

NEW LINE POSITIONS ANALYSIS OF THE ν_3 BANDS OF $^{35}\text{ClNO}_2$ AND $^{37}\text{ClNO}_2$ AROUND 370 cm^{-1}

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Nitryl chloride (ClNO_2) is of atmospheric interest, since it is produced by heterogeneous reactions, in the marine troposphere, between NaCl sea-salt aerosols and gaseous N_2O_5^a , in the polluted continental air^b, and possibly also on polar stratospheric clouds, between N_2O_5 and solid HCl^c . Many high-resolution spectroscopic studies of ClNO_2 in the microwave and mid-infrared regions are available^d. However, ClNO_2 presents two fundamentals in the far-infrared region below 600 cm^{-1} , with the lowest one corresponding to the Cl-N stretching mode, ν_3 around 370 cm^{-1} .

A new investigation of the ν_3 bands of $^{35}\text{ClNO}_2$ and $^{37}\text{ClNO}_2$ has been performed using a high resolution (0.00102 cm^{-1}) Fourier transform spectrum recorded at SOLEIL with highly improved experimental conditions as compared to a previous study^e, leading to a *well resolved spectrum*. As a consequence, significantly better results than previously were obtained. The line assignments were pursued up to higher J and K_a quantum number values, $J = 83$ and $K_a = 44$. For both isotopomers, a total of 6331 transitions were reproduced with a root-mean-square deviation of $2 \times 10^{-4}\text{ cm}^{-1}$ using a Watson-type A -reduced Hamiltonian. Improved band centers, rotational and centrifugal distortion constants for the ν_3 fundamental bands of $^{35}\text{ClNO}_2$ and $^{37}\text{ClNO}_2$ have been determined. The synthetic line list obtained in this study will be interesting for future measurements of ClNO_2 in the atmosphere, e.g. using the new satellite mission FORUM (ESA) covering the $150\text{-}1400\text{ cm}^{-1}$ spectral region.

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