Short-lived Radioisotopic Chronology of Lake Pontchartrain Sediments

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Seven sediment cores taken throughout Lake Pontchartrain in the Fall of 1995 were analyzed for Pb-210 to determine the geochronology and sediment accumulation rates. In many portions of the lake, shell dredging has destroyed the sediment record. However, two cores collected from the southern portion of the lake show a disequilibrium profile of Pb-210 activity that indicates the sediments may be dated by this method. In September, 1996, a second set of nine cores were collected immediately adjacent to the New Orleans city storm discharge canals, bayous, and channel where undisturbed sedimentation is expected to have occurred for the last 30-50 years. X-radiographs taken for several of the cores show fine-scale lamination down the entire length of the core, suggesting these cores contain a reliable chronological record. Several other radioisotopes will be analyzed by gamma spectroscopy in addition to Pb-210 in order to construct a more accurate date model.

Once a rate of sedimentation is determined, the concentration of a number of metals will be measured using ICP-MS. At present there is little downcore geochemical data available for the lake. The profiles from this study will help clarify temporal and spatial changes in metal-loading of bottom sediments over the past several decades.

Evolution of New Technology for Downhole Geology

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The petroleum industry has found that new technology can extend the life of reservoirs and even entire oil producing regions and is now asking for more. Although this demand is helping to accelerate technology development, major technology advances are generally evolutionary changes over long periods of time. Yet another challenge today is for a new technology to be cost effective and not just in terms of the oil or gas discovered. Thus, cooperation and alliances are ever-increasing avenues chosen to optimally achieve commercial technology objectives.

The quest for new downhole geology technologies includes areas of physics that will allow more complete characterization of the rock cored, drilled and logged. Electromagnetic and magnetic measurements seem to be such an area. However, Nuclear Magnetic Resonance (NMR) is actually the culmination of nearly 40 years of research in electromagnetic technologies and their effects on fluids and rock properties that is now revealing basic properties, including microporosity and producibility data needed to optimally develop many discoveries. A relatively new entry in the evolutionary process of commercial technology development is the downhole well logging of magnetic reversals which may routinely provide chronostratigraphic data.

Using older measurements in new ways is an important part of technology evolution. For example, standard electrical, nuclear and acoustical well logging measurements have been incorporated in logging-while-drilling (LWD) technologies. Even the acquisition of borehole electrical imagery and structural dip determination now possible while drilling are actually the result of dipmeter technology evolution that began more than 60 years ago.

Carbonate Reservoir Characterization with Integration of New Technology Reveals New Insights into Old Giants

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Carbonate reservoir characterization continues to improve with advances in technology and synergistic techniques. Reservoir features previously undetected were found to have major impact on field performance. The combination of borehole imagery from horizontal wells with 3-D and/or 4-D seismic has revealed the presence and nature of unsuspected reservoir faulting and fracturing in many Middle East reservoirs. Geotesting of the open faults show them to be the cause of early water production. An equally important cause of early water production is the presence of unsuspected thin high-permeability layers defined by nuclear magnetic resonance (NMR) integrated with borehole imagery.

Both imagery and NMR together are revealing pore sizes and size distributions to better define effective porosity, even with an abundance of micropores present. It also has been possible to better evaluate complex reservoir facies through the integration of NMR and borehole electrical imagery with other logs and/or cores. This assessment included thin porosity layers, heterogeneous patchy or convoluted mixtures, complex Tertiary and Cretaceous karst fills, and vuggy and fractured facies in many formations. NMR defines pore size distributions, whereas electrical imagery reveals megapores and the surrounding matrix including the decimeter-scale porosity distribution. This approach reveals some thin, lower porosity layers to be the most permeable, while the highest porosity layers in one northwest Arabian reservoir are composed of micropores forming unsuspected porous barriers or baffles. Importantly, zones with very high-water saturation were correctly predicted to flow oil without water in Middle Eastern Arab and Thamama reservoirs, as well Paleozoic and Tertiary reservoirs elsewhere.