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Multichannel Heterodyne Spectroradiometer for Atmospheric Greenhouse Gas Measurements

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We present a portable, multichannel laser heterodyne spectroradiometer (MLHS) with a spectral resolution of 0.0013 cm-1 for precision column measurements and vertical profiling of atmospheric greenhouse gases (GHG). Sample spectra of CO_2 and CH_4 absorption lines obtained by direct Sun observations have allowed us to measure GHG column abundance with a precision of 0.5% for CO_2 and 10% for CH_4, as well as to retrieve their vertical profiles and to get a vertical profile of the stratospheric wind Rodin et al. (2020). The fundamentals and specifics of the multichannel configuration implementation of heterodyne receivers are presented in Zenevich et al. (2020). This work presents the first data of atmospheric CO_2 and CH_4 measurements, which were taken in a 4-channel configuration of the heterodyne receiver. Such configuration has allowed us to get atmospheric spectra with the SNR 300-500 within 2 minutes period of signal integration and keep the high spectral resolution. The results of retrieving CO_2 and CH_4 vertical concentration profiles and vertical profiles of the stratospheric wind are also presented.

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