Monitoring of the temporal evolution of water vapor in the stratosphere of Jupiter with the Odin space telescope between 2002 and 2019. B. Benmahi[1], T. Cavalié[1,2], M. Dobrijevic[1], N. Biver[2], K. Bermudez-Diaz[2,3], Aa. Sandqvist[4], E. Lellouch[2] , R. Moreno[2] , T. Fouchet[2] , V. Hue[5] , P. Hartogh[6] , F. Billebaud[1] , A. Lecacheux[2], Å. Hjalmarson[7], U. Frisk[8], M. Olberg[9], And The Odin Team[*] , [1]Laboratoire d'Astrophysique de Bordeaux, Univ. Bordeaux, CNRS, B18N, allée Geoffroy Saint-Hilaire, 33615 Pessac, France, bilal.benmahi@u-bordeaux.fr, [2]LESIA, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université, Univ. Paris Diderot, Sorbonne Paris Cité, 5 place Jules Janssen, 92195 Meudon, France, [3]Université Montpellier 2 Sciences et Techniques, Place E. Bataillon 30, 34095 Montpellier, France, [4]Stockholm Observatory, Stockholm University, AlbaNova University Center, 106 91, Stockholm, Sweden, [5]Southwest Research Institute, San Antonio, TX 78228, United States, [6]Max Planck Institut für Sonnensystemforschung, Justus-von-Liebig-Weg 3, 37077 Göttingen, Germany, [7]Department of Earth and Space Sciences, Chalmers University of Technology, Onsala Space Observatory, 439 92, Onsala, Sweden, [8]Omnisys Instruments AB, Solna Strandväg 78, 171 54, Solna, Sweden, [9]Chalmers University of Technology, Gothenburg, Sweden

In July 1994, comet Shoemaker-Levy 9 (SL9) collided with the Jupiter's upper atmosphere. This has introduced new chemical species into Jovian's atmosphere, notably H_2O. The species can be used as dynamical tracers over large timescales is they are long-lived.

We observed Jupiter's disk-averaged stratospheric H_2O emission at 556.936 GHz between 2002 and 2019 with the Odin space radio telescope with the initial goal of better constraining vertical eddy mixing (K_{zz}) in the atmosphere's layers probed by our observations (0.2-5 mbar).

The Odin observations that we obtained show us a decrease of about 40% of the line emission from 2002 to 2019. Thanks to a combination of a 1D time-dependent photochemical model with a radiative transfer model we analyzed these observations to constrain the vertical eddy diffusion K_{zz} in the Jupiter's stratosphere.

We were only able to reproduce this decrease after modifying a previously established K_{zz} profile in the atmosphere's layers of 0.2 mbar to 5 mbar pressure range. However, the K_{zz} that we obtained is incompatible with the main hydrocarbon observations, suggesting that there is another loss mechanism. We propose that auroral chemistry, not taken into account in our model, as a supplementary process to explain the loss of H_2O seen by Odin. The modeling of the temporal evolution of the chemical species deposited by comet SL9 in the atmosphere of Jupiter with a 2D photochemical model accounting for auroral chemistry would be the next step in this study.

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