INTRODUCTION

The Northern Coast Ranges (Fig. 61) are a composite geomorphic province consisting of structurally controlled, northwest trending, en echelon ridges and valleys that extend from the Klamath Mountains in the north to San Francisco Bay in the south. The core of the Coast Ranges consists of complexly deformed Upper Jurassic to Early Tertiary rocks of the Franciscan Complex. This core is structurally overlain to the east by less deformed, late Mesozoic marine, clastic rocks of the Great Valley Sequence. These two essentially coeval terranes are juxtaposed along a major low-angle fault, the Coast Range Thrust (Bailey et al., 1964), whose present geometry is extensively modified by Tertiary deformation of the Coast Ranges and extensive strike slip displacement along reactivated Mesozoic structural discontinuities (McLaughlin, 1974, 1981; Suppe and Foland, 1978; Suppe, 1979).

FRANCISCAN COMPLEX

The Franciscan Complex is a highly deformed, lithologically heterogeneous assemblage. It consists predominantly of graywacke and metagraywacke with subordinate shale, altered mafic volcanic rocks, radiolarian chert and minor limestones, which range from unmetamorphosed through zeolite, prehnite-pumpellyite, greenschist, and blueschist facies. It also includes minor blueschist and eclogite facies exotic blocks. The distribution and relationships of these rocks is complicated by numerous thrusts and chaotic melange zones. Vestiges of original stratigraphic relations are only locally preserved in large tectonic slabs and thrust sheets. Thrust sequences "top" eastward and "young" to the west and the regional tectonic fabric dips eastward at high angles. Overall, the high P, low T metamorphic grade increases west to east but the metamorphic facies progression is more complicated in detail.

In the northern Coast Ranges, Franciscan rocks are subdivided into three major subparallel belts. From west to east they are the Coastal belt, Central mélangé belt and Yolla Bolly belt (Fig. 61). Coastal belt rocks range in age from Late Cretaceous through Paleocene to Eocene (Blake and Jones, 1974; Evitt and Pierce, 1975) and are predominately arkosic sediments with a smaller component of lithic volcanic and chert fragments than typical Franciscan sandstones. They occur as broken and disrupted sequences of marine clastic rocks with typical turbidite facies associations indicative of deep sea fan deposition. Laumontite and prehnite are abundant and blueschist mineral assemblages are lacking, indicating very low grade metamorphism.

The Central belt includes mélanges containing blocks of graywacke and metagraywacke associated with greenstone, chert, and serpentinite generally enclosed in a sheared mudstone matrix. The Central belt also includes large, coherent sandstone units. High-grade blueschist rocks occurring as knockers are concentrated along the western boundary of the Central belt or associated with serpentinite-filled fault zones.

Most fossils, from the mélangé matrix, range from Late Jurassic to Early Cretaceous (Blake and Jones, 1974) but some blocks contain Late Cretaceous fossils. In this zone stratigraphic reconstructions are difficult due to the thorough and pervasive tectonic mixing. Paleomagnetic determinations from a variety of lithological blocks (Alvarez et al., 1979, 1980; Sliter, 1984) in the central belt suggest translations from southerly latitudes on the order of thousands of kilometers. Displacements of this magnitude have posed questions on the ultimate origin of the Franciscan complex and a spate of models have been generated to explain the assembly of many far-traveled allochthonous fragments (Jones et al., 1977, 1978, 1983; Nur and Ben-Avraham, 1977; Coney et al., 1980; Page, 1982).

Overlying, and in thrust contact with the central belt, is the Yolla Bolly belt. This belt is a composite terrane consisting of an upper, eastern thrust sheet of metapelites and minor metabasalts (South Fork Mountain Schist) underlain by a succession of quartzfeldspathic graywacke, mudstone, and minor conglomerate. Fossil ages range from Tithonian through Valanginian.

The rocks comprising the Yolla Bolly belt have been metamorphosed to blueschist facies and locally jadeite is present. There is an increase in both textural grade and metamorphic grade from west to east across the belt (Blake et al., 1967; Blake and Jones, 1977; Bishop, 1977). Although the original transition is believed to be gradational, faults mark the boundary from one metamorphic or textural domain to the next (Suppe, 1973). The best estimate for the metamorphic age is 115-120 m.y. (Lanphere et al., 1978).

Based largely on its extreme structural disorder and the presence of blueschist blocks, the Franciscan Complex is widely interpreted as an accretionary complex of trench fill turbidites and amalgamated oceanic terranes, formed during subduction along the California coast in the late Mesozoic.

COAST RANGE OPHIOLITE

Throughout the Coast Ranges, remnants of a plate consisting of layered ultramafic and mafic igneous rocks are recognized to structurally overlie rocks of the Franciscan Complex. These remnants taken together are referred to as the Coast Range Ophiolite and are thought to represent a once intact piece of oceanic crust upon which sediments of the basal Great Valley Sequence were deposited.

Reconstruction of the various remnants yields a "composite" ophiolite sequence characterized by the following petrologic units. A basal ultramafic unit consisting of variably serpentinitized harzburgite tectonite which is usually less than 1500 m thick and in fault contact with the surrounding rocks. The ultramafic tectonite is overlain by a layered plutonic complex composed largely of ultramafic to gabbroic cumulate sequences that pass upward into more massive gabbro, microgabbro, diorites and plagiogranites of non-cumulate origin. These, in turn, are overlain by...