

Hawaiian volcanism - Magmas from the seismic low-velocity zone

D.C. PRESNALL^{1,2,3*} AND G.H. GUDFINNSSON^{2,4}

¹Department of Geosciences, Univ. Texas at Dallas,
Richardson, TX 75083-0688, USA,

(*correspondence: dpresnall@ciw.edu)

²Bayerisches Geoinstitut, Universität Bayreuth, D95540,
Bayreuth, Germany

³Geophysical Laboratory, Washington, D. C., 20015-1305,
USA

⁴Iceland GeoSurvey, Grensasvegur 9, 108 Reykjavik, Iceland

The sequence of eruptions for a single Hawaiian volcano begins with a modest volume of alkalic lavas, progresses to a large volume of tholeiitic lavas, and ends with a modest volume of alkalic lavas. At the post-erosional Salt Lake crater on the flank of Koolau Volcano, garnet pyroxenite xenoliths contain diamond [1, 2], which indicates a pressure $> \sim 6$ GPa for the source of the final alkalic stage of Hawaiian volcanism that carried these xenoliths. For a mantle that contains small amounts of carbonate, comparison of phase relations in the CaO-MgO-Al₂O₃-SiO₂-Na₂O and CaO-MgO-Al₂O₃-SiO₂-CO₂ systems [3, 4] with a mature oceanic geotherm indicates that as pressure increases along the geotherm from $\sim 3 - 7$ GPa in the partly melted low-velocity zone, the equilibrium sequence of melts with increasing pressure changes from alkalic to tholeiitic and then back to alkalic compositions. The phase relations along a geotherm indicate further that melt fractions for the low-pressure alkalic melts are small, become large for the medium-pressure (~ 5 GPa) tholeiitic melts, and small again for the high-pressure alkalic melts. This sequence matches the eruptive history of individual Hawaiian volcanoes as well as the change of recent volcanism from southeast to northwest along the island chain. These features are the expected volcanic output from a system of southeast-propagating fractures [5], with progressively deeper extraction of melts as volcanoes age to the northwest. Termination of activity at each volcano is consistent with the difficulty of extracting progressively decreasing melt-fractions from progressively greater depths in the final stages of volcanism. No hot mantle plume is indicated, in agreement with heat-flow data near Hawaii [6].

[1] Wirth & Rochall (2003) *EPSL* **211** 357-369. [2] Frezotti & Peccerillo (2007) *EPSL* **262** 273-283. [3] Walter & Presnall (1994) *J. Petrol.* **35** 329-359. [4] Gudfinnsson & Presnall (2005) *J. Petrol.* **46** 1645-1639. [5] Stuart *et al.* (2007) Spec. Paper **430**, *GSA*, 497-506. [6] Stein & Von Herzen (2007) Spec. Paper **430**, *GSA*, 261-274.

Fossil and non-fossil primary and secondary organic aerosol

A.S.H. PRÉVÔT¹, S. SZIDAT², N. PERRON^{1,2}, V. LANZ¹,
M.R. ALFARRA^{1,3}, P. DECARLO¹, C. MOHR¹
AND U. BALTENSPERGER¹

¹Laboratory of Atmospheric Chemistry, Paul Scherrer Institut,
Villigen, Switzerland

(*correspondence: andre.prevot@psi.ch)

²Department of Chemistry and Biochemistry, University of
Berne, Berne, Switzerland

³Atmospheric and Environmental Sciences, University of
Manchester, Manchester, United Kingdom

A new approach of combining two in the last years developed measurement and data analysis techniques will be presented. The use of positive matrix factorization (PMF) of Aerodyne Aerosol mass spectrometer often allows the distinction of the contribution of biomass burning, hydrocarbon-like organic aerosol, and oxygenated organic aerosol (OOA) to organic mass [1]. The hydrocarbon-like aerosol is interpreted to come from the combustion of fossil fuel (often mostly from traffic) and OOA is thought to consist of secondary organic aerosol which is supported by high correlations of OOA with ammonium sulfate and/or ammonium nitrate. The measurements of ¹⁴C/¹²C ratios in organic carbon (OC) allows the calculation of fossil and non-fossil contributions to (OC) [2]. The PMF results of the AMS data can be combined with the radiocarbon measurements to distinguish the fossil and non-fossil contributions to the carbon of both the primary and secondary organic carbon. Necessary assumptions include OM/OC ratios of biomass burning, hydrocarbon-like organic aerosol and secondary organic aerosol. Results of such combined analyses will be presented at different sites in urban and rural areas as well as close to highways and Alpine valleys. Not all results are finalized yet but results so far suggest that in most cases, secondary organic aerosol is mostly non-fossil both in winter and summer in Switzerland. We will discuss uncertainties due to necessary assumptions.

[1] Lanz, V.A., M.R. Alfara, U. Baltensperger, B. Buchmann, C. Hueglin, & A.S.H. Prevot (2007), *Atmos. Chem. Phys.*, **7**, 1503-1522. [2] Szidat, S., T.M. Jenk, H.W. Gäggeler, H.-A. Synal, R. Fisseha, U. Baltensperger, M. Kalberer, V. Samburova, S. Reimann, A. Kasper-Giebl & I. Hajdas (2004) *Atmos. Environ.*, **38**, 4035-4044.