Submarine volcanoes and high-temperature hydrothermal venting on the Tonga arc, SW Pacific

Methods

Samples of vent fluids were collected separately for liquid and gas phases: liquids in 750 mL capacity Major Sampler syringes constructed of titanium with teflon seals (Von Damm et al., 1985) and gases in pre-evacuated, 150 mL capacity gas-tight bottles, also constructed of titanium (Edmond et al., 1992). Both samplers were configured with titanium intake snorkels, which were positioned using PISCES manipulator arms directly within focused flowstreams where maximum temperatures had been previously measured.

Hydrogen sulphide and silica were determined colorimetrically in batch mode using the methylene blue (nominal precision: 4%) and silicomolybdate (nominal precision: 1%) methods, respectively. Potentiometry was used to assess pH (nominal precision: 0.3%) at room temperature relative to NBS buffers and to measure alkalinity (nominal precision: 0.5%) by the Gran method. Total gas concentrations were determined using manometric and gravimetric procedures (nominal precision: 2%).

Values reported in the text are from samples with “purest” hydrothermal components, which ranged: 16% at Volcano 19 pit site, 19% at Volcano 1, and 96% at Volcano 19 summit, based on preliminary laboratory determinations of Mg compared to ambient seawater values. A comprehensive suite of determinations of the aqueous ionic and gaseous components is presently underway in Germany, New Zealand, and the United States and is intended for publication in the peer literature.
