Petrogenetic history of alkali magmatism at Baitoushan/Changbaishan volcano, China/N. Korea

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The Baitoushan/Changbaishan "hot spot" volcano, located along the China/N. Korean border, has erupted a range of magma compositions from trachyte to rhyolite in the last ~20ky. These magmas retain a variety of distinct mineral and melt components that result from the interplay of multiple alkali-rich magmas, including alkali basalts, trachytes, comendites, and a pantellerite. Potential parental alkali basalts, present as satellite cinder cones surrounding the main edifice, are in U/Th and Th/Ra equilibrium suggesting a lack of initial disequilibrium or old ages. In contrast, two younger comendite units, found along the northern ridge of the caldera, both have U/Th disequilibria and one also has Th/Ra disequilibria, attesting to the youthful nature of comendites at this edifice. $^{87}Sr/^{86}Sr$ ratios of individual potassium feldspar crystals are uniform in the younger of these comendites but are variable in the older, which precludes their derivation from the same magma reservoir. In addition, a pantellerite pumice deposit, located to the east of the main edifice, is intermediate in age between the comendites and has U/Th and Ra/Th disequilibria. It contains quartz crystals that have Titanium in Quartz temperatures lower than 700 degrees Celsius and Th/Ra equilibrium probably as a result of remobilization from a cumulate crystal mush. The highly voluminous comenditic Millenium Eruption (~1000CE), for which Baithoushan/Changbaishan is known, retains extensive U/Th and Th/Ra disequilibrium in both whole rocks and minerals, including potassium feldspar and quartz, and zircons and chevkinite crystals with ages of ~10 ka. Minerals have variable Pb isotope ratios suggesting remobilization from a crystalline mush. By integrating Sr, Nd, and Pb isotope ratios and U-series age constraints of minerals and magmas, we will address the petrogenetic history of this active magma system. Where possible, we also evaluate magmatic conditions at which these interactions occurred using Titanium in Quartz geothermometry, thus building an integrated picture of the time and conditions in which magmatic components are assembled in alkali-rich magma systems.