LINE SHAPE PARAMETERS FOR N_2O DILUTED IN N_2 MEASURED BY MID-INFRARED DUAL-COMB SPECTROSCOPY

B. VISPOEL, J. CLÉMENT, M. LEPÈRE , *Research unit Lasers and Spectroscopies (LLS), Institute of Life, Earth and Environment (ILEE), University of Namur, 61, Rue de Bruxelles, Namur, Belgium*

Nitrous oxide is an important trace gas natrually present in Earth's atmosphere but also results of human activities[1]. It has an important role in atmospheric chemistry and in radiative transfer. N_2O is a strong greenhouse gas with a global warming potential 300 times higher than carbon dioxide[2], and contributes to the depletion of stratospheric ozone[3]. The monitoring of its concentration requires accurate knowledge of N_2O spectroscopic parameters for line shape parameters can be a limiting factor of the precision of atmospheric spectrum analysis. In addition, a limited number of accurate experimental line shape parameters are needed to determine and validate intermolecular potentials used in the state-of-the-art models allowing the calculations of these parameters.

In this preliminary work, the measurements were performed using a mid-infrared high-resolution dual comb spectrometer that is based on quantum cascade lasers. It was shown that this spectrometer is well suited for line shape parameter studies[4]. The N_2O-N_2 spectra were recorded at room temperature in the 1300 cm^{-1} wavenumber region. The line shape parameters were determined by adjusting the Voigt and Speed-Dependent Voigt theoretical models on the experimental line profiles using a multi-spectrum fitting technique. The obtained results are discussed and compared to literature.

Acknowledgements: The authors thank the IRsweep company for the support during the measurements performed with the dual comb spectrometer.

[1] doi:10.1126/science.1179571 D.J. Wuebbles, "Nitrous Oxide: No Laughing Matter", Science, **326**(5949), 56–57 (2009)

[2] IPCC-Chapter 2 P. Forster *et al.*, "Changes in Atmospheric Constituents and in Radiative Forcing" Chapter 2, Climate Change 2007 - The Physical Sciences Basis, *Cambridge University Press*, 131–217 (2007)

[3] doi:10.1126/science.1176985 A.R. Ravishankara *et al.*, "Nitrous Oxide (N_2O): The Dominant Ozone-Depleting Substance Emitted in the 21st Century", Science, **326**, 123–125 (2009)

[4] doi:10.1016/j.jqsrt.2022.108239 M. Lepère *et al.*, "A mid-infrared dual comb spectrometer in step-sweep mode for high-resolution molecular spectroscopy", Journal of Quantitative Spectroscopy and Radiative Transfer, **287**, 108239 (2022)

p-number: p229 **Submitted on Wed, 21 Jun 2023 11:42:50 +0200**