HIGH RESOLUTION SPECTROSCOPY AND GLOBAL ANALYSIS OF THE TETRADECAD REGION OF METHANE $^{12}CH_4$

A. NIKITIN, *Institute of Atmospheric Optics, 634055 Tomsk, Russia and Laboratoire GSMA, UMR 6089 CNRS-Université de Reims Champagne Ardenne, Moulin de la Housse BP 1039, Cases 16-17, F-51687 Reims Cedex 2, France*; V. BOUDON, C. WENGER, *Laboratoire Interdisciplinaire Carnot de Bourgogne, UMR 5209 CNRS-Université de Bourgogne, 9. Av. A. Savary, BP 47870, F-21078 Dijon Cedex, France*; L. R. BROWN, *Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Drive, Pasadena, California 91109, USA*; S. BAUERECKER, *Physical Chemistry, ETH Zürich, CH-8093 Zürich, Switzerland and Institut für Physikalische und Theoretische Chemie, Technische Universität Braunschweig, D-38106, Germany*; S. ALBERT, M. QUACK, *Physical Chemistry, ETH Zürich, CH-8093 Zürich, Switzerland*.

We present the first detailed analysis of the Tetradecad region of methane $^{12}CH_4$ from 2.1 to 1.6 μm (4800 to 6250 cm^{-1})[a]. New high resolution FTIR spectra measured in a collisional cooling cell at 80 K and at room temperature have allowed us to perform many new assignments. All assigned lines of $^{12}CH_4$ in the 0–6200 cm^{-1} region have been included in a global fit, extending our previous analysis covering all levels up to and including the Octad (*i.e.* up to 4800 cm^{-1} [b]). In the end, 3012 line positions and 1387 intensities of 45 individual subbands were modeled up to $J = 14$. The root mean square deviations were 0.023 cm^{-1} for line positions and 13.86 % for line intensities in the Tetradecad region itself. Although this study is still preliminary, it is already sufficient to characterize the stronger bands throughout the whole of the Tetradecad polyad. The analysis and present success substantially improves our understanding of the methane spectra needed to interpret planetary atmospheres.

[a] This work is part of the ANR contract "CH_4Titan" (ref: BLAN08-2_321467). Part of the research described here was also carried out at the Jet Propulsion Laboratory, under a contract with the National Aeronautics and Space Administration. Our work is also supported by the Swiss National Science Foundation.

[b] S. Albert, S. Bauerecker, V. Boudon, L. R. Brown, J.-P. Champion, M. Loëte, A. Nikitin, M. Quack, *Chem. Phys.*, **356**, 131–146 (2009).