Geochronological and geochemical constraints on the construction of the Lluta pluton, Tacna (Peru)

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Looking at the active margin scale, subduction-related magmatism leads to the emplacement of voluminous intrusive rocks into the crust, forming large plutonic belts parallel to the trench. Due to long-term magmatic activity in single region, these plutonic belts become highly complex in terms of structural features, emplacement history, and geochemical signatures.

Along the Western margin of South America, subduction has been ongoing since ~570 Ma. In this study, we present the emplacement history of the Lluta pluton, located at the southeastern end of the peruvian Coastal Batholith, in the Tacna area. This pluton can be considered as an archetype of the Cretaceous to Paleocene magmatic arc activity and gives insight to the emplacement mechanisms of composite batholiths.

To unravel the emplacement history of the Lluta pluton, we performed major and trace element whole rock analyses on 21 samples, Sr and Nd isotopic measurements on 8 samples, and laser-ablation inductively coupled mass spectrometry (LA-ICPMS) U-Pb analysis on 5 samples.

The Lluta pluton intruded sedimentary jurassic strata, after which the whole crustal sequence was tilted about 28° towards the west. The pluton has since been exhumed exposing more than 70 km^2 at the surface, and providing a cross section through the different levels of the pluton. The lithologies vary from gabbro to granite.

The gabbroic intrusion, located at the base of the pluton yields an age of 72.4 ± 0.5 Ma, whereas the various dioritic to granitic intrusions at lower crustal levels yield younger ages between 62.8 ± 0.4 and 62.0 ± 0.4 Ma. The entire dataset however displays a strong geochemical arc signature, that fits within the range of plutonic arc signatures in southern Peru. Initial Sr isotope ratios range is 0.70445-0.70575 and initial Nd isotope ratio range is 0.51248-0.51260.

Integration of the entire dataset illustrates the discontinuous contruction of a single pluton in a subduction context. Isotopic signatures suggest either a varying amount of crustal contamination or magma mixing processes for the different lithological units, and show that the parental magmas are slighly more juvenile than those of the northern Coastal Batholith section of Arequipa.

Effects of carbonate assimilation on magma from Sumbing volcano, central Java, Indonesia and implications for Merapi

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Sumbing volcano is situated at the southern end of a NNW-SSE trending chain of volcanoes in central Java that lies ~ 50 km east of a parallel chain, which includes Merapi. Sumbing has received little attention partly due to its dormancy since 1730. New petrological and mineralogical data along with whole rock major and trace element and Sr-Nd-Hf-Pb isotopic analyses were conducted for 20 volcanic rocks collected from Sumbing in 2009.

There are two petrographic and chemical magma groups. *Pyroclastic deposits* are predominantly fragments in lahars at the base of the volcano and contain ubiquitously higher percentages of Ca-bearing mineral phases such as clinopyroxene and highly altered plagioclase feldspar. The latter display a large range in anorthite (An) content. In contrast, a group of *lavas* show much less evidence for mineral-melt disequilibrium, are orthopyroxene (enstatite) rich and display more restricted plagioclase compositions.

The pyroclastic deposits are more silica undersaturated than the lavas and contain higher concentrations of CaO, Ba, Sr and have elevated $^{87}Sr/^{87}Sr$, all of which overlap fields for Merapi. Correlations between degrees of silica saturation, Sr/Nb and $^{87}Sr/^{86}Sr$ suggest that these magmas become progressively enriched in Ca, Sr and$^{87}Sr/^{86}Sr$ with increasing silica undersaturation i.e. more contaminated rocks have lower SiO_2. In contrast, the lavas display little variation in these properties, beyond what would be expected from closed system differentiation. We interpret the two groups as originating from similar parental magma but displaying the effects of having experience (pyroclastic) or escaped (lava) interaction with carbonate in the arc crust.

The lavas at Sumbing suggest that all magma erupted from Merapi has interacted with crustal carbonate. Therefore, Sumbing lavas provide the best estimate of parental melt characteristics of the arc front in central Java.

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