VOLATILE-FLUID EVOLUTION IN SUBMARINE MAGMA-HYDROTHERMAL SYSTEMS

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Characterizing the origin and evolution of gases such as CO_2, H_2O, and CH_4 is crucial to understanding mid-ocean ridge spreading systems because volatiles provide a common thread that link geological, hydrothermal, and biological processes in ridge crest environments. Although many of these links have long been recognized, until recently little was known about the compositions and evolution of fluids that circulate deep within the oceanic crust. Key to gaining new insights into magma-hydrothermal environments has been the successful recovery by ODP drilling of rocks that represent the crystallized portions of submarine magma chambers. In her presentation, Dr. Kelley will discuss the nature of fluids trapped within these rocks and the constraints that these results place on the flux of volatiles from the lithosphere to the hydrosphere. A surprising result of her studies is the discovery of fluids with methane concentrations greater than 40 times those of basaltic gases and of vent fluids. This last finding is of particular significance in that the carbon-bearing fluids may provide a critical energy source for diverse microbial populations that exist in the sub-seafloor and within actively venting sulfide structures, and thus represent an important link between deep-seated hydrothermal systems and more shallow crustal environments. Dr. Kelley has sailed as a metamorphic petrologist on ODP Leg 140 at Hole 504B, Leg 147 at Hess Deep, and Leg 153 at Mid-Atlantic Ridge.