The first record of a high time resolution carbon dioxide flux for the North-East Crater of Mount Etna

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A brand new methodology has been developed, combining Ultra-Violet (UV) camera spectroscopy with a field portable gas analyser to record CO_2/SO_2 ratios for the production of the very first high time resolution ($\sim$1 Hz) CO_2 flux. The technique was tested successfully using the North-East crater of Mount Etna over the period of $\sim$1 hour. The resultant dataset demonstrated that CO_2 emissions are highly variable over timescales of seconds to hours. This has significant implications for the estimation of global volcanic emissions which are currently poorly constrained, whilst the unprecedented resolution of the data opens up new possibilities for volcano monitoring and eruption forecasting. Results fit well with previous estimates of gas emissions from Mt Etna during a quiescent period with contributions of $\sim$11.66 kt d^{-1} and $\sim$2.68 kt d^{-1} assessed for CO_2 and SO_2 respectively. The CO_2 and SO_2 flux record presented non-stationary periodicities between $\sim$40-500 s, with a shared period of $\sim$89 s. A $\sim$85 s period was also present in the CO_2/SO_2 ratio, which cannot be a feature of atmospheric transport, thus upholding the volcanogenic nature of gas periodicities present. Further research needs to be completed focusing on acquiring longer datasets.