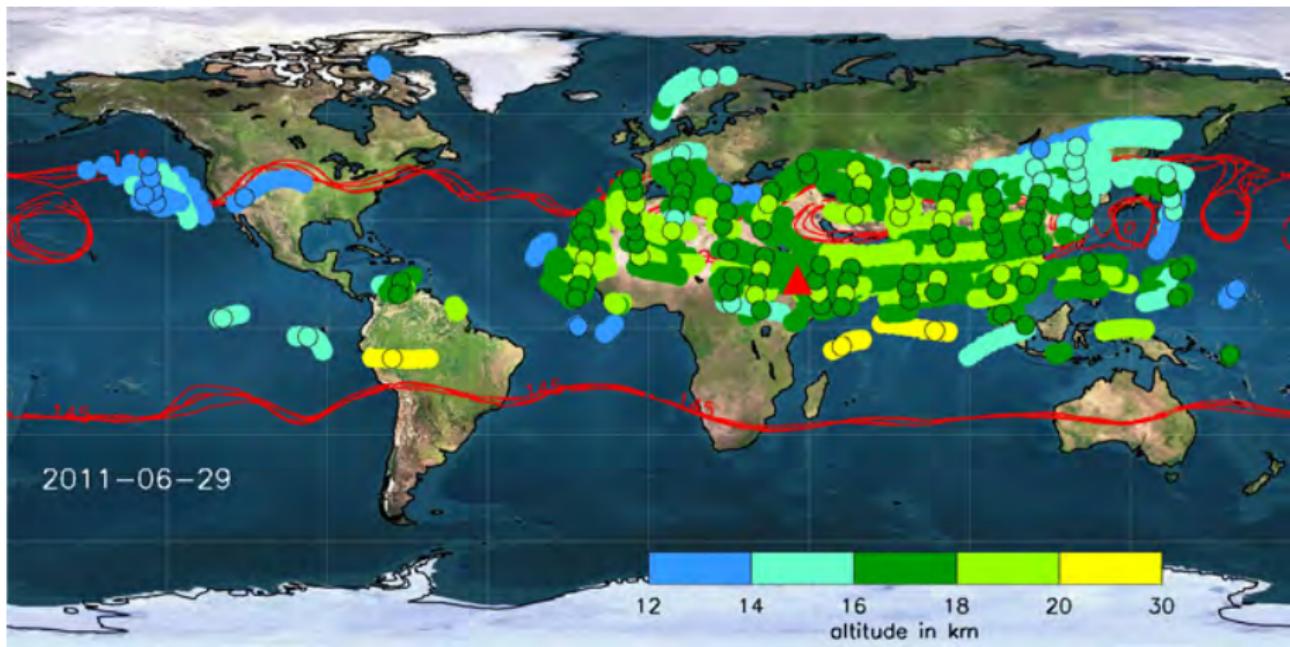
MIPAS observations of Nabro eruption



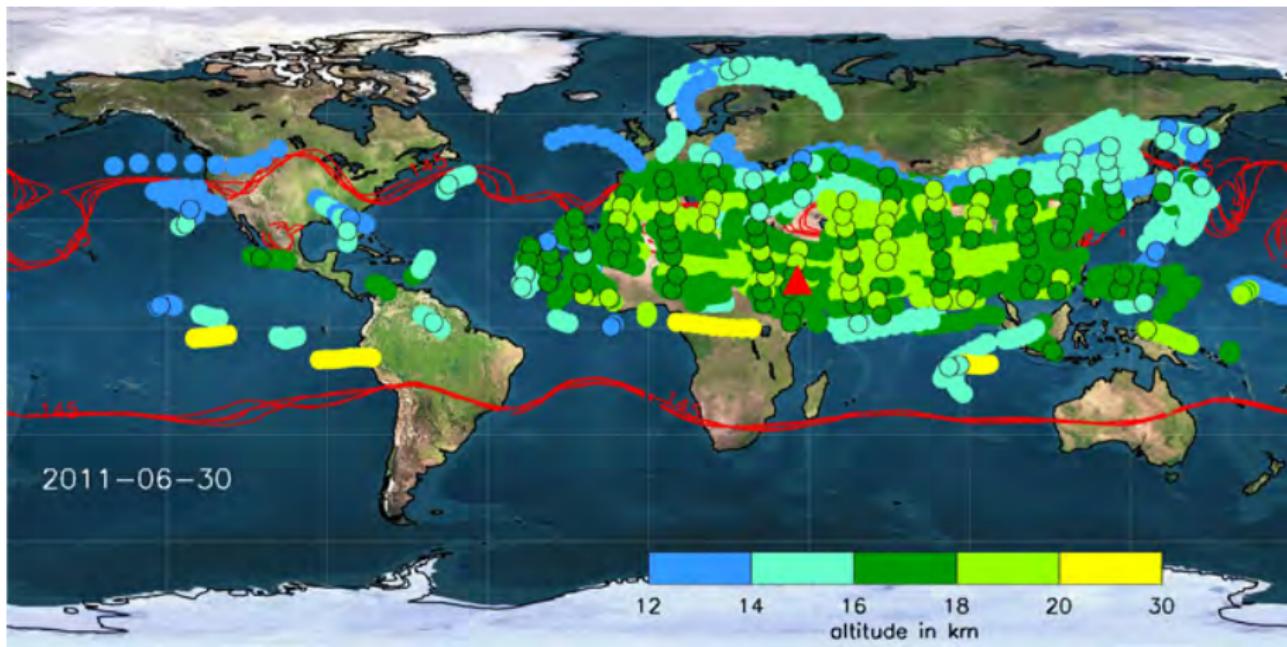
MIPAS observations of Nabro eruption



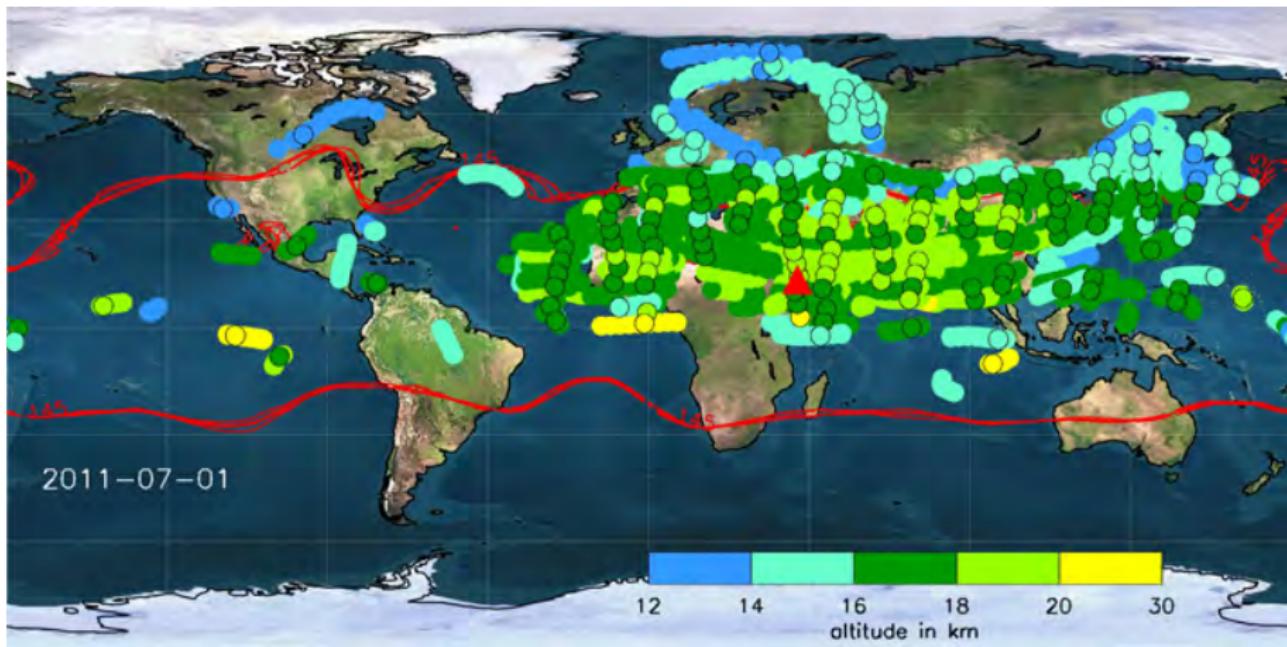
MIPAS observations of Nabro eruption



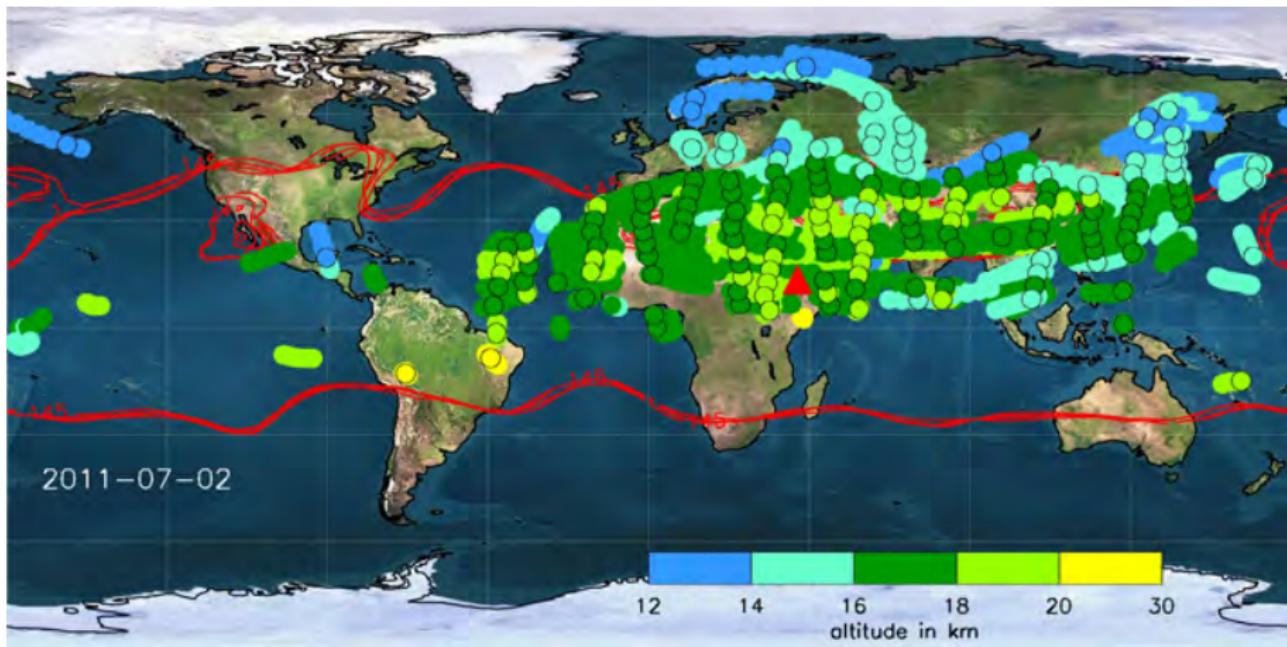
MIPAS observations of Nabro eruption



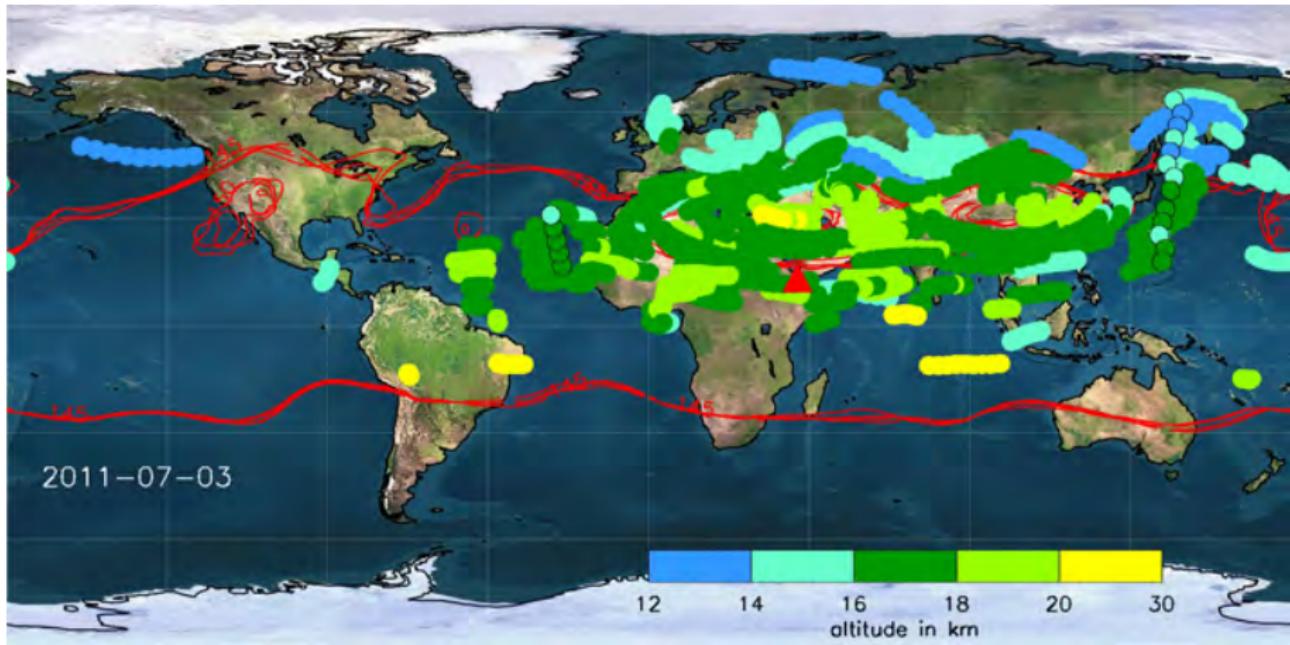
MIPAS observations of Nabro eruption



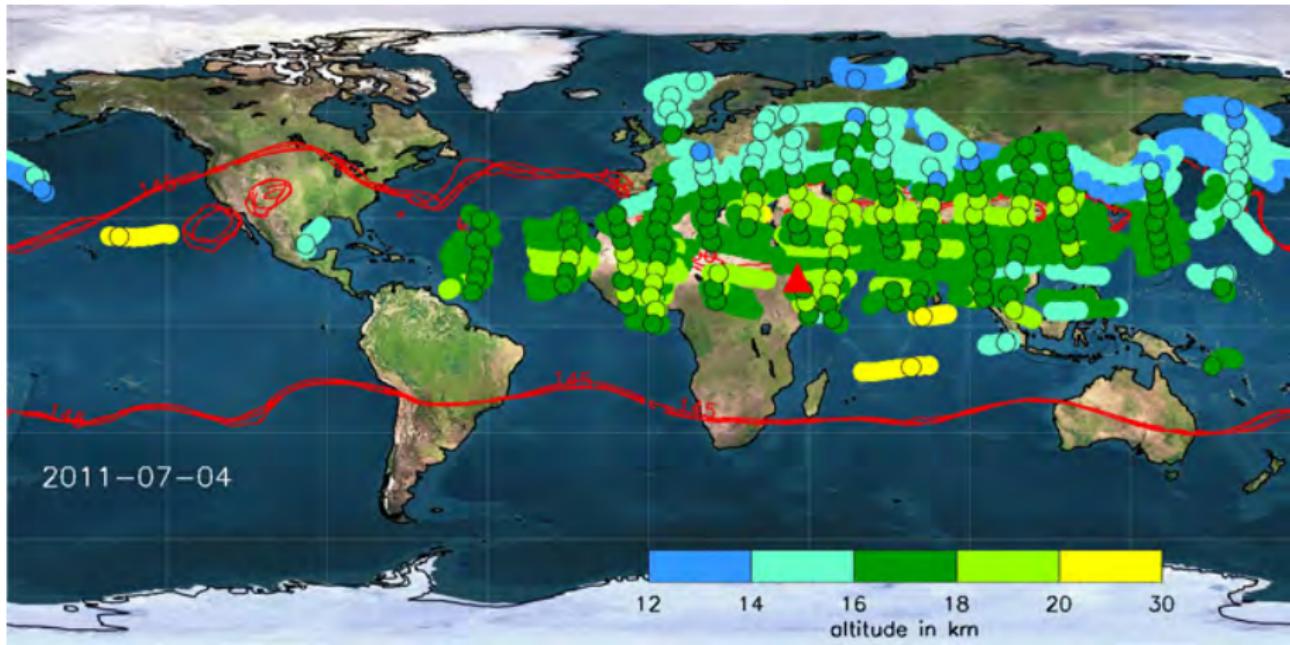
MIPAS observations of Nabro eruption



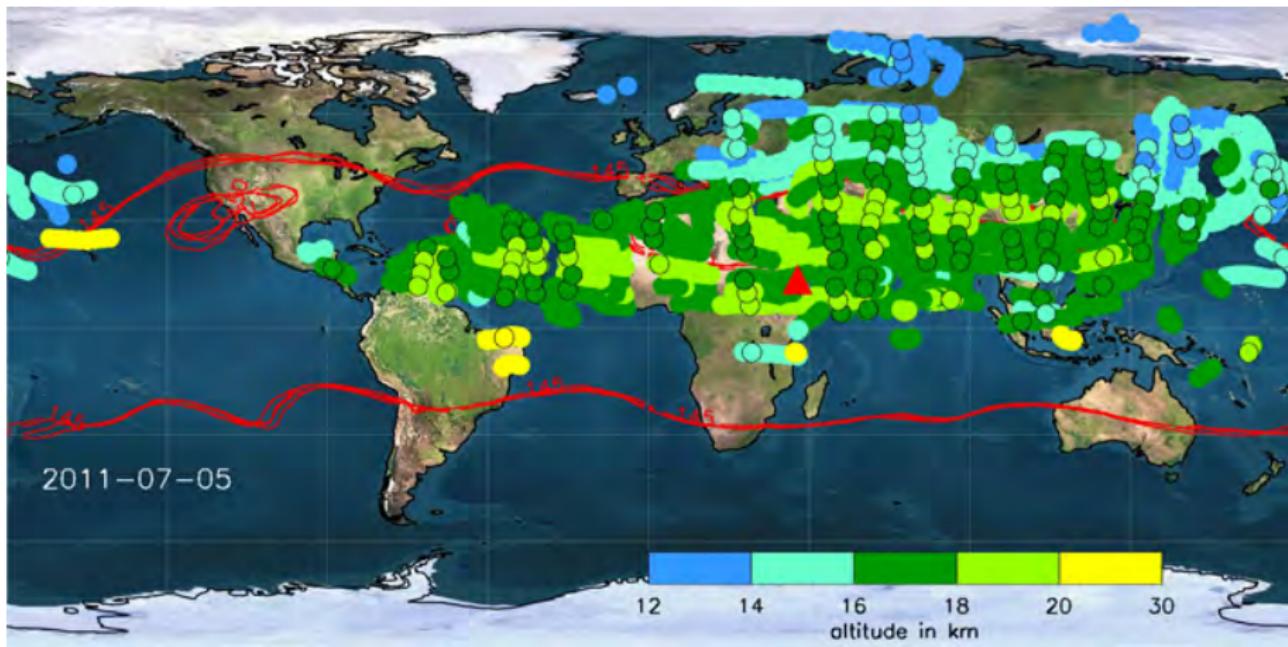
MIPAS observations of Nabro eruption



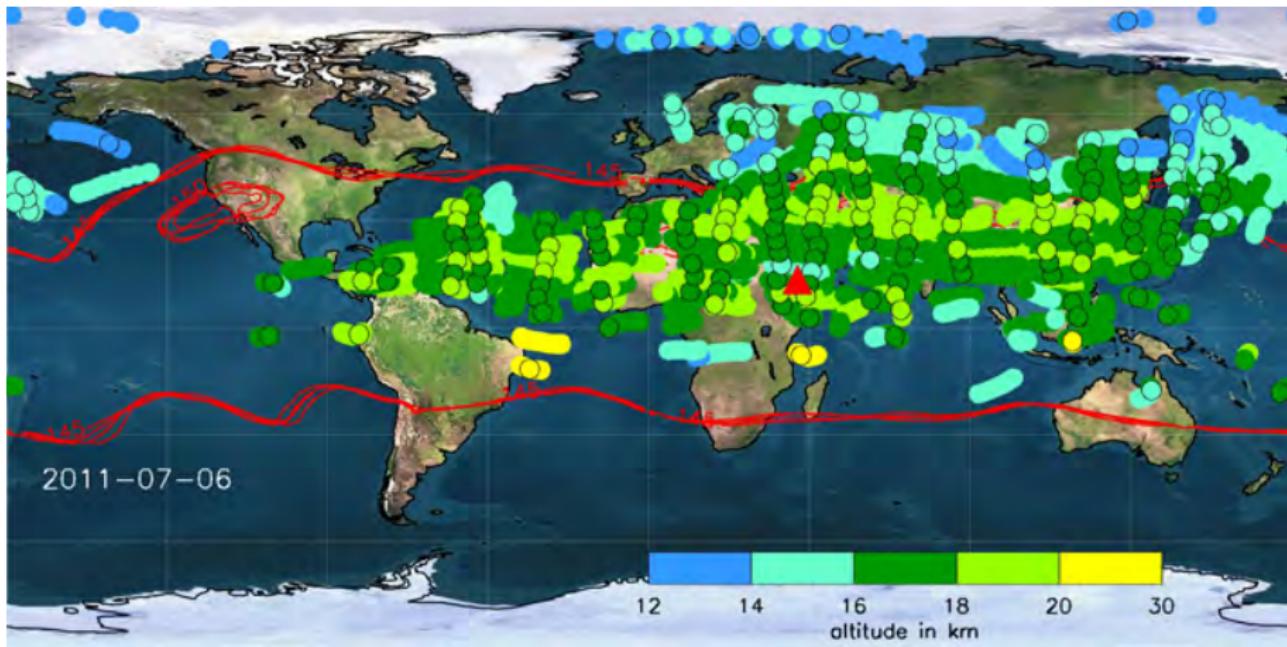
MIPAS observations of Nabro eruption



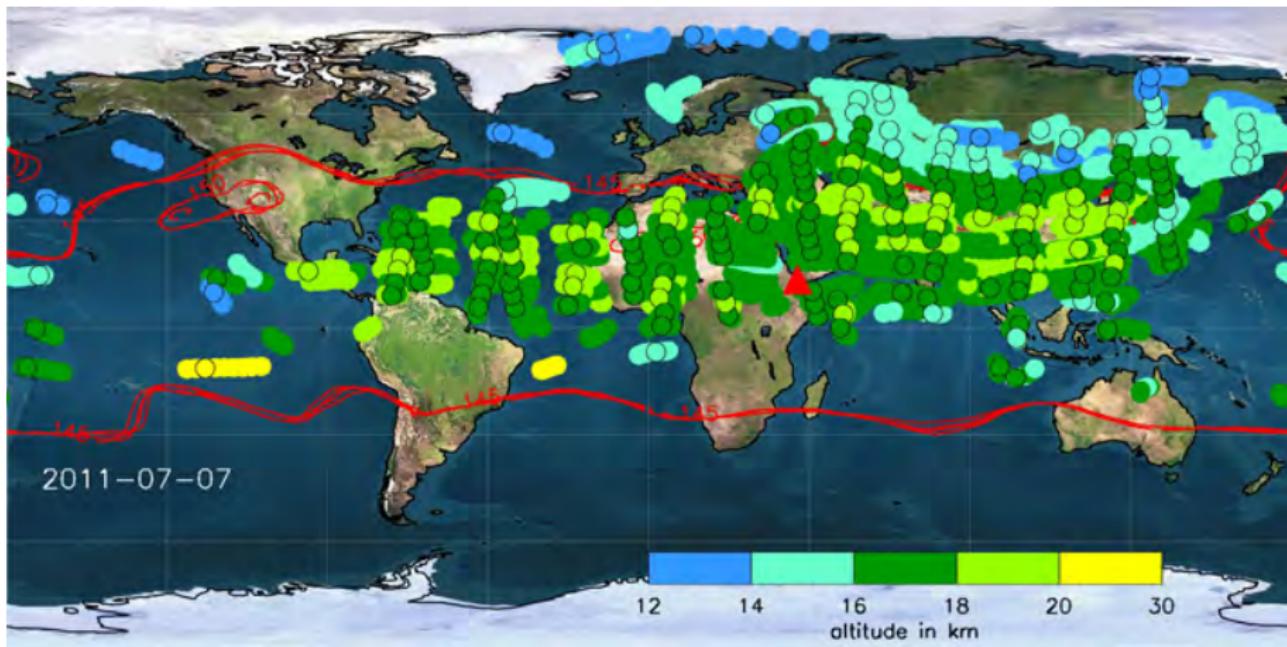
MIPAS observations of Nabro eruption



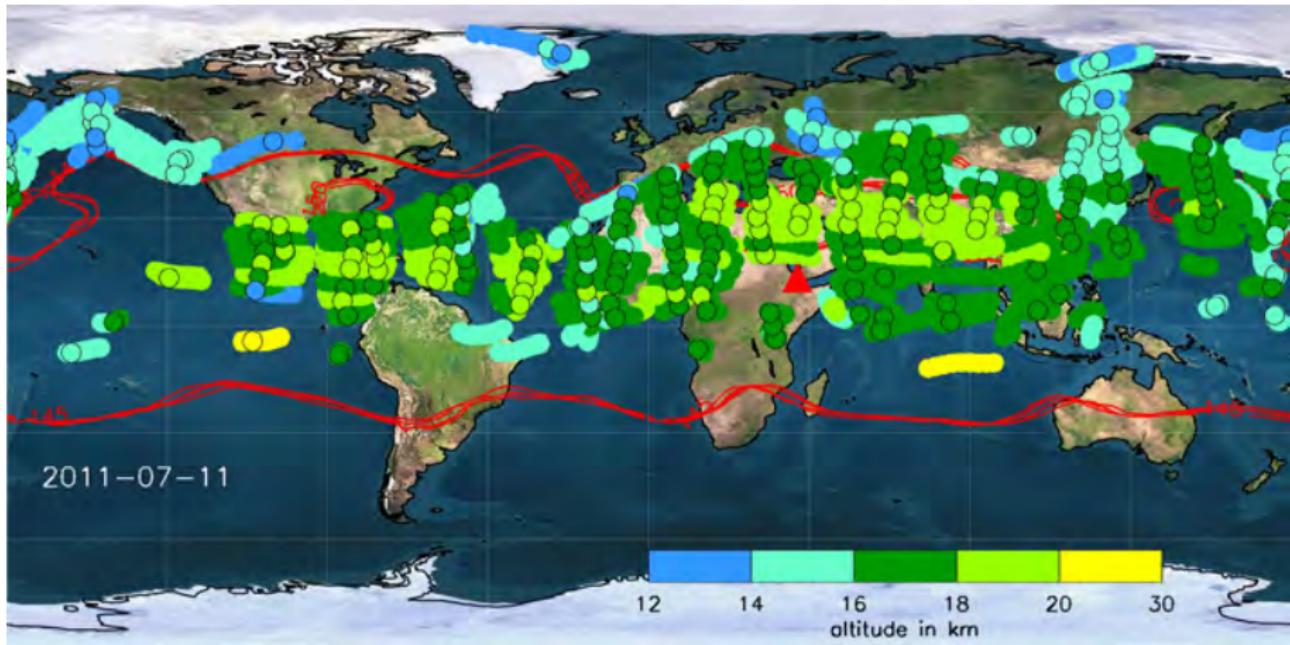
MIPAS observations of Nabro eruption



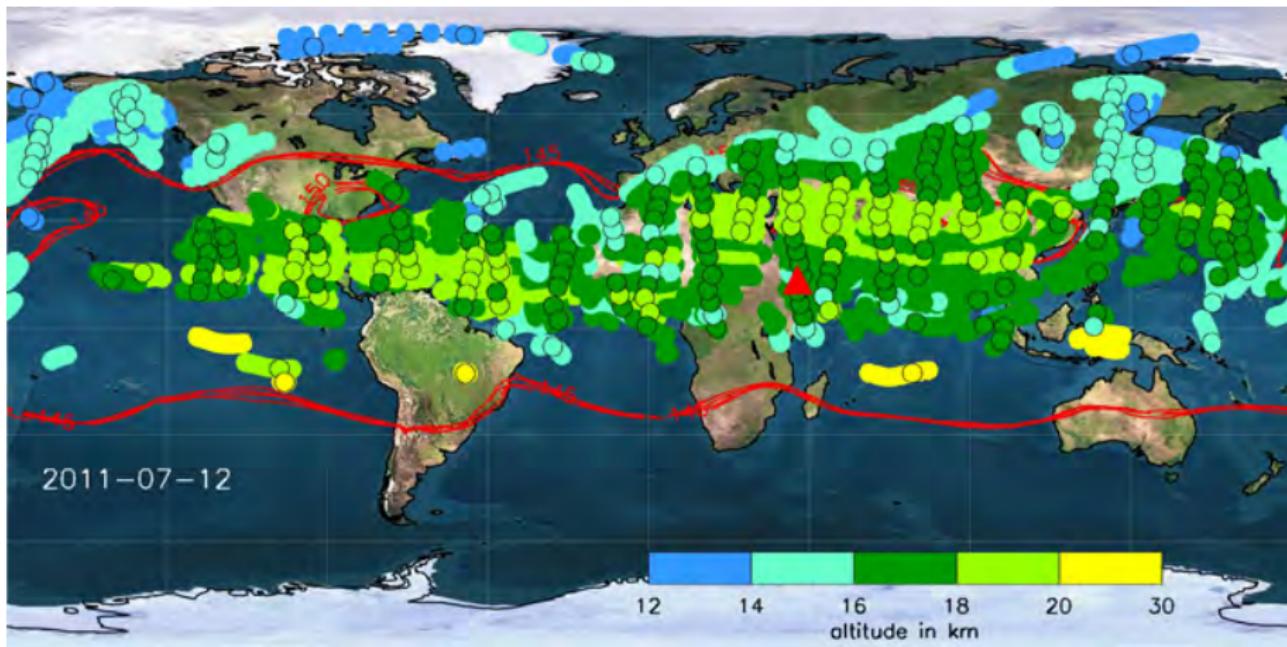
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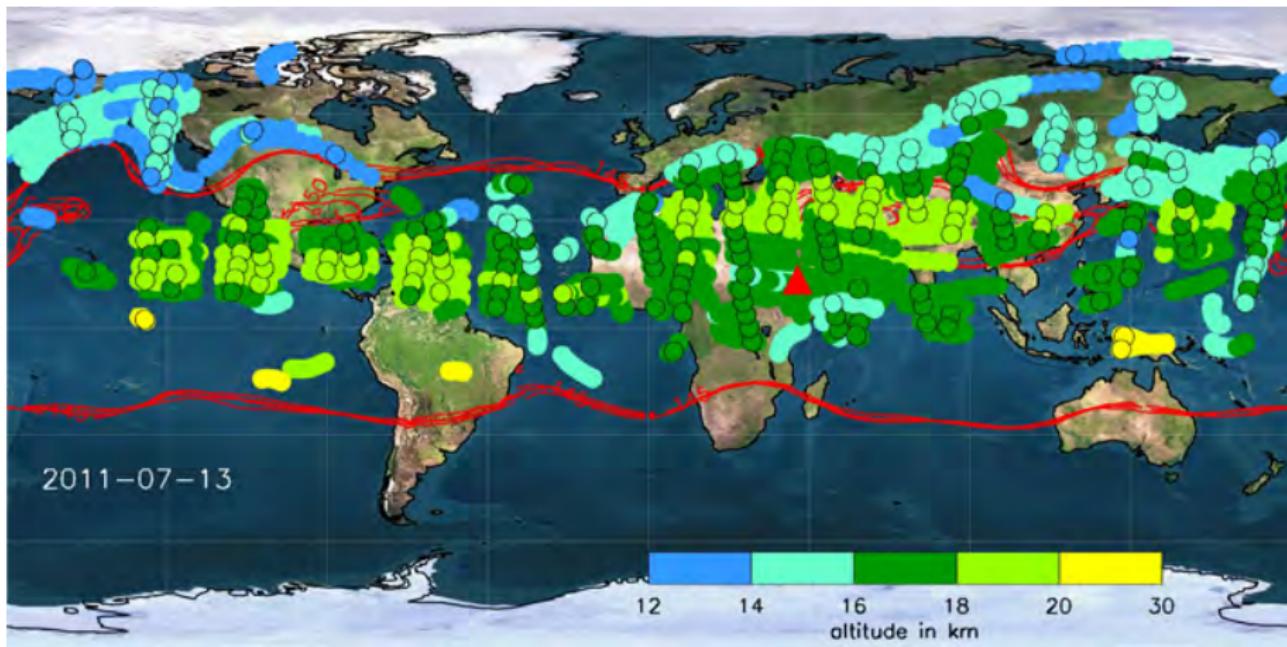
MIPAS observations of Nabro eruption



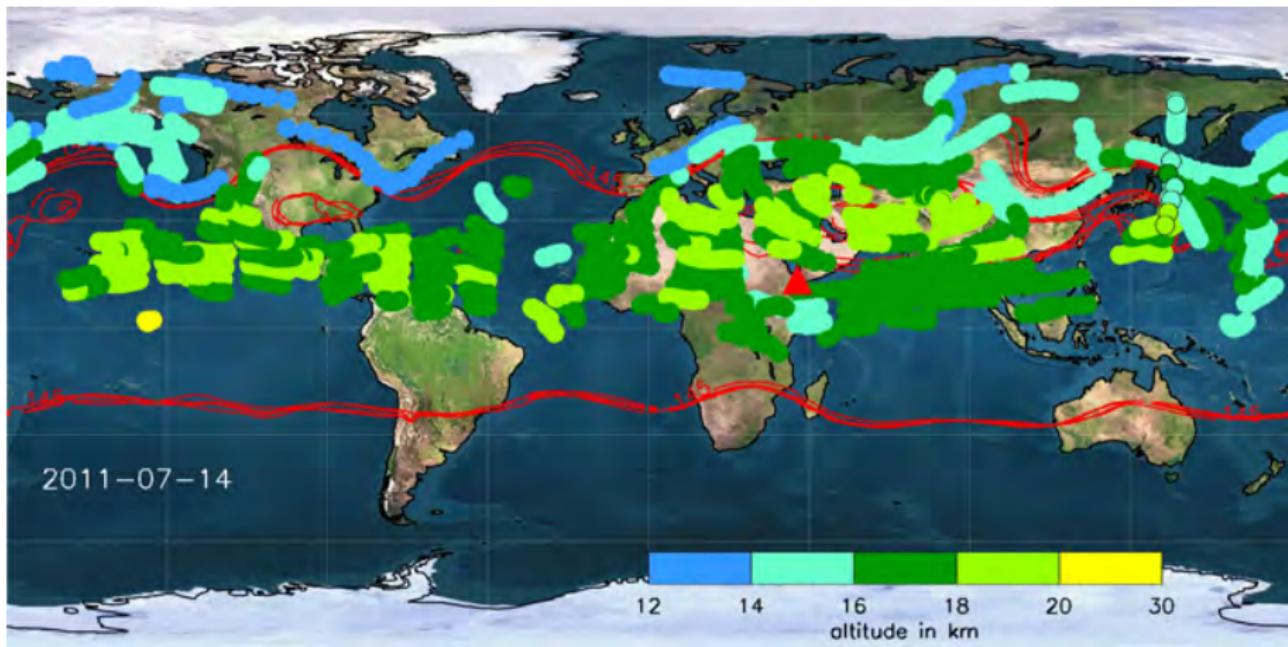
MIPAS observations of Nabro eruption



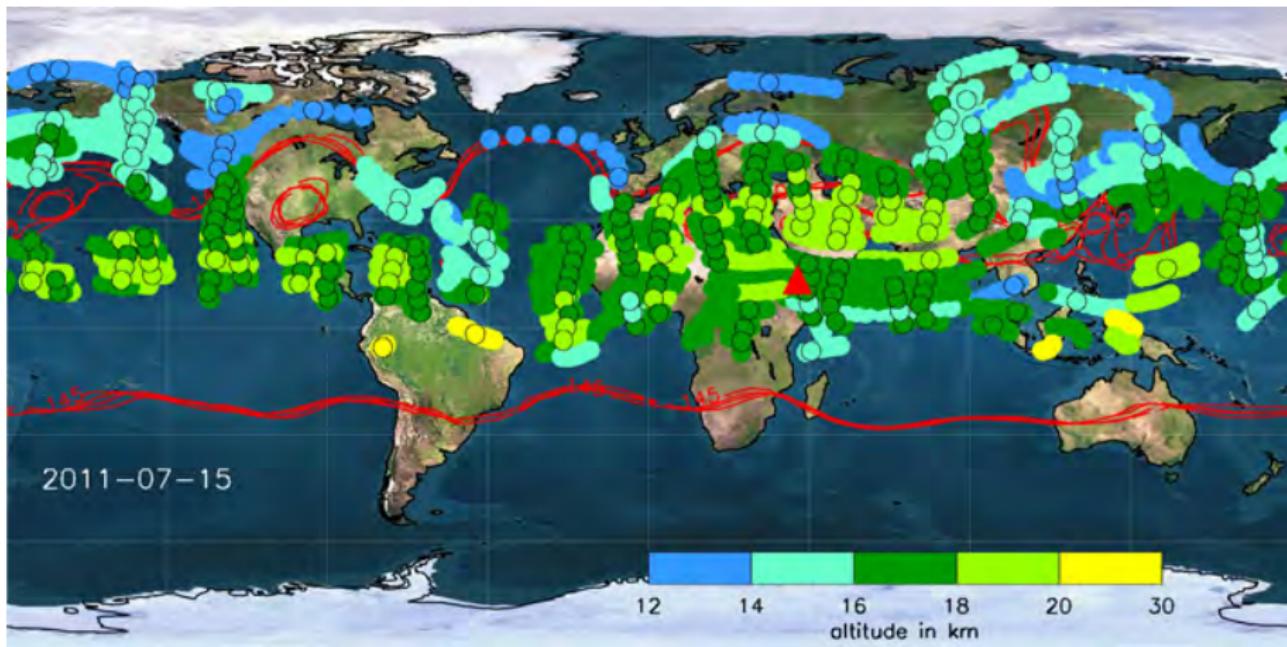
MIPAS observations of Nabro eruption



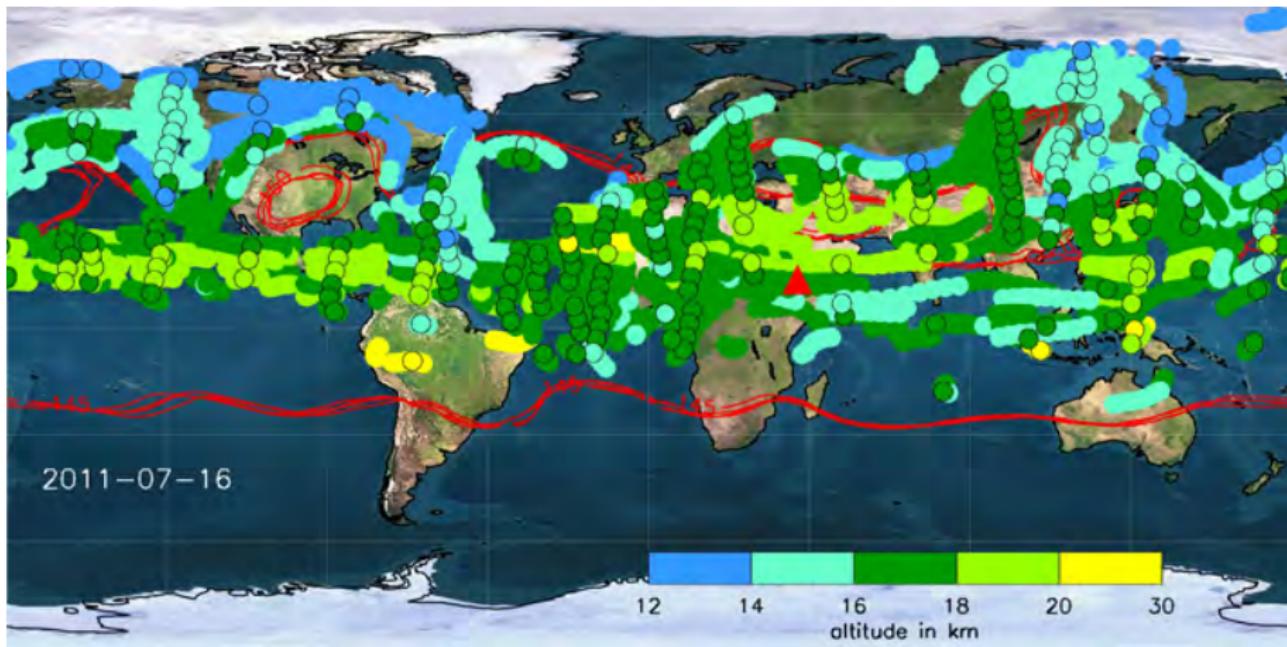
MIPAS observations of Nabro eruption



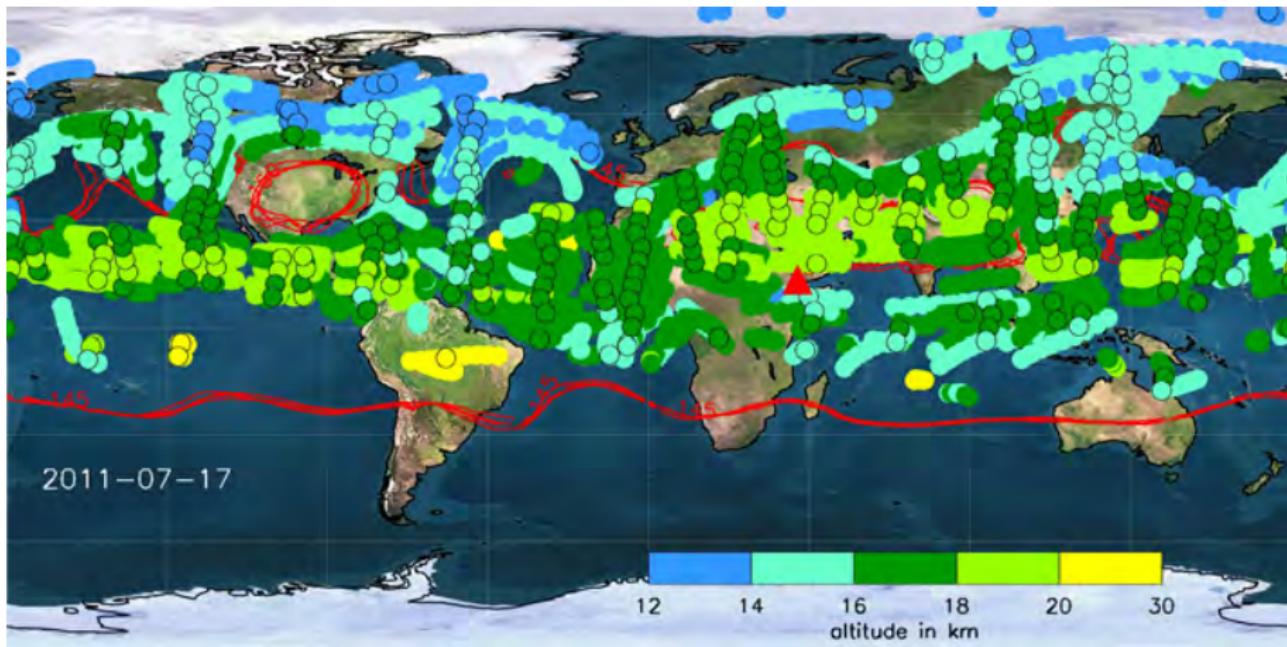
MIPAS observations of Nabro eruption



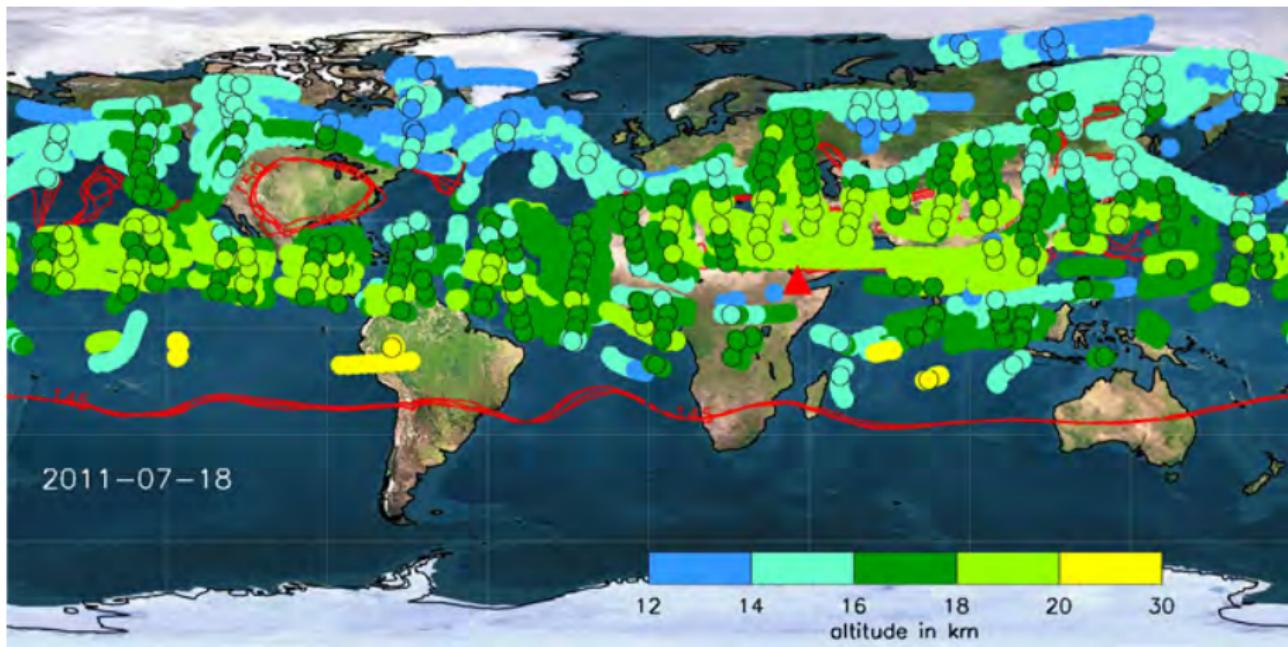
MIPAS observations of Nabro eruption



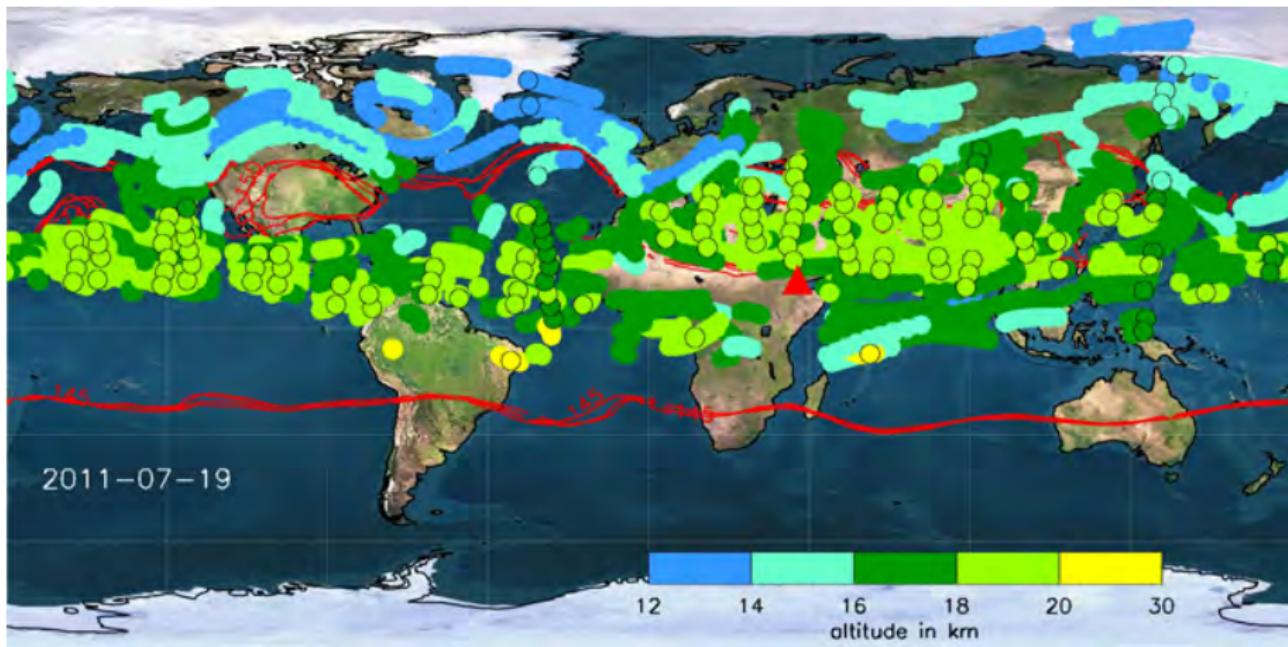
MIPAS observations of Nabro eruption



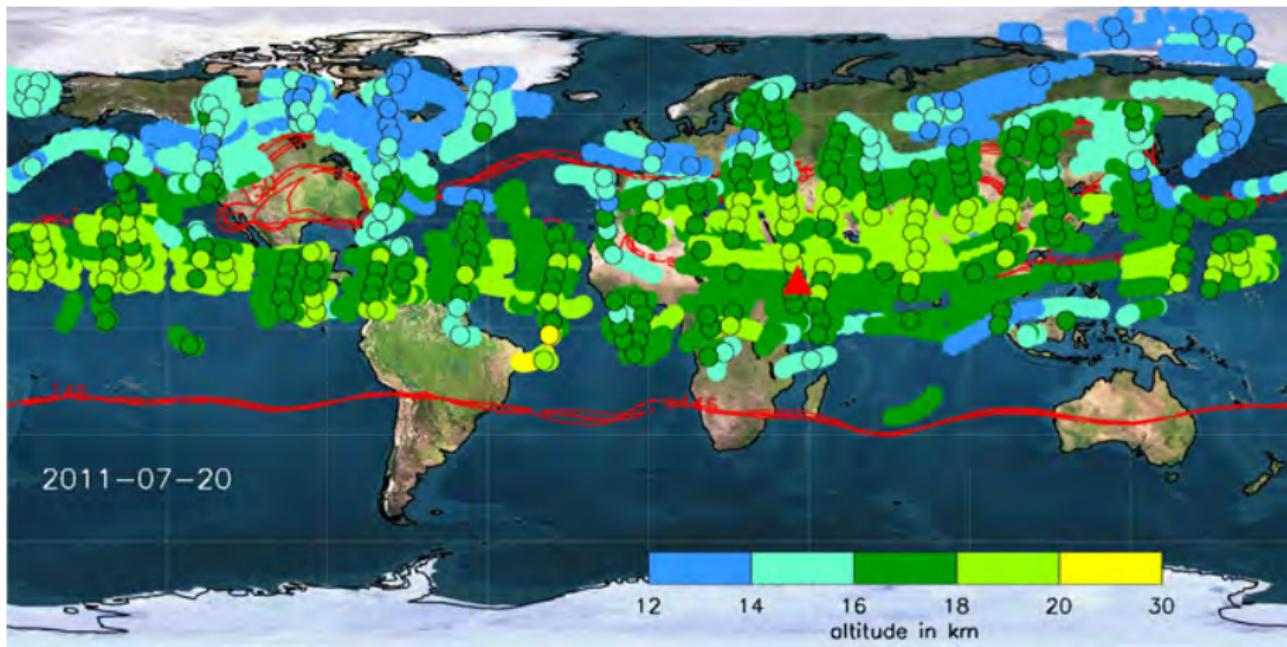
MIPAS observations of Nabro eruption



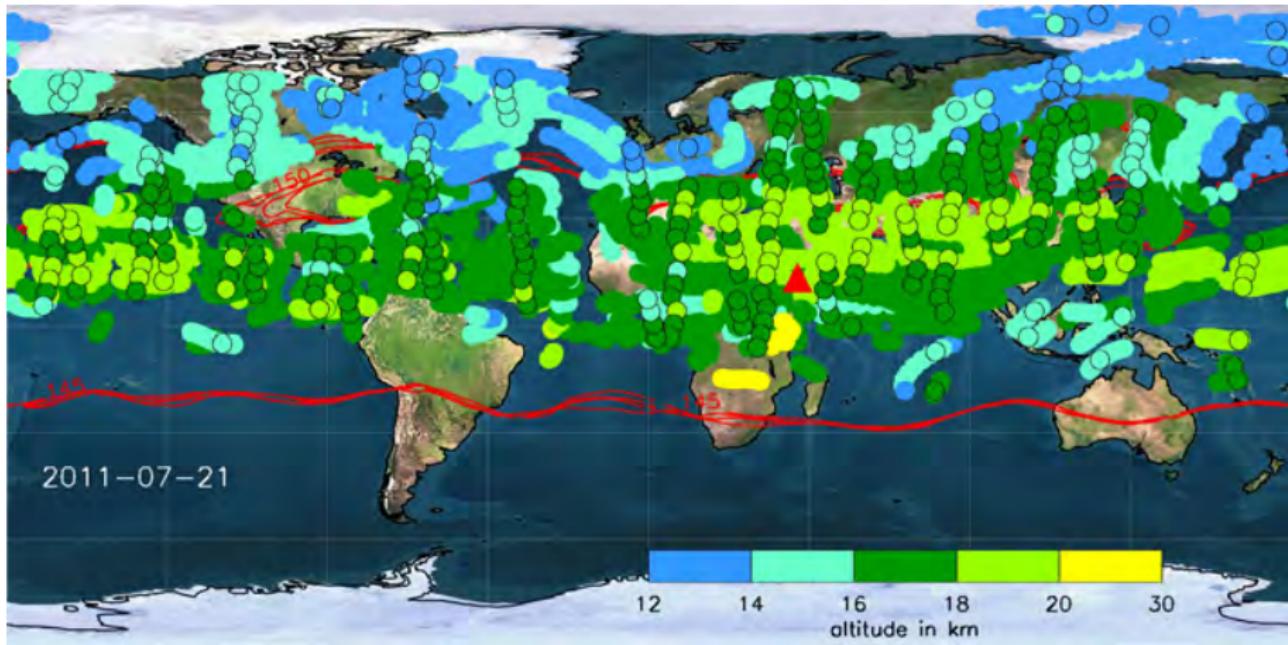
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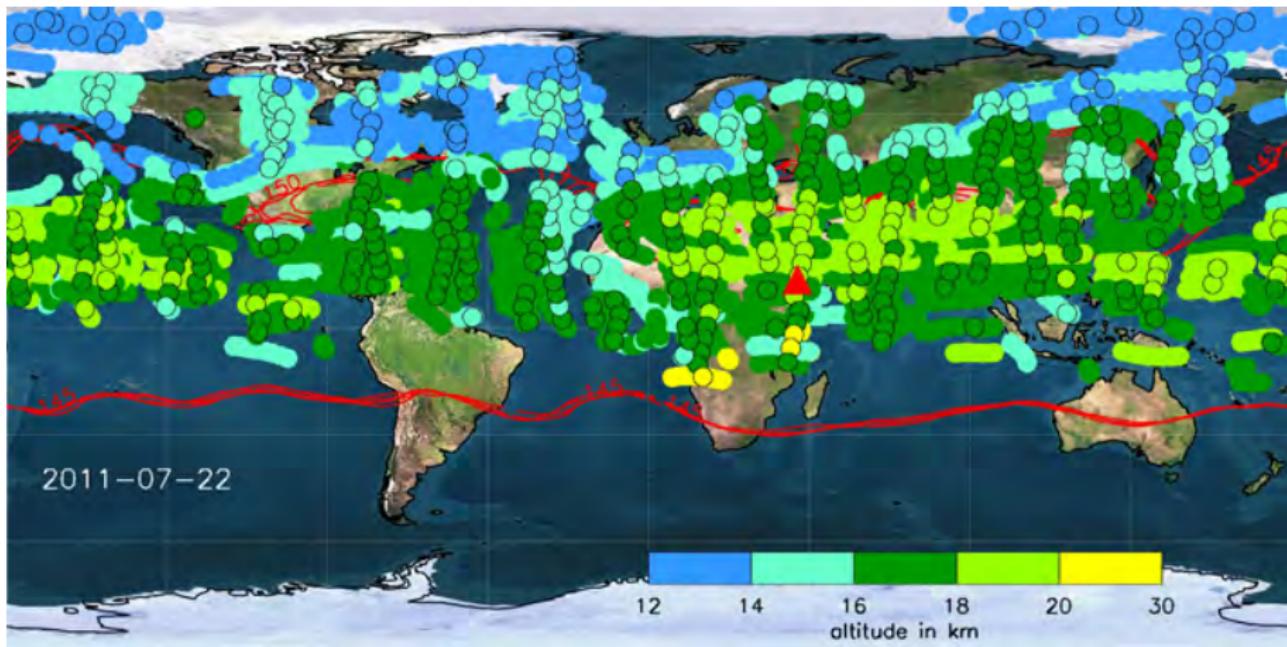
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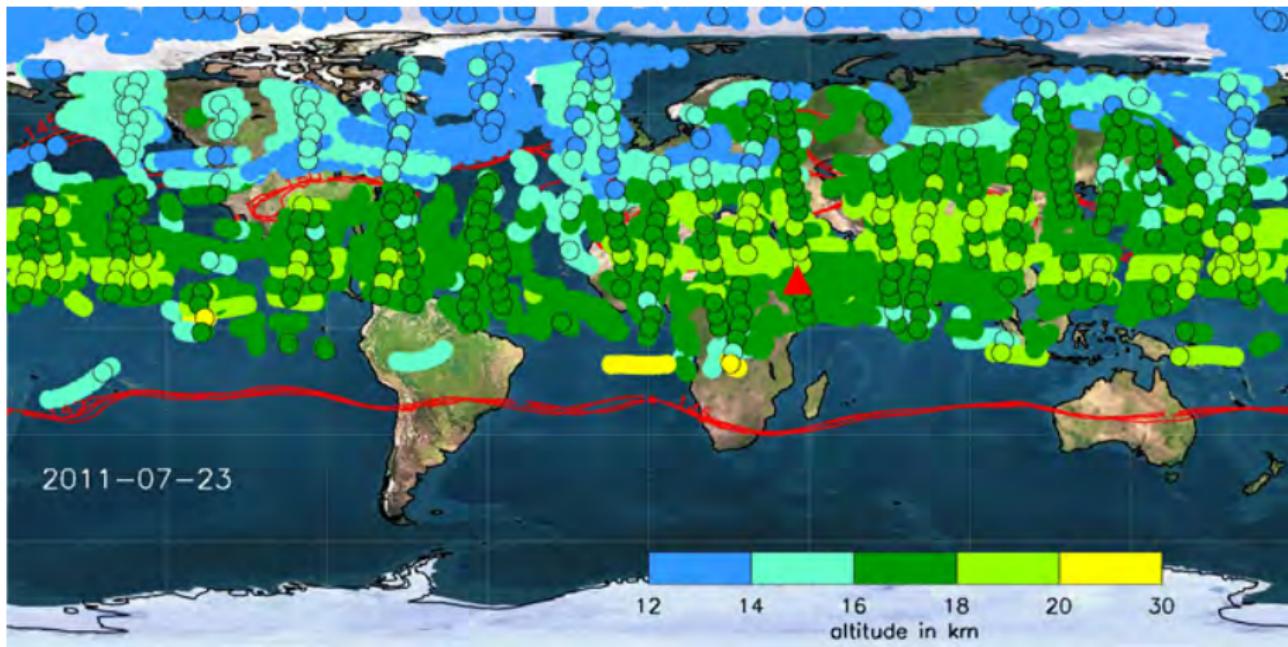
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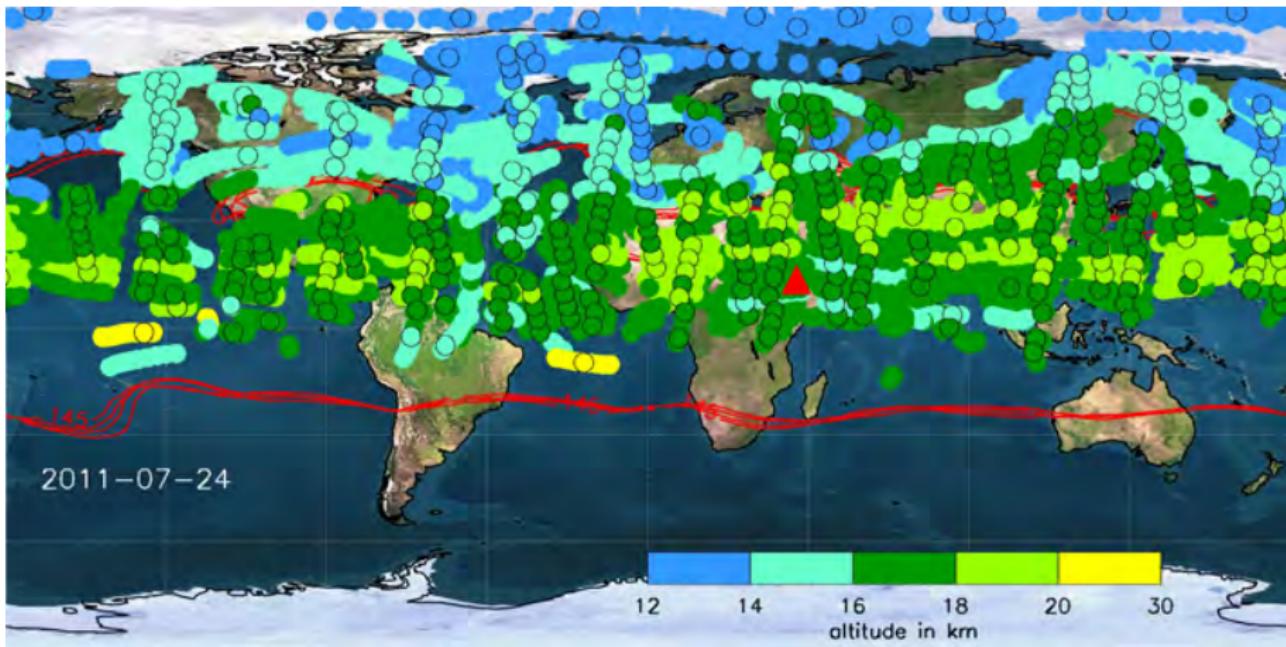
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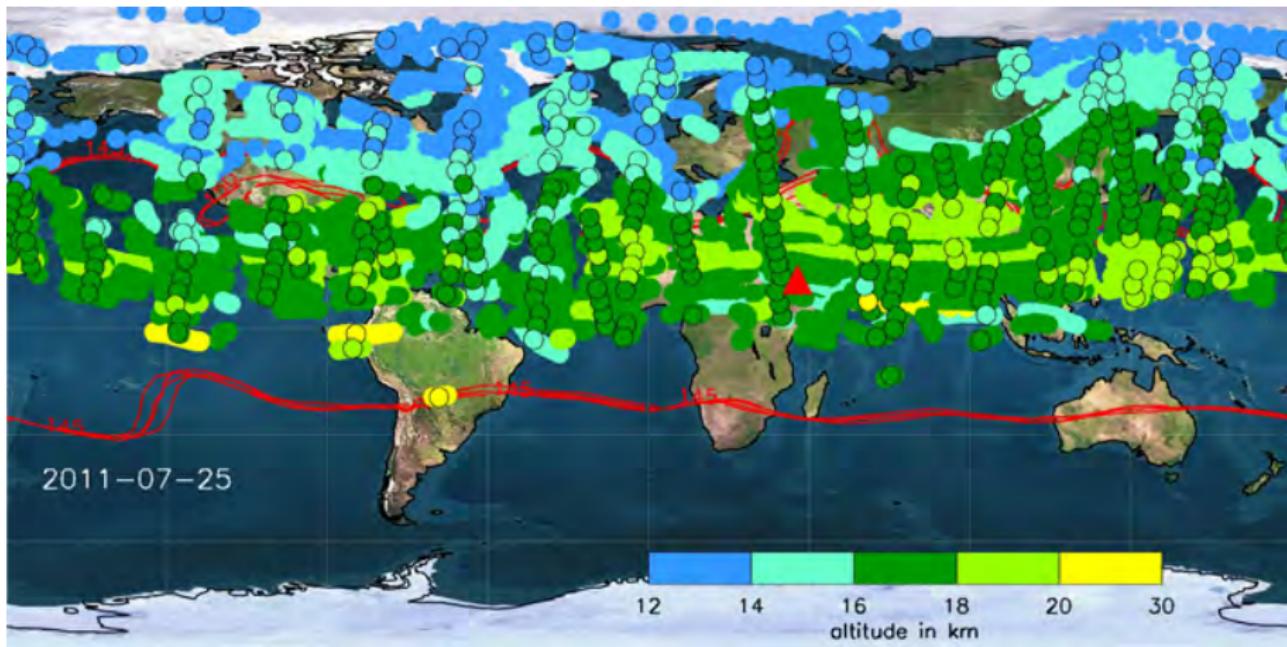
MIPAS observations of Nabro eruption



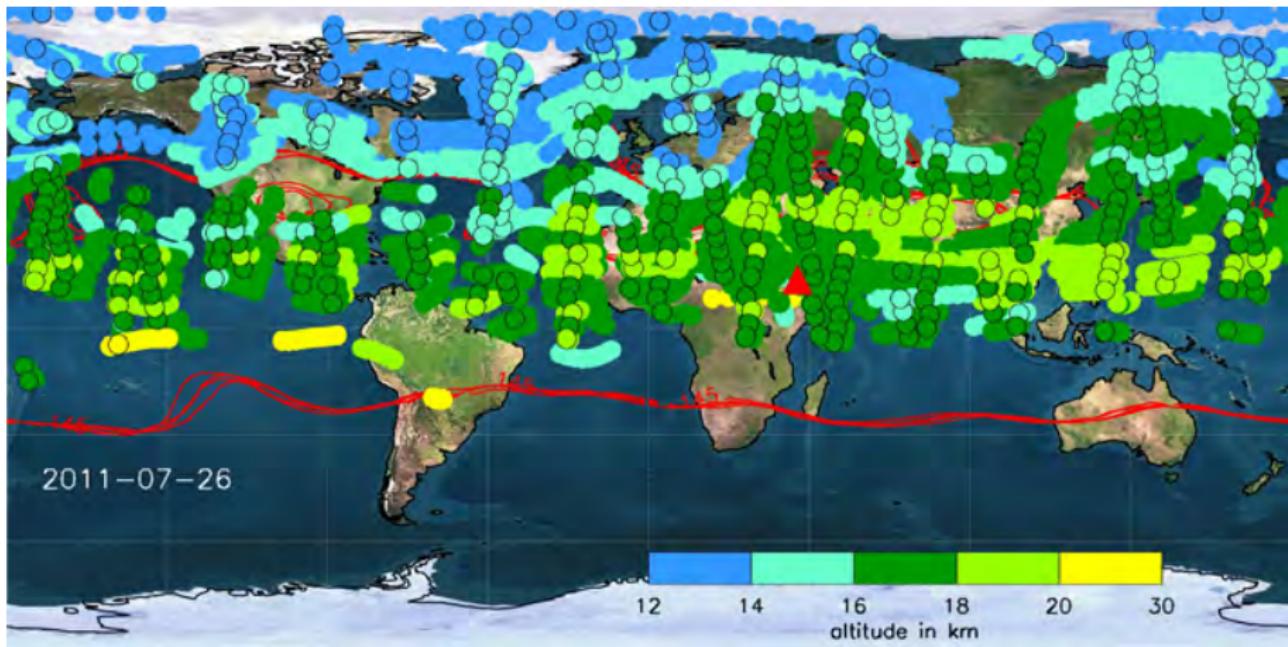
MIPAS observations of Nabro eruption



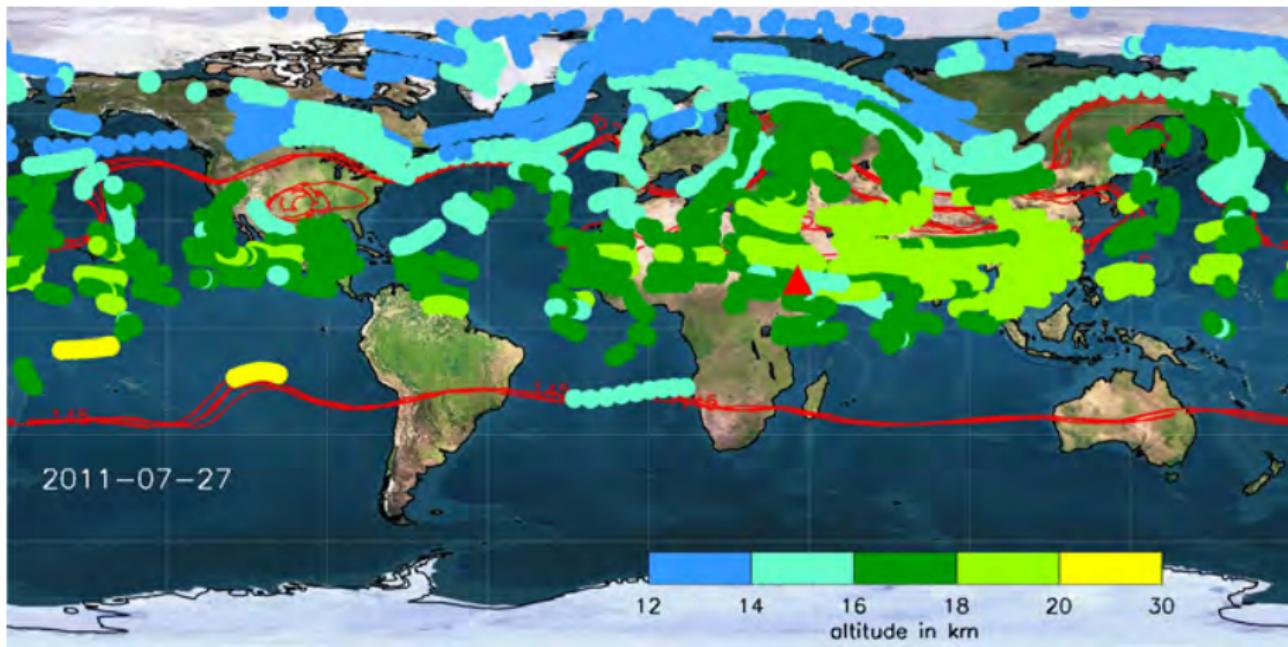
MIPAS observations of Nabro eruption



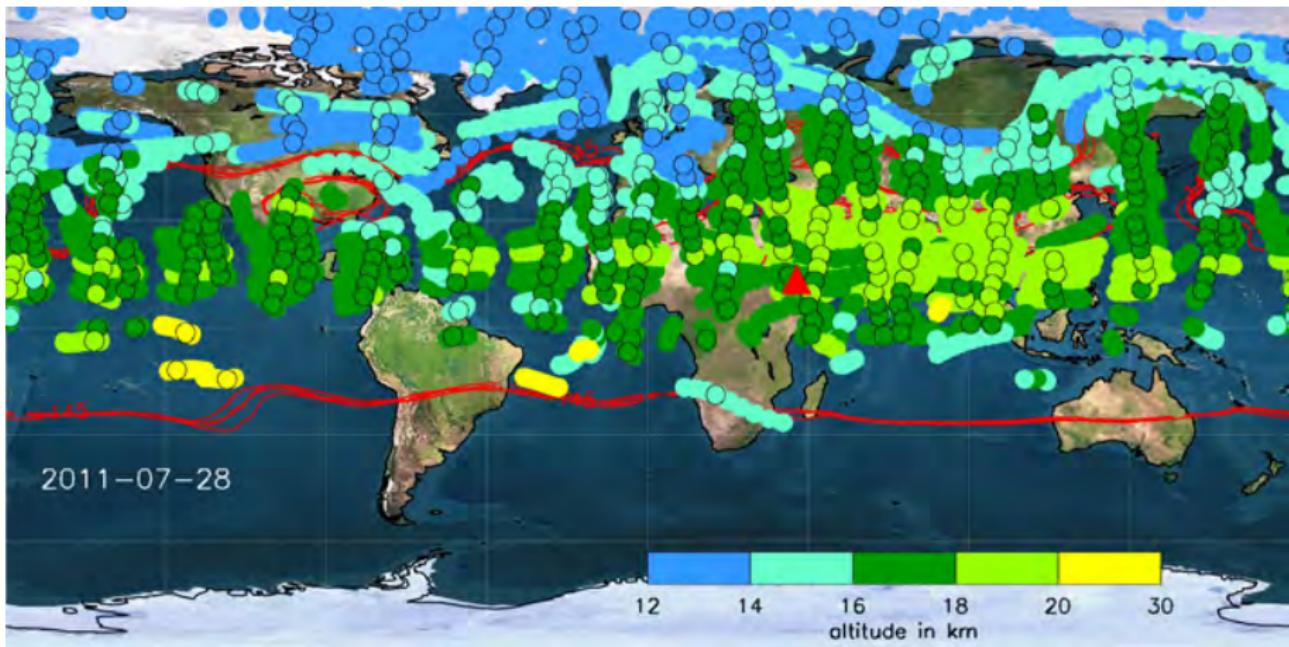
MIPAS observations of Nabro eruption



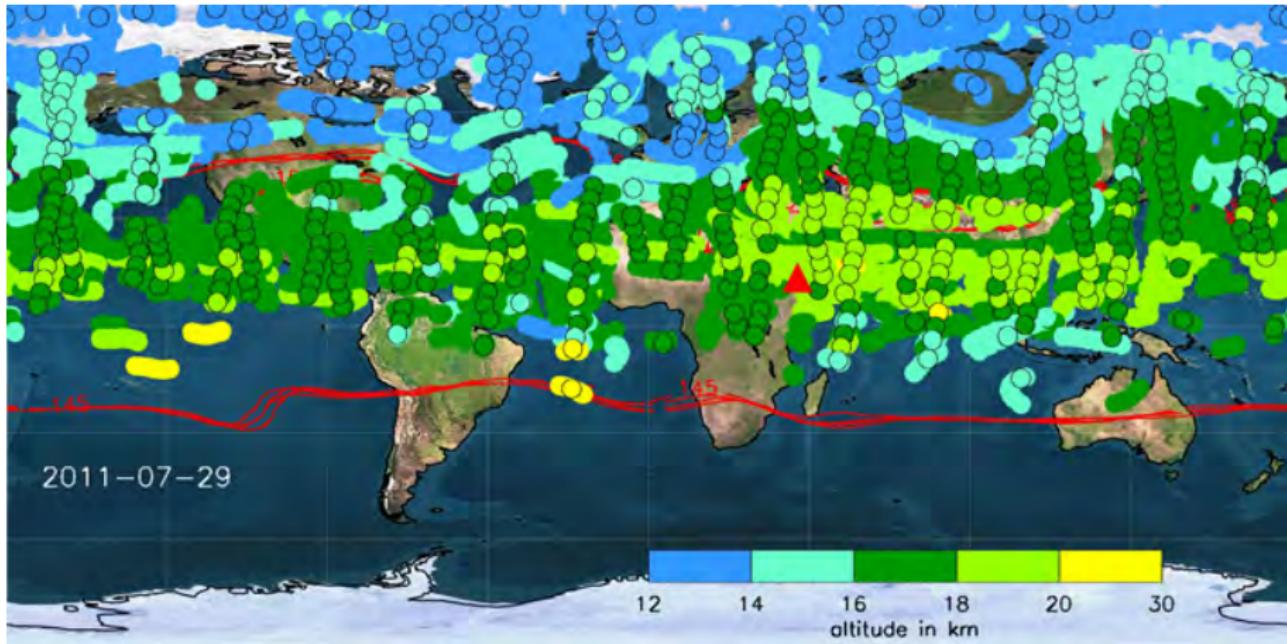
MIPAS observations of Nabro eruption



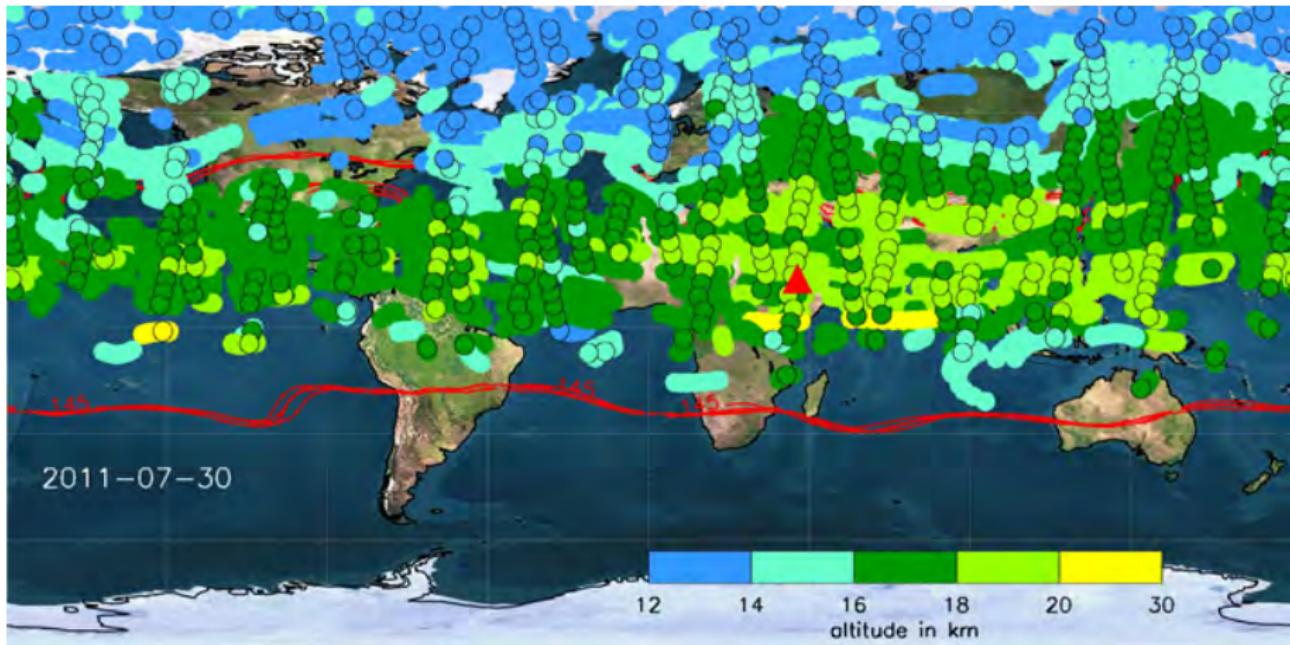
MIPAS observations of Nabro eruption



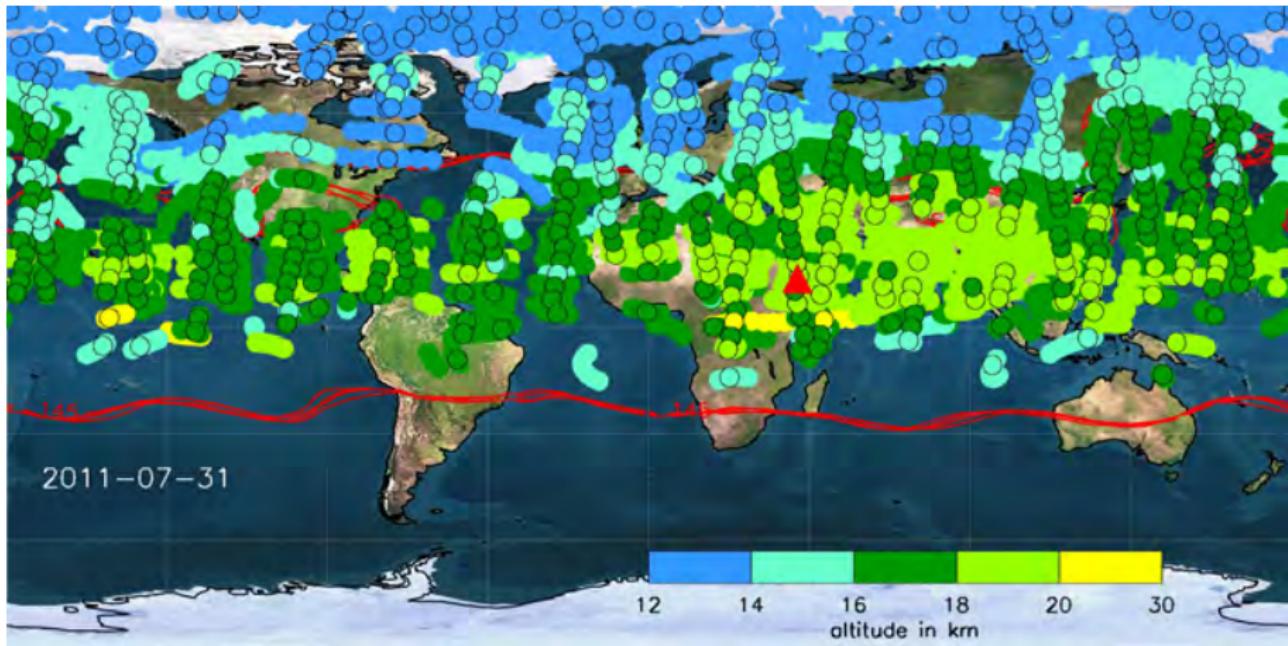
MIPAS observations of Nabro eruption



MIPAS observations of Nabro eruption



MIPAS observations of Nabro eruption



Summary

Detection Method:

- improved aerosol detection method
- particle type classification
- good agreement with other instruments (location and top altitude)
- method applicable to other IR-limb instruments e.g. GLORIA

Nabro eruption:

- sulfate aerosol observations in the UTLS
- sulfate aerosol follows circulation around the Asian monsoon and is successively entrained
- sulfate aerosol moves isentropically into the northern hemisphere stratosphere
- sulfate aerosol traces several wave breaking events