Geophysical Research Abstracts,
Vol. 11, EGU2009-5839, 2009
EGU General Assembly 2009


# Real-time Multi-GAS sensing of volcanic gas composition: experiences from the permanent Etna and Stromboli networks

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Measuring the composition of volcanic gases released from active volcanoes brings profound insights into our understanding of volcanic processes and, when combined with other methods, contributes to volcano monitoring. Volcanic gases can now be measured with a large variety of highly sophisticated techniques, but high-resolution routine measurements are possible with only a few of them (e.g., FTIR), and typically for only a few compounds. The Multi-GAS (Multi-component Gas Analyser System) technique has recently been demonstrated as a powerful method for the real-time high-resolution measurement of volcanic gas plumes, as has been used for discrete measurement surveys at several volcanoes including, among others, Etna, Stromboli and Vulcano in Italy, Villarica in Chile, Masaya in Nicaragua, Yasur and Ambrym in Vanuatu Republic, Miyakejima and Asama in Japan, and Soufriere Hill volcano on Montserrat. More recently, permanent Multi-GAS devices have been installed for the first on an active volcano at Etna (in 2004) and Stromboli (in 2006), allowing for the acquisition of unprecedented accurate time-series of volcanic gas compositions (for the three major components CO2-SO2-H2O) at both volcanoes. Here, we review the results of such permanent MultiGAS networks, and we demonstrate their implications for the comprehension of volcanic degassing processes. We also show that cycles of increase of Multi-GAS-sensed CO2/SO2 ratios preceded the most recent eruptive episodes on Etna in 2006-2008 and Stromboli in 2007, providing us with valuable precursor information on magma ascent within the shallow plumbing systems of these very active volcanoes, and thus deeply contributing to volcano hazard mitigation.