DEVELOPMENT OF AN OPTICAL FEEDBACK-CAVITY RING DOWN SPECTROMETER AT 8.5 μm. APPLICATION TO THE SELF CONTINUUM OF WATER VAPOR.

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The effective atmospheric absorption of the earth atmosphere within its 10 μm transparency window is crucial for radiative transfer calculations. The contribution of the water continuum in this region is still under discussion. The proposal of an updated value at 1184 cm^{-1}should increase the accuracy of the semi-empirical MTCKD model, which is incorporated in radiative transfer codes. For this purpose, we used a newly developed spectrometer combining a quantum cascade laser (QCL) with a high finesse linear cavity, working around 8.45 μm. This setup takes benefit of optical feedback from an optical cavity and constitutes a Optical-Feedback-Cavity Ring Down Spectrometer (OF-CRDS). We will present the behavior of the laser in such a configuration and demonstrate the sharpening of the QCL emission profile under optical feedback from a TEM_{00} resonant mode of a linear cavity. Absorption spectra are measured using the CRDS method, and reach a sensitivity of 10^{-8} cm^{-1}per ring down event. Long-term performance will be presented. The spectral resolution, governed by the free spectral range of the optical resonator, is about 300 MHz. The spectra are obtained by adjusting the temperature of the QCL. Some already known water absorption lines were identified in the spectra, from 1183 $\mathrm{cm}^{-1}$and 1186 cm^{-1}, and used for calibration. The broadband absorption of the water self-continuum is evaluated and will be compared to the literature.

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