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Airborne multi-axis DOAS measurements of tropospheric SO₂ plumes in the Po-valley, Italy

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Abstract. During the second FORMAT (FORMAldehyde as A Tracer of oxidation in the troposphere) campaign in 2003 the airborne multi-axis DOAS instrument (AMAXDOAS) performed scattered-light spectroscopic measurements of SO₂ over the city of Mantova and the power plant Porto Tolle, both situated in the Po-valley, Northern Italy. The SO₂ vertical columns and emission flux were derived from two days of measurements, 26 and 27 September 2003. The SO₂ emission flux from the power plant Porto Tolle was calculated to 1.93×10^{25} molec s⁻¹ on 26 September and in good agreement with official emission data, which quote 2.25×10^{25} molec s⁻¹. On 27 September the measured flux was much lower (3.77×10^{24} molec s⁻¹) if ECMWF wind data are used, but of comparable magnitude (2.4×10^{25} molec s⁻¹) if the aircraft on-board wind measurements are utilised. Official emission data was 2.07×10^{25} molec s⁻¹ indicating only a small change from the previous day. Over the city of Mantova, the observed SO₂ vertical columns were 1.1×10^{16} molec cm⁻² and 1.9×10^{16} molec cm⁻² on 26 and 27 September, respectively. This is in good agreement with ground-based measurements of 5.9 ppbv and 10.0 ppbv which correspond to 1.2×10^{16} molec cm⁻² and 2.2×10^{16} molec cm⁻² if a well mixed boundary layer of 500m altitude is assumed.

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