Santee River drainage system. Coarse, poorly sorted sand disconformably overlies Pleistocene estuarine clays and is capped by a dense clay plug. Beach ridges prograded seaward over the first inlet sequence. A second cycle of inlet migration truncated the northernmost part of the beach ridges and scoured into the inactive-fill clay plug of the earlier inlet deposit. The resultant stratigraphic framework consists of a stacked series of upward fining, active inlet-fill sands overlain by thicker inactive inlet-fill clay plugs.

Migrating tidal inlets greatly alter barrier island stratigraphy. Reworked beach ridge sediments are incorporated into tidal inlet channels preserved on the updrift end of the barrier island. Fine-grained clay plugs form permeability barriers between adjacent barrier island sand bodies. Shoreline transgression will remove the uppermost barrier island deposits sealing the lower inlet-fill sequences between Pleistocene estuarine clays and continental shelf silts and clays.

UNDERWOOD, MICHAEL B., Cornell Univ., Ithaca, NY

Sedimentary Facies Within Coastal Belt Franciscan Complex, Garberville Quadrangle, Northern California

Mildly deformed shale and sandstone, exposed along the South Fork of the Eel River in the Garberville Quadrangle (northern California Coast Ranges), are thought to represent a distinct lithofacies of the coastal belt Franciscan complex. These rocks have been correlated with the so-called Yager Formation, exposed farther to the north. Near Garberville, the folded sandy turbidites and shales are probably Eocene or younger in age, and are in contact with three other tectonostratigraphic units: (1) melange of the Franciscan central belt; (2) deformed sedimentary rocks of the coastal belt and King Range, exposed to the west; and (3) younger (Miocene-Pliocene) shelf deposits, which resemble the Wildcat Group of the Eel River basin.

Regional mapping of turbidite facies (using the Ricci-Lucchi scheme) shows that a high percentage of the section consists of hemipelagic mudstone and shale; these facies G deposits are commonly interbedded with thin facies E silty turbidites. Locally, the fine-grained strata pass abruptly into sequences of thick-bedded to massive facies B sandstone and associated facies C turbidites. At one locality, thinner facies D turbidites are abundant within a thickening-upward and coarsening-upward sequence that is over 100 m thick. Small-scale thinning-upward cycles within this mega-sequence suggest localized channel migration and abandonment. The measured orientations of flute casts indicate that paleocurrents radiated toward the west and southwest, apparently at a high angle to the continental margin.

Together, these data suggest that sediments exposed in the Garberville area were probably deposited within continental slope and restricted basin settings. If the general model associating the Franciscan complex with a Mesozoic-Cenozoic trench wedge is followed, then these strata can be interpreted as sediments deposited on the trench slope and within small trench slope basins above the deformed "accretionary prism" represented by much of the rest of the Franciscan.

VAIL, PETER R., and J. R. HARDENBOL, Exxon Production Research Co., Houston, TX

Effect of Sea Level Change on Shelf-Slope Boundary

Eustatic sea level changes cause alternating periods of subaerial exposure, flooding, or progradation at the shelf-slope boundary. Eustatic falls of sea level that are more rapid than subsidence cause subaerial exposure and canyon cutting. Rises of eustatic sea level coupled with subsidence commonly cause flooding of the shelf margin, marine transgression, and sediment starvation of the middle and outer shelf. Stillstands or slow falls of eustatic sea level that are less than the rate of subsidence commonly cause marine regressions where, in many places, the shoreline progrades out to the shelf-slope boundary.

The effect of eustatic sea level changes on the shelf-slope boundary is readily observable on seismic data despite changes in the rate of subsidence and rate and type of deposition. Seismic and well data from offshore northwest Africa are used to demonstrate these relations. In this area, high subsidence rates followed the opening of the Atlantic in the Early Jurassic and gradually changed to very slow subsidence rates in the Tertiary. Depositional rates increased throughout the Jurassic, reaching a maximum in the Early Cretaceous. Rates of deposition were very low in the Late Cretaceous and Early Tertiarty and increased again in the late Tertiary. Sediment type changed from primarily carbonate in the Jurassic to sands, silts, and shales in the Cretaceous and Tertiary.

This and other examples demonstrate that sea level change is the major factor affecting the shelf-slope boundary in different tectonic settings. The only known cause for the high rates of sea level change determined in these studies is glaciation. Such studies indicate major phases of glaciation occurred periodically throughout the Phanerozoic. Timing of possible glacial periods is shown for the Jurassic and Tertiary.

VAIL, PETER R., and ROBERT G. TODD, Esso Production Research Co., Houston, TX

Cause of Northern North Sea Jurassic Unconformities

Thirteen unconformities and their correlative conformities (sequence boundaries) divide the strata of the Jurassic of the northern North Sea into twelve cycles of coastal onlap. Comparison of charts showing regional relative change of coastal onlap, unconformity age, stratal patterns, and facies relations from the northern North Sea with global charts of relative changes of coastal onlap and eustatic sea level indicates that the unconformities are global and are caused by eustatic changes of sea level. Nine of the global unconformities are believed to be caused by rapid eustatic falls of sea level, three by slow falls followed by rapid rises, and one by an increased rate of sea level fall. In addition, four marine hiatuses were identified that are interpreted to be related to rapid rises of sea level.

Fault block rotation or differential block subsidence occurred almost continuously throughout the Jurassic, causing tilting of beds. Unconformity recognition is enhanced by periodic truncation of tilted strata by lowstand erosion and/or onlap during the subsequent rises, but the tectonics do not cause the unconformities.

Northern North Sea unconformities and coastal onlap are demonstrated on two seismic sections tied to well control. One section is from the United Kingdom part of the north Viking graben; the second is from the inner Moray Firth. Sequence boundaries and charts showing chronostratigraphy, relative change of coastal onlap, and ages of unconformities are shown for each seismic section.

VAN BEUREN, VICTOR, ARCO Oil and Gas Co., Lafayette, LA, and WAYNE A. PRYOR, Univ. Cincinnati, Cincinnati, OH