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Vertical profile of peroxyacetyl nitrate (PAN) from MIPAS-STR measurements over Brazil in February 2005 and its contribution to tropical UT NO_y partitioning

C. Keim^{1,*}, G. Y. Liu^{1,**}, C. E. Blom¹, H. Fischer¹, T. Gulde¹, M. Höpfner¹, C. Piesch¹, F. Ravagnani², A. Roiger³, H. Schlager³, and N. Sitnikov⁴

¹Institut für Meteorologie und Klimaforschung, Forschungszentrum Karlsruhe, Germany

²Institute of Atmospheric Sciences and Climate (ISAC-CNR), Bologna, Italy

³Institut für Physik der Atmosphäre, Deutsches Zentrum für Luft- und Raumfahrt, Wessling, Germany

⁴Central Aerological Observatory, Dolgoprudny, Moscow region, Russia

* now at: Laboratoire Interuniversitaire des Systèmes Atmosphériques (LISA) CNRS/Univ. Paris 12 et 7, France

** now at: Department of Earth and Atmospheric Science, City College of New York, USA

Abstract. We report on the retrieval of PAN (CH₃C(O)OONO₂) in the upper tropical troposphere from limb measurements by the remote-sensor MIPAS-STR on board the Russian high altitude research aircraft M55-Geophysica. The measurements were performed close to Araçatuba, Brazil, on 17 February 2005. The retrieval was made in the spectral range 775–820 cm⁻¹ where PAN exhibits its strongest feature but also more than 10 species interfere. Especially trace gases such as CH₃CCl₃, CFC-113, CFC-11, and CFC-22, emitting also in spectrally broad not-resolved branches, make the processing of PAN prone to errors. Therefore, the selection of appropriate spectral windows, the separate retrieval of several interfering species and the careful handling of the water vapour profile are part of the study presented.

The retrieved profile of PAN has a maximum of about 0.14 ppbv at 10 km altitude, slightly larger than the lowest reported values (<0.1 ppbv) and much lower than the highest reported in the literature (0.65 ppbv). Besides the NO_y constituents measured by MIPAS-STR (HNO₃, ClONO₂, HO₂NO₂, PAN), the in situ instruments aboard the Geophysica provide simultaneous measurements of NO, NO₂, and the sum NO_y. Comparing the sum of in-situ and remotely derived NO+NO₂+HNO₃+ClONO₂+HO₂NO₂+PAN with total NO_y a deficit of 30–40% (0.2–0.3 ppbv) in the troposphere remains unexplained whereas the values fit well in the stratosphere.

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