Geology of the Tiburon Peninsula, Marin County, California

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Preliminary results of on-going detailed geologic mapping on the NW-SE trending Tiburon Peninsula, southern Marin County, has revealed a complex but locally coherent terrain composed of variably deformed and metamorphosed rocks of the Franciscan Complex. The structurally lowest terrain in the area consists principally of interbedded sandstone and shale, graywacke, lesser conglomerate, chert, and minor basalt (greenstone). This terrain is overlain by ultramafic (um) rocks composed mainly of altered peridotite (harzburgite) and serpentine which were originally emplaced along a low-angle fault. Uplift and extensive erosion has exposed large portions of the footwall sedimentary and volcanic terrain leaving two erosional remnants, or klippen, of the hanging wall um rocks: a roughly circular sheet capping Ring Mountain located in the NW portion of the peninsula, and an elongate, complexly folded and faulted sheet capping the central and SE portions of the peninsula.

The fault zone at the base of the overlying um rocks can be seen in various exposures throughout the peninsula and is recognized by the occurrence of pervasively sheared serpentinite and/or talc schist. It is also recognized by the presence of high-grade metamorphic blocks of varying size composed of blueschist, eclogite, and/or amphibolite that have weathered out of the soft, fault-sheared matrix and remain as dense, isolated blocks along the fault contact. These features are especially well exposed at Ring Mountain where the faulted base of the um sheet has been extensively exposed by erosion.

Footwall rocks exhibit alteration characteristics that increase as the fault is approached. Typically, red-bedded chert becomes intensely folded, bleached, brecciated, and re-silicified; relatively unaltered graywacke and/or interbedded sandstone and shale become increasingly foliated and commonly contain thin, tightly folded, quartz-filled cross fractures as the fault is approached. Clastic rocks adjacent to the fault contact commonly exhibit a well-developed schistose texture defined in hand specimen by the occurrence of thin bands of chlorite smeared around more resistant lens-shaped quartz grains. Preliminary thin section analyses of these shear zone schists indicate that they contain euhedral tablets of lawsonite within a cataclastic, clay-altered matrix. The textural features observed within the footwall rocks are interpreted as having been produced during emplacement of the overlying um sheet. The presence of euhedral lawsonite observed within the clay-altered matrix of the footwall schists indicate that these rocks were also subjected to localized high P/T conditions either during emplacement or post-emplacement of the overlying um sheet.

Biography

David Bero is a registered geologist in California and Wyoming. He received a Bachelor's degree in geology from Humboldt State University and a Master's degree in geology from CSU Fresno. He also studied economic geology and tectonics as a graduate student at the University of Arizona. He worked as an exploration geologist for various U.S. mining companies from 1980 – 1990, working throughout the Great Basin, the Klamath Mountains, the Sierra Nevada, and in Central America. From 1990 to the present he has worked as a consulting geologist for various engineering firms within the Bay Area and Sonoma County. For the past 14 years he has been mapping the geology of various areas within the Franciscan Complex. These studies include portions of the Sonoma County coastline near the town of Jenner and, more recently, the Tiburon Peninsula. He presented a preliminary geologic map of the Tiburon Peninsula at the recent GSA meeting held in Seattle, WA, in November 2003. This mapping effort has led to additional on-going studies of Tiburon Peninsula geology as well as other areas within southern Marin County.