LINE POSITION AND LINE INTENSITY ANALYSES OF $H_2^{18}O$ UP TO THE FIRST TRIAD AND $J = 20$[a]

L. H. COUDERT, *Institut des Sciences Moléculaires d'Orsay, Université Paris-Saclay, CNRS, Orsay, France*; GEORG CH. MELLAU, *Physikalisch Chemisches Institut, Justus Liebig Universitat Giessen, Giessen, Germany*; SEMEN MIKHAILENKO, *Atmospheric Spectroscopy Div., Institute of Atmospheric Optics, Tomsk, Russia*; ALAIN CAMPARGUE, *UMR5588 LIPhy, Université Grenoble Alpes/CNRS, Saint Martin d'Hères, France*.

We present a line position analysis of a large body of data pertaining to $H_2^{18}O$ and involving all 5 vibrational states up to the First Triad, namely, the lowest lying states (000), (010), (020), (100), and (001). The data set contains infrared lines retrieved in this work, from FTS and from high-temperature emission spectra, and already published high-resolution measurements including microwave and THz transitions, and kHz accuracy transitions.[b] The analysis, carried out with the Bending-Rotation fitting Hamiltonian,[c] allows us to reproduce more than 11700 data with a unitless standard deviation of 1.6 up to $J = 20$ and $K_a = 16$. The highly accurate THz transitions[b] are reproduced with an RMS of 0.2 MHz and the kHz accuracy transitions[b] with an RMS better than 0.3 MHz.

A line intensity analysis of absorption transitions involving the same vibrational states will also be presented. FIR line intensities measured in this work using FTS were fitted in addition to previously measured line intensities. 3890 line intensities are accounted for with a unitless standard deviation of 1.4.

The absorption line list calculated using these results will be compared to that recently obtained from theoretical calculations.[d] With the present set of spectroscopic parameters, discrepancies up to 0.09 cm^{-1} are noted for the line positions.

---

[a]Financial support from the French Programme National de Physique et Chimie du Milieu Interstellaire is acknowledged

[b]Kyrö, *J. Mol. Spec.* **88** (1981) 167; Matsushima *et al., J. Mol. Spec.* **193** (1999) 217; and Diouf *et al., J. Phys. Chem. Ref. Data* **50** (2021) 023106

[c]Coudert and Chélin, *J. Mol. Spec.* **326** (2015) 130

[d]Conway *et al., J. Quant. Spec. Rad. Trans.* **241** (2020) 106711