

AMNESIA IN PLUTON EMPLACEMENT: BALBUENA PLUTON, BAJA CALIFORNIA, MEXICO

Paul H. Wetmore*, Keegan L. Schmidt and Scott R. Paterson
Dept. of Earth Sciences, University of Southern California 90089-0740
*Wetmore@earth.usc.edu

Pluton emplacement necessarily involves multiple mass transfer processes (MTPs) that may work in concert or may vary dramatically in time and crustal position to create space. Constraining the relative contributions of various MTPs may be hampered by the removal of the evidence of early MTPs preserved in the aureole by the effects of later processes such as stoping. Furthermore, the removal of such history-bearing aureoles may even be selective.

The Balbuena pluton (BP) is an excellent example of a composite intrusive body that was emplaced by multiple MTPs. The BP was emplaced into the Alisitos arc segment of the western Peninsular Ranges batholith following contractional deformation that generated southwest-vergent thrust faults and tight to isoclinal folds at greenschist facies metamorphic conditions. The pluton is composed of three phases: an elliptical biotite-hbl tonalite inner phase, and crescent-shaped diorite and biotite \pm hbl tonalite middle and outer phases. The two inner phases appear to have been intruded penecontemporaneously and formed a >1km wide structural aureole. This aureole is characterized by pronounced deflection (>80°) of lithologic contacts and structures away from regional trends into near concordance as well as dramatic increases in ductile strain (>70% shortening) and metamorphic grade (lower amphibolite?). The outer and youngest phase of the BP preserves some roof contacts, and appears to have removed much of the earlier-formed structural aureole through stoping. The contacts between this phase and the country rocks are typically knife-sharp and discordant to lithologic contacts and structural trends.

The different dominant MTPs associated with the inner phases (ductile flow) relative outer phase (stoping) likely reflect differences in the relative plutonic level between the two. At the present level of exposure the structural aureole forms the walls to the older phases, with the roof to these phases still higher in the crust. However, at the same level the aureole forms the roof to the outer phase. Furthermore, the shape and location of the outer phase suggest it was strongly influenced by earlier anisotropy, thereby selectively removing the structural aureole and any earlier-formed emplacement history with it.