High-resolution aerosol records spanning recent centuries to millennia from polar ice core arrays

J.R. MCCONNELL[1]*, H. ANSCHÜTZ[2], M. BISIAUX[1], R. EDWARDS[1], D. PASTERIS[1] AND E.R. THOMAS[3]

[1]Desert Research Institute, Division of Hydrologic Sciences, Reno, Nevada, U.S.A (*correspondence: joe.mcconnell@dri.edu)
[2]Norwegian Polar Institute, Tromsø, Norway.
[3]British Antarctic Survey, Natural Environment Research Council, Cambridge, U.K

The importance of aerosols in climate forcing is poorly known in large part because of a paucity of historical records of aerosol sources, transport pathways, concentrations, and deposition. Archived in glaciers and ice sheet are detailed, long term records of aerosols. Because of their short atmospheric lifetimes, aerosol concentrations are highly variable in both time and space so arrays of ice core records are necessary to reconstruct past changes.

We present continuous ice core records of aerosol deposition during recent centuries and millennia developed from Arctic and Antarctic ice core arrays using a novel ice core analytical system which allows for simultaneous measurements of more than 30 elements and chemical species. Included are records of dust, sea salt, biomass burning, volcanic and industrial pollution aerosols. We explore the similarities and differences between the records and use model simulations to evaluate relationships between climate change, land use patterns and industrial emissions and aerosol concentrations and deposition in the remote polar regions.

A method for estimating relative volatile abundances in planetary magmas from apatite

F.M. MCCUBBIN[1]* AND H. NEKVASIL[2]

[1]Geophysical Laboratory, Carnegie Institution of Washington, 5251 Broad Branch Rd., NW, Washington, DC 20015 (*correspondence: fmccubbin@ciw.edu)
[2]Department of Geosciences, Stony Brook University, Stony Brook, NY 11794-2100

Apatite/basaltic melt partition coefficents for F (3.4) and Cl (0.8) were determined by [1] and, we have estimated an apatite/basaltic melt partition coefficent for H_2O (~0.2) using that same data set. Coupled with the Cl- and H_2O-solubility model of [2], we have constructed a diagram for using apatite to estimate the relative abundances of volatiles in planetary magmas. We have applied this method to apatite from lunar and martian rocks, which we have plotted in Figure 1 below.

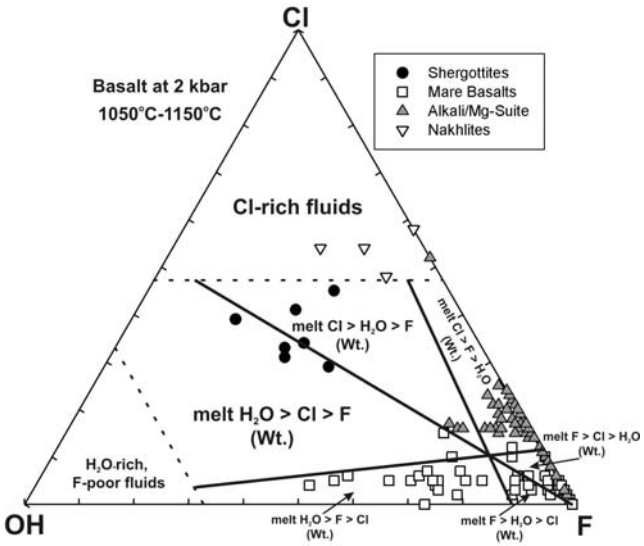

Figure 1: Ternary plot of martian and lunar apatite volatile contents [data from 3-5]. OH was calculated by difference assuming (1-F-Cl =OH). Solid black lines delineate fields of constant relative volatile abundances in the melt. Dashed lines indicate fields for which apaite could have only formed from either fluid, or fluid-saturated melt.

[1] Mathez & Webster (2005) *GCA*, **69**, 1275-86. [2] Webster & De Vivo (2002) *Am Min*, **87**, 1046-61. [3] Patino-Douce & Roden (2006) *GCA*, **70**, 3173-96. [4] Treiman & Irving (2008) *MAPS*, **43**, 829-54. [5] McCubbin *et al.* (2009) *LPSC* **40**, #2246.