

Laser absorption spectroscopy of methane at 2.3 μm

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The present work focuses on the spectroscopic analysis of methane absorption in the atmospheric absorption window at 2.3 μm . The strong methane absorption in this part of spectrum favours this range for the retrieval of methane concentration in the atmosphere, (e.g. [1]) as well as for monitoring its spin isomers in different processes where the nuclear spin (NS) conversion may occur. This analysis covers three principal isotopologues: $^{12}\text{CH}_4$, $^{13}\text{CH}_4$ and CH_3D . The Vertical External Surface Emitting Laser (VECSEL) source [2] was coupled to a helium cooled Herriott cell [3] to measure the absorption spectra both at steady state conditions (from 50 to 296K), in order to provide data for identification of lower states energies, and during relatively fast cooling to observe the NS conversion or conservation. Here we report the results of this analysis concerning mainly the quantum assignments, line shapes and NSI behaviour during the cooling process.

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