Cities on Volcanoes 9
November 20-25, 2016
Puerto Varas, Chile
*'Understanding volcanoes and society: the key for risk mitigation'*

# Field measurement of carbon isotopes (13C/12C) in volcanic CO2 by IRIS, with MultiGAS and drones: The carbonate signature at volcanoes of the Central Andes

**C. I. Schipper[1], Y. Moussallam[2], A. Curtis[3], N. Peters[4], T. Barnie, P. Bani, H.J. Jost, A. Aiuppa, G. Tamburello**

[1]Victoria University of Wellington

[2]SCRIPPS New Mexico

[3]Tech University of Cambridge

[4]The Open University

[5]IRD

[6]Thermo-Fisher Scientific

[7]INGV

[8]Palermo University of Palermo

Keywords: volcanic gas; carbon isotopes; carbon cycle; Isotope Ratio Infrared Spectroscopy

Carbon is arguably the most important element for life on Earth, but its role in arc volcanism is incompletely understood. Arc volcanoes act as the interface between Earth's interior and atmosphere, through which carbon from subducting oceanic lithosphere is partly recycled from the down going slab, with additional input from the underlying mantle. To quantify the relative contributions of slab and mantle carbon to volcanic CO2 has traditionally relied on the collection of representative samples from fumaroles, or more rarely the volcanic plume itself, and the subsequent analysis of these samples by Isotope Ratio Mass Spectrometry back in the lab. Although the gold standard in analytical precision, this process is difficult, and significantly limits the type and number of samples that can be obtained. We describe a novel co-implementation of a field-deployable Isotope Ratio Infrared Spectrometer, MultiGAS instruments and drones, for rapid and accurate determination of ?13C of volcanic CO2 in the field. Application of this system to the passively degassing Isluga and Lastarria volcanoes in the Central Andes of Chile demonstrate the volcanic CO2 to be derived almost entirely from recycled and assimilated carbonate, with ?13C of -0.3±1.5 and 1.1±1.0 ‰, respectively. We focus on these test sites to demonstrate the power of determining carbon isotopes from remote volcanoes in the field, which heralds a new era in quantifying the roles that subduction zones and arc volcanoes play in the global carbon cycle.