mont or coastal zone.

The nature and quantity of sediment produced from the source area determine the morphologic character of the river, and a river can be classified into five patterns dependent on type of sediment load. The (1) straight and the (2) sinuous-thalweg patterns reflect relatively low values of sediment transport, of bed-load to total-load ratio, and of stream power. The (3) meandering pattern reflects relatively low to moderate values of sediment transport, of bed-load to total-load ratio, and of stream power. The (4) meandering-braided transitional pattern and the (5) braided pattern reflect relatively high values of sediment transport, of bed-load to total-load ratio, and of stream power.

Throughout geologic time fluvial systems have had complex erosional and sediment-production histories as a result of external and internal influences. The external variables that most significantly affect the fluvial system are tectonic, eustatic, and climatic. The response of the fluvial system to changes in these controls is not necessarily simple; rather a complex response involving both erosion and deposition will ensue and the morphologic character of a river will change as the character of the sediment delivered from the source area changes. The exceeding of intrinsic geomorphic thresholds also produces episodes of high sediment movement.

The character of sedimentary deposits (piedmont, deltaic, or nearshore) will reflect the geology, morphology, and erosional history of the source area as well as the type of river transporting the sediment. Abrupt changes in amount and type of sediment reflect not only the complexity of the erosional evolution of the area, but also the dynamics of the sediment-producing and transport zones of the fluvial system.

SCOTT, ROBERT W., World Oil, Houston, Tex.

Oil and Gas in China

No abstract available.

SHEPHERD, RUSSELL G., and WILLARD G. OWENS, Willard Owens Associates, Inc., Wheat Ridge, Colo.

Hydrogeologic Significance of Ogallala Fluvial Environments

A "spring line" separates areas of flowing and nonflowing artesian wells completed in alluvial-fan deposits of the Ogallala Formation southwest of Cheyenne, Wyoming. Electric and lithologic logs from water well test holes in the area permit the distinction of depositional subenvironments within and near the ancient fan. West of the "spring line," the Ogallala coarsens upward through an aquifer unit of interbedded sand and gravel approximately 35 m thick, representing low-sinuosity fluvial-channel deposits. East of the "spring line," the same unit becomes markedly finer and is characterized by fining-upward subunits 10 to 15 m thick, representing deposits of fluvial channels with higher sinuosities. Water wells completed in the proximal-fan deposits on the west commonly produce a few hundred gallons per minute; in contrast, wells in the distal fan and in interbedded fan and lacustrine deposits on the east produce only several tens of gallons per minute or less. Identifying the location of the distal margin of the low-sinuosity deposits, and thus the "spring line," through interpretations of depositional environments from outcrops and logs, helped locate rapidly one industrial water supply in the area.

Contrasting fan geometries illustrate varying rates of progradation with respect to the adjacent aggrading flood basins, whereas cyclicity within fan bodies reflects lobe shifting and/or basin-floor subsidence. General contrasts in fan thickness, size, and facies on opposite basin margins allow reconstruction of the basin geometry and provide clues to the likely types of bounding faults.

SINGLER, CHARLES R., Youngstown State Univ., Youngstown, Ohio, and M. DANE PICARD, Univ. Utah, Salt Lake City, Utah

Paleosols as Environmental Indicators in Nonmarine Sedimentary Rocks—Example from Brule Formation

Although there has been considerable study of Pleistocene and post-Pleistocene soils as stratigraphic markers and environmental indicators, much less attention has been given to older paleosols. In nonmarine sedimentary beds, periods of nondeposition or erosion can be characterized as intermittent, areally extensive, and of variable duration. Under favorable conditions of weathering, soils may develop on exposed rocks and subsequently be preserved by deposition and burial.

The Brule Formation (Oligocene) in northwest Nebraska consists predominantly of fluvial and eolian rocks. Based on paleontologic evaluations, several stratigraphic levels have been suggested as being soils or soil complexes. Of these, two stratigraphic zones were studied as possible paleosols. One of these, the lower ash bed of the Whitney Member, Brule Formation, has physical characteristics similar to those of a soil formed in a semiarid climate.

The lower ash bed is indicated to be a paleosol on the basis of trends in organic matter, particle-size distribution, and calcium carbonate content. The vertical profile shows a zone of higher organic matter in the upper part, a zone of high clay content below, and high calcium carbonate content in the subsoil. The White marker bed of the Whitney Member of the Brule Formation was also studied. The amounts of organic matter, clay, and calcium carbonate do not indicate a simple paleosol origin for the White marker bed.

Comparison of the lower ash paleosol to modern soils provides a basis for additional interpretations. Depth and thickness of zones of accumulation suggest that the paleosol was developed under a grassland cover and are characteristic of Chestnut-type soil. The climatic conditions that typically produce these characteristics include an average annual precipitation of 30 to 45 cm.

SMITH, SCOTT R., Saskatchewan Dept. Mineral Resources, Regina, Sask.

Geology and Hydrocarbon Accumulation in Mississippian Midale Beds, Benson Oil Field, Southeastern Saskatchewan