

MEASUREMENTS DOUBLY-SUBSTITUTED METHANE ISOTOPOLOGUE ($^{13}\text{CH}_3\text{D}$ AND $^{12}\text{CH}_2\text{D}_2$) ABUNDANCE USING FREQUENCY STABILIZED MID-IR CAVITY RINGDOWN SPECTROSCOPY

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In this work, we demonstrated a spectroscopic method of measuring abundances of doubly-substituted methane isotopologues ($^{13}\text{CH}_3\text{D}$, $^{12}\text{CH}_2\text{D}_2$). In this method, we use a frequency stabilized cavity ringdown spectroscopy (FS-CRDS) technique to measure $\Delta^{12}\text{CH}_2\text{D}_2$ in naturally abundant methane to sub 0.1% level within one hour of average. Compare to traditional isotope-ratio mass spectrometer, which requires more than 24 hours of average to achieve comparable precision, this method provides a fast way of measuring clumped isotopologue abundance optically without destroying samples.