Timescale of TAG activity revisited

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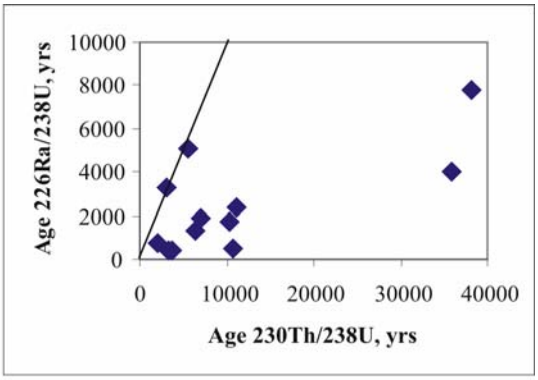
The duration and periodicity of mid-oceanic hydrothermal activity needs to be understood to better estimate its impact on global geochemical cycles. Previous U series dating of sulphides from the active transatlantic geotraverse TAG by Lalou et al., (1998) and You & Bickle (1998) have shown that hydrothermal activity is possibly episodic with repeat intervals of ~ 2000 yrs. The hydrothermal mounds undergo continual reworking during younger hydrothermal events which may compromise one or more of the U-series concentrations. Here we compare ^{230}Th/^{234}U and ^{226}Ra/^{230}Th ages. ^{230}Th/^{234}U and ^{226}Ra/^{230}Th isotope ratios of handpicked pyrite and anhydrite fractions were analysed by MC-ICP/MS and TIMS techniques.

Preliminary results show that ^{226}Ra/^{230}Th ages are significantly younger than ^{230}Th/^{234}U ages. This result implies that the uranium isotopic system has been perturbed since crystallisation of the original mineral phase and that either one or both of the Th and Ra chronometers reflect this perturbation.



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The thermodynamics of mixing in saline and mixed solvent solutions at elevated temperature and pressure: A framework for geological phase equilibria calculations

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An activity model which is valid for saline, mixed solvent, supercritical aqueous solutions is described. The model represents long-range contributions to the excess free energy of solution by a traditional Debye-Huckel term, while medium and long range interactions are represented by an asymmetric formalism (Van Laar type) term. This combination allows a physically meaningful description of a large composition range using a relatively small number of parameters.

Speciation is treated explicitly, with separate chemical potentials for associated and dissociated compounds of identical formula. This allows phenemona such as ion hydration to be incorporated easily into calculations.

The model has been coded into THERMOCALC, computer software that calculates equilibria for mineral-based chemical systems. This has been used to calibrate model parameters against experimental data from the literature for the systems NaCl-H_2O, KCl-H_2O, H_2O-SiO_2-CO_2, H_2O-NaCl-CO_2 and H_2O-NaCl-SiO_2. Modelled relationships between components represent the data reasonably well, to within experimental error in most cases. Calibrated parameters are consistent with physical expectations, and are relatively insensitive to changes in pressure and temperature. Uncertainties on calibrated parameters are largest when species are present in low quantities because fit diagnostics are then relatively insensitive to the specified parameters. A shortage of data for a wide composition range in any given system renders calibration difficult for many minor components; it is recommended that mixing energies should be set to zero for these species because activity coefficients are dominated by contributions from the more concentrated components. This simplification allows a wide range of fluid compositions to be modelled.