UNDISCOVERED ERRORS OF VOIGT PROFILE BEYOND TINY W-SHAPED RESIDUALS

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Stimulated by valleys being notoriously too deep in atmospheric spectra close to strong lines optically thick lines in laboratory water spectra in the ν_2 region were investigated. These spectra were previously used to generate a new spectroscopic database[a,b] applying the Voigt line shape function in a least squares fitting procedure including non-opaque lines, only. Surprisingly, applying the new spectroscopic data, lines were found to be modeled too narrow when saturated. Fitting the Lorentz broadening parameters (fixing the accurately known intensities) of the opaque lines yielded 3-4% higher values than in the database. The reason and consequences will be given in this paper.

[a] L.H. Coudert, G. Wagner, M. Birk, Y.I. Baranov, W.J. Lafferty, J.M. Flaud, J. Mol. Spectrosc., 251, 339-57 (2008).
[b] M. Birk, G. Wagner, Journal of Quantitative Spectroscopy and Radiative Transfer, 113, 889-928 (2011).