COMPACT QUANTUM CASCADE LASER BASED $^{13}$CO$_2$/12CO$_2$ ISOTOPIC RATIOMETER FOR FIELD MEASUREMENTS OF VOLCANIC GASES

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High precision measurements of $^{13}$CO$_2$/12CO$_2$ are needed in a wide range of fields that include volcano emission studies [1-2], atmospheric chemistry, combustion diagnostics, medical diagnostics and biology. Currently we are developing a compact, field deployable quantum cascade laser based sensor to perform real time measurements with a precision of $\delta \sim 0.1^\circ/_{oo}$, using absorption spectroscopy. The initial design of this analyser will target the prediction of potential volcano activities, but can be useful in other trace gas sensing applications.

A thermoelectrically cooled, pulsed, single frequency quantum cascade laser will be employed as spectroscopic source, which is required for field deployment. The laser is designed to operate at 4.33 $\mu$m, where the P-branch of 12CO$_2$ overlaps the R-branch of $^{13}$CO$_2$ of the 00$^\circ$1-00$^\circ$0 transition. To reach a high precision delta value, the influences of temperature and pressure stabilities must be taken into account, as well as the water vapor collision broadening.