AAPG Annual Meeting
March 10-13, 2002
Houston, Texas

Edwin H Westergaard[1], Raymond L Eastwood[1], Austin Boyd[2], Greg Gubelin[3] (1) BP Alaska, Anchorage, AK (2) Schlumberger-Doll research, Ridgefield, CT (3) Schlumberger, Oklahoma City, OK

Using NMR Logs to Enhance Permeability Estimates in Siderite Rich Intervals at Aurora and Borealis, North Slope Alaska Satellite Fields

Aurora and Borealis are North Slope Lower Cretaceous Kuparuk Formation satellite fields with combined estimated reserves over 130 MMBO. The Kuparuk C, the primary reservoir at Aurora/Borealis, contains significant siderite and glauconite. NMR logs are being used to help improve permeability estimates in constructing a 3D Geocelluar Model. This model will be the foundation for reservoir simulation.

A key challenge to petrophysical interpretation and building a geologic model has been the effect of complex lithology on log-computed permeability. NMR log permeability and measured core permeability show close agreement except in sideritic zones. The presence of siderite causes a significant shift in the NMR T2 relaxation times and a subsequent decrease in NMR log permeability estimation. The shift to faster T2 relaxation time is primarily due to iron content in the siderite. NMR total porosity is unaffected by siderite. Adjustments can be made to NMR log processing parameters for improved permeability and capillary bound fluid estimation. Core comparisons demonstrate, in sideritic intervals, NMR logs can provide a more accurate total porosity than conventional neutron-density cross-plot porosity. Siderite content can then be determined from variation between NMR total porosity and density porosity in sideritic zones. Using this technique, adjustments can be made to NMR processing and interpretation parameters in sideritic zones to provide more accurate permeability estimation and capillary bound fluid determination. Lab NMR on selected siderite rich cores was performed to verify this technique. Comparisons between NMR T2 cut-off, surface relativity and internal field gradient vs. siderite content will be presented.