Volcanic CO_2 flux measurements by Tunable Diode Laser absorption Spectroscopy

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In the last decades, the use of near-infrared room-temperature diode lasers for gas sensing has grown significantly. The use of these devices, for instance in combination with optical fibers, is particularly convenient for volcanic monitoring applications [1,2]. Here, we report on the first results of the application of an open-path infrared tunable laser-based at Campi Flegrei (Southern Italy). Such Diode-laser-based measurements were performed, during two field campaigns (october 2012, and january 2013), in the attempt to obtain novel information on the current degassing unrest of Solfatara and Pisciarelli fumarolic fields.

At each site, we used an ad-hoc designed measurement geometry, using a TDLS (a Gas Finder unit) and several differently positioned retroreflectors (mirrors), to scan the fumaroles' plume from different angles and distances. From post-processing of the data (acquired at 1 hz), we derived tomographic maps of CO_2 concentrations in the plume and, by integration and combination with plume transport speed (from video cameras), we inferred the CO_2 flux directly. The so-calculated fluxes, the first ever obtained at Campi Flegrei, average of ~500 tons/day, and support a significant contribution of fumaroles to the total CO_2 budget. The cumulative (fumarole [this study] +soil [3]) CO_2 output from Campi Flegrei is finally evaluated at 1600 tons/day.

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Why was Rodinia underendowed? Comparing the effects of paleogeography versus lithosphere thickness on secular ore deposit preservation

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An empirical observation from the Meso- to Neoproterozoic geologic record is that this period, spanning the assembly and tenure of the supercontinent Rodinia, is one of the least endowed in mineral deposits. This underendowment is puzzlingly at odds with models that suggest peaks in contraction-related deposit formation associated with the supercontinent cycle.

The current model suggests change in lithospheric thickness (more negatively buoyant with time) would result in a lack of preservation of deposits, due to enhanced uplift and erosion. With nearly 30% of VMS and Sedex deposits hosted in high grade terrains irrespective of lithospheric age, Rodinia's high grade belts still are underendowed, hence an alternative explanation must be sought,

New models for the transition from breakup of the Paleoproterozoic supercontinent Nuna to assembly of Rodinia highlight the influence of accretion style and paleogeography in deposit preservation. Rodinia extroverted, hence was dominated by subduction of old oceanic lithosphere and strong advancing accretion. This doomed preservation of its VMS deposits, whch must accrete quickly to be preserved. Rodinia's long-lived, and latitudinally disposed, peripheral orogen setting, with limited back-arc development, meant that open ocean circulation was enhanced, further diminishing potential for VMS and lode gold deposits. Where Nuna evolved from interior to peripheral orogenic settings a similar deposit decline is observed, suggesting that ultimately paleogeography and style of accretion play a significant role in mineral deposit preservation. Hypothetically running geologic history forward in time suggests that the future supercontinent Amasia is destined to be another Rodinia.

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