NEW ANALYSIS OF THE ν_5 AND $2\nu_9$ BANDS OF HNO_3 BY HIGH RESOLUTION FOURIER-TRANSFORM INFRARED SPECTRA IN THE 11 μm REGION AND BY CM-TECHNIQUES: LINE POSITIONS AND LINE INTENSITIES

A. PERRIN, J. ORPHAL, J.-M. FLAUD, *Laboratoire de Photophysique Moléculaire, CNRS, Université Paris-Sud, Campus d'Orsay, Bât. 350, 91405 Orsay Cedex, France*; S. KLEE, G. C. MELLAU, *Justus-Liebig-Universität, Physikalisch-Chemisches Institut, Heinrich-Buff-Ring 58, 35392 Gießen, Germany*; H. MÄDER, D. WALBRODT, *Institut für Physikalische Chemie, Olshausenstrasse 40, 24098 Kiel, Germany*; M. WINNEWISSER, *Department of Physics, The Ohio State University, Columbus, Ohio 43210, USA*.

Nitric acid (HNO_3) plays an important role in the Earth's atmosphere as a reservoir molecule of NO_x species. This molecule has a strong infrared signature at 11 μm which is one of the most commonly used for the infrared retrieval of HNO_3 in the atmosphere since this spectral region coincides with an atmospheric window. It is therefore essential to have the best possible spectral parameters in this spectral region. The main goal of this work was to get better line positions and intensities for the ν_5 and $2\nu_9$ cold bands located at 879.1088 and 896.4482 cm^{-1} respectively. This work was also motivated by theoretical considerations. Very strong resonances involve the v=5^1 and v=9^2 rotational levels. In addition the ν_9 mode (OH torsion) is a "large amplitude" motion, and the torsional splittings are easily observed in the mm/submm region for the rotational transitions in the v=9^2 and v=5^1 excited states [a,b]. Both effects are accounted for in the present line position and intensity calculations. For this study, in addition to the available literature data [a,b,c] a large set of new high resolution FTS spectra recorded in Giessen were analysed and new centimeter measurements performed for ν_5 and $2\nu_9$ rotational transitions in Kiel were used.

[a] T. M. Goyette, L. C. Oesterling, D. T. Petkie, R. A. Booker, P. Helminger and F. De Lucia, J. Mol. Spectrosc. 175, 395 (1996)
[b] D. T. Petkie, T. M. Goyette, P. Helminger, H. M. Pickett and F. De Lucia, J. Mol. Spectrosc. 208, 121 (2001)
[c] R. A. Toth, L. R. Brown, and E. A. Cohen, J. Mol. Spectrosc., in press (2003)