Magma mingling and mafic enclaves: structural relations within upper crustal plutons in the Peninsular Ranges batholith
Mesa Grande 7.5’ Quadrangle, northern San Diego County, California

Janis L. Hernandez¹, Lawrence L. Busch¹, and Victoria R. Todd²
California Geological Survey, Los Angeles, CA, 21740 Clarion Drive, Williamsport, PA 17701
Janis.Hernandez@conservation.ca.gov, Lawrence.Busch@conservation.ca.gov, vtodd@chilitech.net

ABSTRACT: The California Geological Survey currently is mapping upper crustal plutons in the Mesa Grande 7.5’ quadrangle, northeastern San Diego County. These plutons are part of a transect across the Peninsular Ranges batholith, San Diego County, California. New mapping revealed spectacular exposures of agmatite, a field term for commingled fine-grained gabbroic dikes. Agmatite consists of felsic granitic rocks that have intruded a fault zone between tonalitic and gabbroic host rocks (Paterson et al., 2010; Dave Tucker, 2010). In Carney Canyon, agmatite consists of felsic granitic rocks that have intruded a fault zone between tonalitic and gabbroic host rocks. The agmatite body measures about 5 km long and 1.5 km wide, and strikes NNE, approximately parallel to the plutonic contacts. These dike bodies may be ribbon-like inclusions (mafic enclaves). The agmatite body exhibits evidence of brittle and ductile deformation extending northward to the Elsinore Fault Zone.

Possible parental magmas for the agmatite in Carney Canyon are the Alpine tonalite and one or more gabbro plutons, mapped along the west side of Pamo Valley, a NNE-oriented fault-controlled valley that is with a pluton of Japatul Valley tonalite, mapped along the west side of Pamo Valley, a NNE-oriented fault-controlled valley. It is bounded on the east by a pluton of Kc – Cuyamaca gabbro. The Western contact exhibits evidence of brittle and ductile deformation extending northward to the Baja Fault Zone.

The agmatite plates and vein or vein-like structures in the Carney Canyon pluton have mafic enclaves that are rare in other plutons of the Peninsular Ranges batholith. Similar examples are known from Mesozoic intrusive sequences in the southwestern United States. In Carney Canyon, the mafic enclaves are ribbon-like inclusions (mafic enclaves) that are spatially associated with the Alpine tonalite and a lensoid body of gabbro. The mafic enclaves range in size from sub-mm to several meters in width. The enclaves are mostly composed of plagioclase and hornblende, with rare pyroxene. The enclaves are foliated, with foliation orientations that are approximately parallel to the strike of steeply dipping foliation and the strike of the host pluton.

Detailed mapping will improve our understanding of structures and emplacement histories of upper crustal plutons in the western Peninsular Ranges batholith that crystallized at pressures between 3 and 4 kb.

Selected References


Kc – Cuyamaca gabbro
KJvs

GSA 2016 Cordilleran Section Meeting Paper No. 256, AAS 2016

Figure 1: Mesa Grande 7.5’ quadrangle, southwestern portion of the map area.

Figure 2: Mesa Grande 7.5’ quadrangle, southern portion of the map area.

Figure 3: Description of selected map units, Mesa Grande 7.5’ quadrangle. Mapping in progress, V. Todd and J. Hernandez, 2016

Figure 4: Mesa Grande 7.5’ quadrangle, northeastern portion of the map area.

Figure 5: Mesa Grande 7.5’ quadrangle, southeastern portion of the map area.

Figure 6: Mesa Grande 7.5’ quadrangle, southeastern portion of the map area.