Talk to be given Friday (Oct. 10st) at Macalester College

The Life and Times of Supervolcanoes: Inferences from Long Valley Caldera.

Cataclysmic eruptions of silicic magma from “supervolcanoes” are among the most awe-inspiring natural phenomena found in the geologic record, in terms of size, power, and potential hazard. Based on the repose intervals between eruptions of this magnitude, the magmas responsible for them could accumulate gradually in the shallow crust over time scales that may be in excess of a million years (Smith, 1979; Spera and Crisp, 1981; Shaw, 1985). Pre-eruption magma residence time scales can also be inferred from the age difference between eruption (i.e., using 40Ar/39Ar dating to determine the time when hot erupted material cools to below its Ar closure temperature, □200 to 600 °C) and early pre-eruption crystallization (i.e., zircon saturation temperatures; Reid et al., 1997). I will discuss observations from Long Valley a Quaternary volcanic center in California. Long Valley is a voluminous, dominantly silicic caldera system. Based on extensive dating of accessory minerals (e.g., U-Th-Pb dating of zircon and allanite) along with geochemical and isotopic data we find that silicic magmas begin to crystallize 10's to 100's of thousands of years prior to their eruption and that rhyolites record episodes of punctuated and independent evolution rather than the periodic tapping of a long-lived magma. The more punctuated versus more gradual magma accumulation rates required by the absolute and model ages, respectively, imply important differences in the mass and heat fluxes associated with the generation, differentiation, and storage of voluminous rhyolites and emphasize the need to reconcile the magmatic age differences.