

Continuous ozone measurements over Kiruna during winter/spring 2002: A new millimeter wave radiometer operated at the Swedish Institute of Space Physics, Kiruna, Sweden

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Introduction

A new millimeter wave radiometer has started operation at the Swedish Institute of Space Physics, Kiruna, Sweden. The location of the instrument (67.8 N, 20.4 E) allows continuous observation of the evolution of ozone and ozone loss related trace gases in the Arctic polar stratosphere. It is designed for measurements of thermal emission lines between 200 and 224 GHz. Observations include of ozone, chlorine monoxide, nitrous oxide, and nitric acid. From the measurements profiles between 15 and 60 km altitude can be retrieved. Partial column densities (above 15 km) of the species are calculated from the profiles.

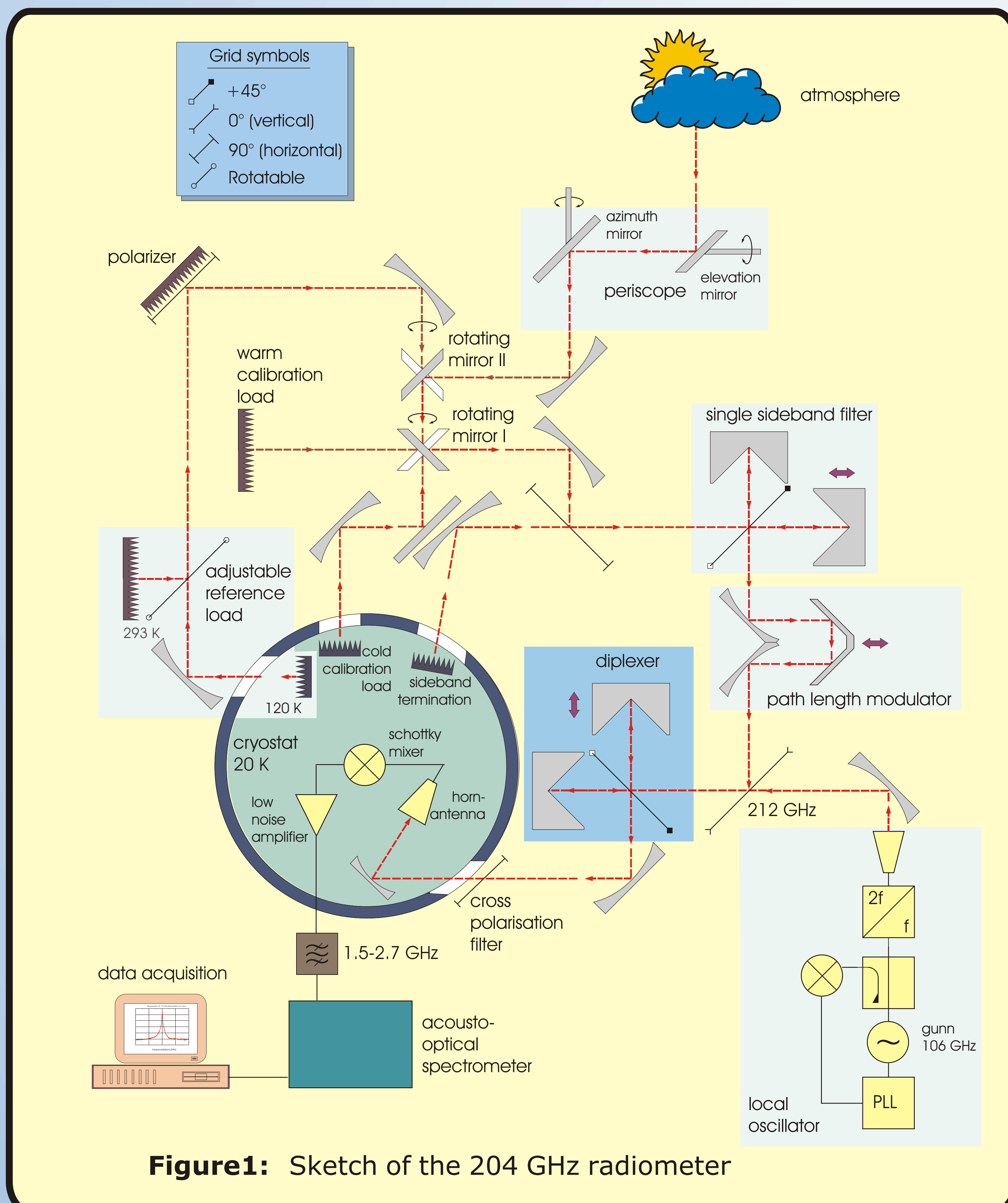


Figure 1: Sketch of the 204 GHz radiometer

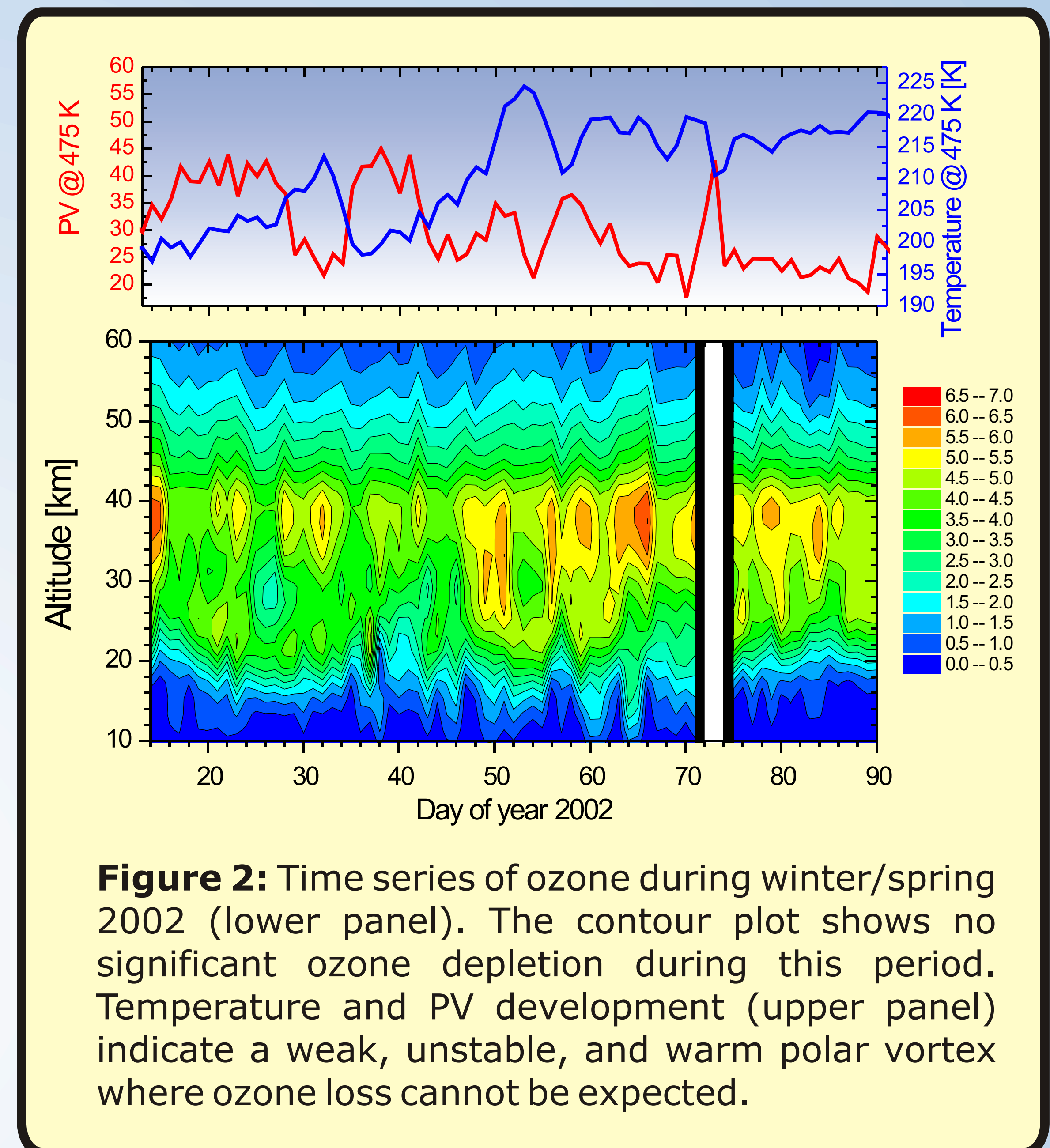


Figure 2: Time series of ozone during winter/spring 2002 (lower panel). The contour plot shows no significant ozone depletion during this period. Temperature and PV development (upper panel) indicate a weak, unstable, and warm polar vortex where ozone loss cannot be expected.

Measurements

Measurements of the trace gases can be done continuously. Seasonal variation as well as year-to-year changes can be observed. The instrument is tuned to ozone as default. Integration time for ozone measurements is about 15 min but can be reduced significantly if needed. Other trace gases need integration times of up to an hour due to the faint signature of the emission lines and the instrumental baseline. The periscope mirror system can point in any azimuth and elevation angle above the horizon. As shown in figure 3 measurements can be performed along the flight track of an ozone sonde.

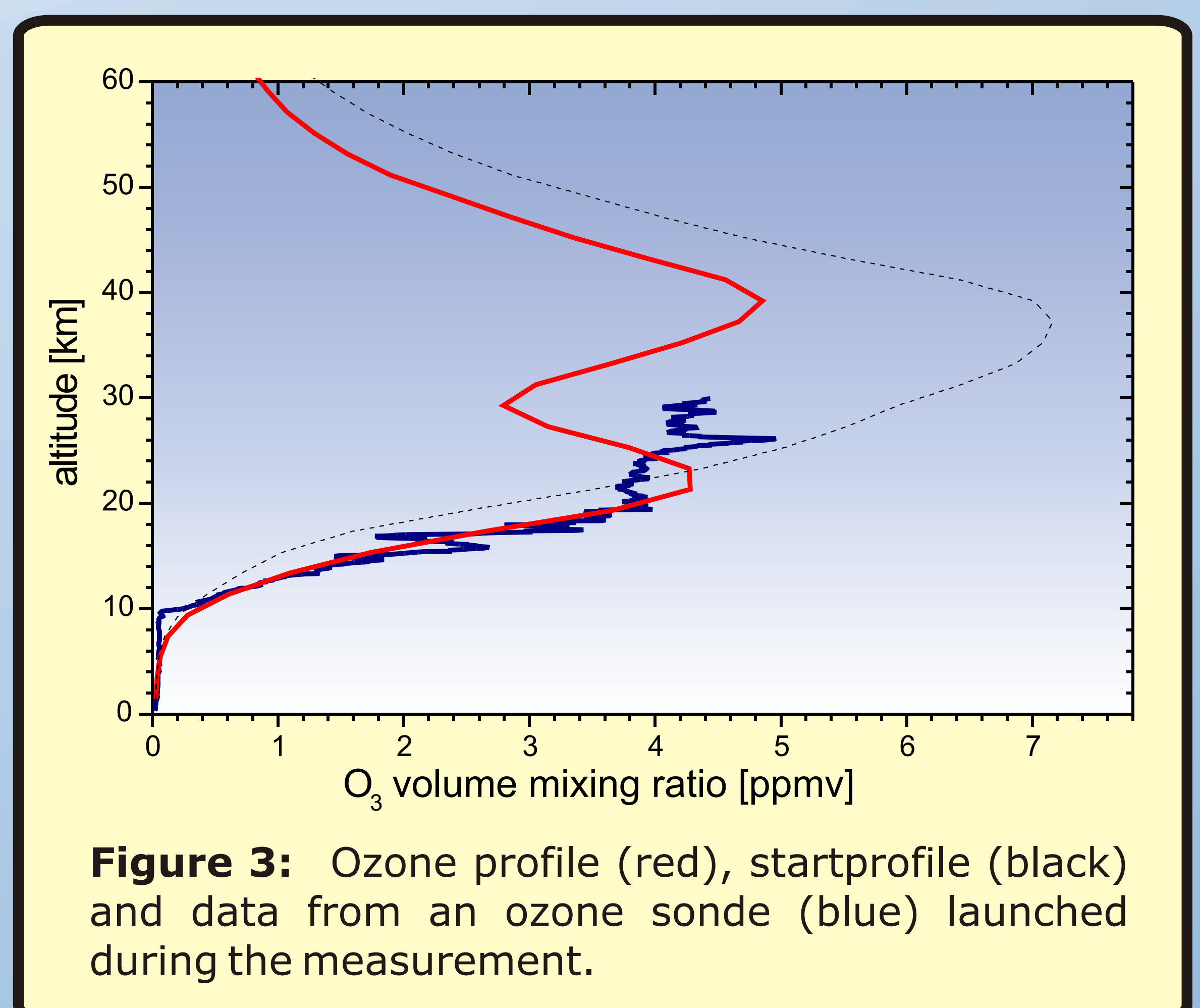


Figure 3: Ozone profile (red), startprofile (black) and data from an ozone sonde (blue) launched during the measurement.

System parameters

Frequency range	200 – 224 GHz
Bandwidth	1.2 GHz
Local oscillator	Gunn diode (208 – 216 GHz)
1st and 2nd IF frequency	8 resp. 2.1 GHz
Receiver noise temp. @ 22 K	1000 – 1600 K

Acousto-optical Spectrometer

Number of channels	2048
Spectral resolution	1.2 GHz

Acknowledgements

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