UC **SANTA BARBARA**
Department of Earth Science

Speakers Club

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The mid-ocean ridge basalt ferric iron crisis

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New analytical developments have led to substantial revisions in the estimated Fe^{2+}/Fe^{T} of mid-ocean ridge basalt glasses. In addition to the obvious implications for the oxidation state of the source mantle, the Fe^{2+}/Fe^{T} of magma influences its equilibrium with olivine, the basis of petrological models of magmatic temperature. Hence Fe^{2+}/Fe^{T} affects the inference of potential temperature and extent of melting in the sub-ridge mantle and models of complementary formation of erupted basalts and cumulate lower crust. Petrological models of primary basalt composition, potential temperature, and thickness of igneous crust suggest that there is a "crisis" because the values of Fe^{2+}/Fe^{T} near 0.84 suggested by the original calibration of the XANES method are inconsistent with olivine-glass data and require primary liquidus temperatures too low to explain the thickness of oceanic crust or the mass of cumulates in the lower crust. The crisis might be resolved by further revision of glass Fe^{2+}/Fe^{T} estimates, new melting models, source compositions, crustal thickness compilations, or interpretations of the plutonic-volcanic relationship.