ABSTRACT

Depositional systems of the Late Cretaceous contrast with those of the Paleogene in subsurface sections along the east side of the San Joaquin basin between Bakersfield and Fresno. Upper Cretaceous deposits include thick fan deltas and submarine fan facies of the Moreno and Panoche Formations, whereas the Paleogene contains extensive nearshore, shelf, slope and submarine fan deposits of the Lodo, Domomgine, Tuney, Famoso, and Kreyenhagen Formations. Although both systems were deposited in a relatively stable forearc setting, each is different because of eustatic sea-level variations and tectonic changes in the adjacent Sierra Nevada.

Upper Cretaceous sediments were deposited on a basement surface having several west-trending ridges and valleys. Westerly flowing stream systems draining an ancestral Sierra Nevada of moderate relief formed prograding fan deltas which filled the valleys with thick wedges of nonmarine channel deposits, creating a bajada along the shoreline. Detrital material moved rapidly across a narrow shelf and into a complex of submarine fans in the basin to the west.

In early Eocene, a low stand of sea level coincident with the end of uplift of the Sierra Nevada resulted in extensive erosion of the range. Stream-fed fan deltas were replaced by major west-flowing river systems. Following a rapid sea-level rise, sand from the river systems was deposited on a broader shelf along a wide belt roughly coincident with California Highway 99. A single river was the point source for sand in a submarine fan northwest of Bakersfield.

Upper Cretaceous and Paleogene depositional systems probably continue north along the east edge of the Great Valley. This proposed scenario for the east side of the San Joaquin basin is analogous to forearc deposits in the San Diego area, including the Cretaceous Rosario fan delta and submarine fan system and the Eocene La Jolla and Poway fan delta, nearshore, shelf and submarine fan systems.

INTRODUCTION

Late Cretaceous and Paleogene deposits of the San Joaquin basin reflect forearc depositional systems that were strongly influenced by the Sierra Nevada magmatic arc. The Late Cretaceous system is dominated by a narrow shelf and steep slope, and contains fan deltas and submarine fans. In contrast, the Paleogene depositional systems are dominated by a broad shelf containing tidal flats and shelf sand sheets, as well as associated deltas and submarine fans. Late Cretaceous and Paleogene depositional systems have many features in common with other West Coast forearc deposits of similar age, which are influenced by erosion rates from the arc, width of the shelf, tectonic controls on subsidence, and eustatic sea-level changes (Ingersoll and Dickinson, 1981; Lohmar and Warme, 1979; Moxon and Graham, 1987). Detailed depositional analysis of the Late Cretaceous and Paleogene of the east central San Joaquin basin is difficult due to a lack of outcrop. The information that is available is from a limited number of widely spaced wildcat wells. Use of depositional models assists with correlating between wells and provides a framework for interpretation. The San Diego area (Lohmar and Warme, 1979) provides the best available analog with a similar Upper Cretaceous-Paleogene stratigraphic sequence overlying arc basement rocks. Therefore, the goal of this study is, through use of a model, to document the stratigraphy and depositional environments of Upper Cretaceous and Paleogene deposits in the east central San Joaquin basin, and to explain their existence in terms of the sedimentologic and tectonic setting.

The area of study is between the cities of Fresno and Bakersfield and from the Sierra foothills west to about the center of the San Joaquin Valley (Figs. 1 and 2). The study examines all strata below the lower Miocene Vedder and Tumbler Formations and above the Sierra Nevada basement complex. This interval contains three major depositional systems (Figure 3): (1) undifferentiated Upper Cretaceous equivalents to the Moreno and Panoche Formations of the western San Joaquin basin, (2) Paleocene to lower Eocene Lodo Formation and (3) Middle to upper Eocene Domomgine, Famoso, Kreyenhagen, and Tuney Formations. The primary source of stratigraphic information was gathered by correlating electric logs from about 150 abandoned wells in the eastern San Joaquin basin. Use of depositional models assists with correlating between wells.

REGIONAL SETTING

The study area is on the east limb of the Great Valley syncline (Fig. 1). Most of the east-central San Joaquin basin lacks significant structural features other than a uniform 3 to 5 degree dip to the west. However, faults are recognized along the southeast edge of the study area where there is greater well density due to oil field development. Gentle folds along the west edge of the study area have associated oil and gas accumulations (Nasco, Trico, and Riverdale fields). The Sierra Nevada basement complex crops out east of the study area and extends beneath the basin fill at least as far west as the axis of the Great Valley syncline. A major structural feature, the Bakersfield arch, is present in the subsurface southwest of Bakersfield (MacPherson, 1978). Cretaceous sedimentary rocks...