trend is noted where saturation indices appear to increase away from the producing zones of the Minnelusa in the northeastern part of the Powder River basin. Therefore, saturation indices may be used as an indicator of secondary porosity development and consequently as an exploration tool for hydrocarbon accumulation in the Minnelusa Formation.

MARLEY, WALTER E., North Carolina State Univ., Coal Geology Associates, Raleigh, NC

Subfacies Controls of Coal Bed Discontinuities, Southern Wasatch Plateau, Utah

The lower Blackhawk Formation and the Star Point Sandstone of the southern Wasatch Plateau are the lower deltaic and nearshore facies, respectively, of an Upper Cretaceous regressive deltaic sequence. Economic coal beds are associated with peat-forming environments in both the lower delta plain and the accretionary ridge–distributary mouth bar subfacies of the delta.

Discontinuities (rolls, splits, and pinch-outs) within the coal beds of the accretionary ridge subfacies are controlled primarily by: (1) proximity of the peat marsh to the high-energy shoreline environment, (2) relative compaction ratios of channel sands and finer detritus over which the peat marsh developed, and (3) topographic expression of the paleodrainage network incised within the top of the underlying Star Point sediments. Discontinuities (rolls, splits, pinch-outs, and washouts) within the coal beds of the lower delta plain subfacies are controlled primarily by: (1) proximity of the peat swamp to laterally contemporaneous distributary channels, (2) relative compaction ratios of underlying sands and finer detritus, and (3) erosion of the heat beds by basal scouring of overriding distributary channels.

Detailed outcrop measurements and drill hole data are used to develop accurate, site-specific, paleoenvironmental models to define the areas of potential coal-bed discontinuities and to aid in local exploration and mine planning.

MARROQUIM, M., M. B. ARAUJO, and M. MELLO, PETROBRAS, Rio de Janeiro, Brazil

Models of Oil Entrapment in Ceara Basin, Brazil

Five oil fields have been discovered in Ceara basin, northeastern Brazil, as a result of 33 wildcats drilled. All of the discoveries are localized in Mundau area in the eastern part of the basin. In this area four major stratigraphic units are recognized in seismic and well data: rift (Aptian), transgressive (Albian/Cenomanian), slope (Upper Cretaceous/Miocene), and shallow platform (Paleocene/Miocene) sequences. The main potential reservoirs are deltaic-lacustrine sandstones of the rift sequence and turbiditic sandstones of the slope sequence. Good source characteristics are exhibited by the shales of rift and transgressive sequences; the slope sequence offers fair to good content of adequate organic matter, but is partly immature.

Three distinct types of oil traps have been found in Ceara basin. (1) Structural traps, with the reservoir, source, and seal belonging to the rift sequence; the pool is confined to horst blocks, formed by the intensive faulting which affects this sequence. (2) Combined traps, where rift sequence reservoirs, dipping landward, are truncated by an unconformity and sealed by overlying transgressive shales; the source may be from both rift and transgressive sequences. (3) Stratigraphic traps, formed by turbiditic sandstones immersed in the shales of the slope sequence, which provide both source and seal.

The fields discovered so far are small, with areas ranging from 2 to 5 sq km. Delineation is made difficult by faulting (traps of types 1 and 2) and by lack of continuity of reservoirs (traps of type 3). Advance seismic techniques, such as 3-D migration and higher resolution surveys, have been used as a help in solving these problems.

MARTINEZ, RUBEN D., G.S.I. de Mexico, S.A., Mexico City, Mexico, and JORGE STANFORD B.,, Petroleos Mexicanos, Tampico, Mexico

A Seismic Stratigraphy Case History in Northeast Mexico

A study was made using seismic work to define stratigraphic features in the Tampico basin in Mexico. The Tampico basin is in northeast Mexico, south of Tampico. The objective of the study was to define stratigraphy features within the Mesozoic and Tertiary parts of the basin. The lithologic sequence includes (a) consolidated Tertiary sands and shales, and (b) Cretaceous clastics and limestones, shales, and sandstones. Oil in the area is produced from turbidites and conglomerates which fill paleocanyons of Eocene age. The paleocanyons appear in a fan form. The lithology in the Late Cretaceous and Upper Jurassic section displays no major structural features, except a regional dip toward the Gulf Coast which is conformable with the basement. Conventional multichannel common-depth-point (CDP) reflection seismic data were collected and processed in the area during 1977 to 1980. After a preliminary structural interpretation was made on data, a seismic line which ran transverse to a fan in a paleocanyon was selected to use as a base for a seismic stratigraphy study. This seismic line was reprocessed through wavelet processing sequence to produce a true amplitude section. The wavelet processing sequence was used to reduce distortions in the basic wavelet and to recover high frequencies lost due to transmission and absorption effects. From the true amplitude section, seismic anomalies such as bright spots and flat spots were identified. Following this, the data were processed through a rigorous wave equation inversion to produce an interval velocity section which then became the main tool for stratigraphic interpretation. Low velocity anomalies were encountered within the Eocene, the top and base of the Late Cretaceous, and the Upper Jurassic. These anomalies corresponded to those identified in the true amplitude section and are postulated to be oil-saturated zones. The anomalous zones were then mapped laterally using the other seismic sections in the area.

MARTINSON, DOUGLAS G., Lamont-Doherty Geol. Observatory, and Columbia Univ., Palisades, NY

Correlation of Time Series: An Inverse Approach with Applications in Geology and Geophysics

A simple mathematical inverse method has been developed to correlate two time series $Y_1(x_1)$ and $Y_2(x_2)$, where these two signals are related to each other by a mapping function $x_1(x_2)$. The mapping function describes differences between the two signals and is parameterized in terms of a sum of simple functions of unknown coefficients, a_i. These coefficients are estimated from the time series with the assumption that the best coefficients are those which minimize the difference between $Y_1[x_1(x_2)]$ and $Y_2(x_2)$. The standard analytic errors in the estimates of a_i and thus the uncertainty in $x_1(x_2)$, have been calculated and are negligible.

The method has been applied to the correlation of stratigraphic records, well logs, seismic records, and magnetic anomalies. In all cases, high resolution correlations have been attained and continuous mapping functions recovered. The mapping functions in the first three of these applications reveal the continuous change in relative sedimentation rate histories or thickness of strata be-