

## **Description of Additional Supplementary Files**

Supplementary Data 1 - Summary of preferred whole rock data for halogen, K and noble gas isotope abundances. F and F/Cl from pyrohydrolysis, all other values from neutron-irradiation noble gas mass spectrometry (NI-NG-MS). Full pyrohydrolysis and NI-NG-MS datasets available in Supplementary Data 2 and 2 respectively.

Supplementary Data 2 – Full dataset for whole rock halogen and sulphate abundances determined by pyrohydrolysis

Supplementary Data 3 – Full dataset and processing for whole rock halogens and heavy noble gas isotopes determined by neutron-irradiation noble gas mass spectrometry (NI-NG-MS)

Supplementary Data 4 – Summary of in situ halogen abundances determined by secondary ionisation mass spectrometry (SIMS) and electron probe microanalysis (EPMA)

Supplementary Data 5 – Full dataset for in situ halogens measured by secondary ionisation mass spectrometry (SIMS)

Supplementary Data 6 – Major elements, loss on ignition, and total carbon determined by X-ray fluorescence spectroscopy (XRF) and element analyser

Supplementary Data 7 - Bulk mineralogy determined by powder X-ray diffraction (XRD)

Supplementary Data 8 - Fluid evolution and CO<sub>2</sub> flux modelling calculations

Supplementary Data 9 - Secondary ionisation mass spectrometry (SIMS) data for glass and scapolite standards