Short Path Thermal Desorption - SPME - CT - GC/MS:
Analysis of trace organic compounds present in hot volcanic
gases with high sulfur, water and acid matrix

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The significance of organic emissions from quiescent volcanic degassing to
stratospheric chemistry is that the negligible aqueous solubility of most
emitted organic compounds does not lead to a quantitative tropospheric
washout effect as postulated for explosive volcanic HCl and HF emissions.
All previous attempts (eg. [1]) have two major analytical problems in
common: a) loss and modification of compounds through photolysis,
catalysis, adsorption, oxidation, & reaction with not separated condensate
during sampling; b) insufficient chromatographic separation due to the high
sulfur, water and mineral acid content of the gas. Sampling and analysis of
organic compounds in hot (up to 900°C) volcanic gases therefore has to be
customized to the difficult matrix of volcanic discharges.

We successfully developed and applied Short-Path Thermal
Desorption-Solid Phase Microextraction-Cryotrapping-GC-MS
(SPTD-SPME-CF-GC-MS) as a reliable standard protocol, together with
new sampling techniques. It meets the required analytical accuracy and
precision for reproducible (externally standardized) quantitative sampling
and analysis.

Among the over 100 detected and quantified compounds are several alkanes,
alkenes, arenes, phenols, furans, PAH's and their halogenated, methylated
and sulfonated derivatives, and various heterocyclic compounds. All
reported compounds are found well above laboratory, ambient air, adsorbent
and field blank values. For some analytes (e.g., CFC-11, CH₂Cl₂, CH₃Br),
concentrations are up to several orders of magnitude greater than even
midlatitudinal industrial urban air maxima.

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