INTRODUCTION

This article serves as an overview to the pre-Neogene geology of the Sacramento Basin and sets the stage for more detailed papers dealing with specific stratigraphic units along the field trip route. Emphasis in this guidebook is on latest Cretaceous and Tertiary deposits, so that this discussion focuses primarily on sedimentary and tectonic events during this time period. Later events are dealt with in the paper by Graham (this volume), in which he contrasts the Neogene strike-slip regime with the older arc-trench tectonics described here.

Mesozoic-Cenozoic Arc-Trench System

A major key to understanding the 30,000 ft of Mesozoic strata comprising the Great Valley Sequence of the northern California Coast Ranges was the recognition that its deposition was coeval with magmatism in the Sierra Nevada batholith and sedimentation and deformation of the Franciscan Complex along the coast (Lamphere, 1971; Suppe and Armstrong, 1972; Everndon and Kidder, 1970). This led to the view that these three units were related elements of a continental-margin arc-trench system (Figure 1) (Hamilton, 1969; Dickinson, 1970). Subsequent work has expanded this interpretation and shown that the Franciscan Complex consists of a heterogeneous mixture of oceanic and terrigenous materials that were accreted along a subduction zone seaward of a deep marine forearc basin fronting the magmatic arc in the Sierra Nevada (Dickinson and Rich, 1972; Blake and Jones, 1974; Ingersoll and others, 1977). Changes in the rate and direction of oceanic plate convergence against the North American Plate effected changes in the activity and location of the system, but these three main elements (subduction complex, forearc basin, and arc) were long-standing features that persisted from the Late Jurassic into the Neogene. The system persists today in the Pacific Northwest and in Mexico, but was supplanted in California in the Oligocene by the transform fault system of the San Andreas Fault.

Inception

The earliest radiometric dates on blueschists and ophiolites exposed in the Coast Ranges west of the Sacramento Valley imply a Late Jurassic (Kimmeridgian) age for inception of subduction along the continental margin (Lamphere, 1971). A popular interpretation is that subduction jumped westward from a pre-Late Jurassic position centered on the present Sierra Nevada foothills metamorphic belt (Figure 2A). Schweickert and Cowan (1975) attributed the jump to collision of an east-facing island arc with a west-facing continental margin arc, clogging the subduction zone along the continental margin. Subduction then jumped farther west as the oceanic crust on the rear (seaward) side of the island arc broke up. This set off a new phase of continental-margin arc magmatism as plutons intruded and metamorphosed the older arcs and fed volcanoes at the surface.

Sediment eroded from the arc found its way westward and began accumulating as the Great Valley Sequence in the forearc basin on a remnant of oceanic crust (the Coast Range Ophiolite) and in the trench (Figure 2B). Ingersoll (1978a, 1979) interpreted Tithonian and Neocomian (Late Jurassic-Early Cretaceous) conglomerate and shale near the base of the Great...

Figure 1. Geologic map of California, showing the distribution of 1) igneous and metamorphic rocks of the Sierras-Klamath magmatic arc; 2) sedimentary strata of the Great Valley Sequence; 3) deformed and metamorphosed rocks of the Franciscan Complex; and 4) Cenozoic volcanic and sedimentary cover. Units 1-3 form parallel belts in northern California but have been disrupted and transported by Neogene strike-slip faults in southern California.

Geology and Sedimentation of the Southwestern Sacramento Basin and East Bay Hills, 1983
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