

Huerta, Nicolas J. and Dawn Y. Sumner (University of California, Davis)

DEVELOPING NEUTRON COMPUTED TOMOGRAPHY AS AN EFFICIENT, NON-INVASIVE TOOL TO IMAGE ORGANICS IN SEDIMENTARY ROCKS

Neutron computed tomography (NCT) is a new technique that will become a valuable tool to study 3-D characteristics of reservoir rocks – such as porosity, permeability, total organic carbon (TOC), and fluid flow pathways. We are developing this technique using the McClellan 2MW TRIGA thermal reactor administered by UC Davis. NCT measures neutron attenuation in a sample in 360 orientations and allows calculation of the distribution of attenuation in 3-D. Attenuation is produced by the neutron scattering and absorbing cross-section of the elements present. The key advantage of this system is that hydrogen and carbon are very attenuating when compared to most rock forming elements. Thus, we can get a 3-D picture of organics in rocks.

Current research has focused on calibrating NCT for packed sand; it is apparent that water in the sand from ambient moisture is significant enough to change the attenuation of the sample. We have eliminated this issue by drying the sand for 24 hours at 40 degrees centigrade. Current methods for packing the sand produce uniform attenuation with depth in the sample, variance will become apparent with upgrades to the software and hardware. We do see that with larger grain size, and less grain packing, overall attenuation is lower.

Future research will use paraffin wax, for a controlled look at fluid flow and imaging organics within a sedimentary sample. Also, sands of varying composition will be analyzed with NCT and other methods to calibrate the system and guide development of software. An eventual goal with this program is to image a rock and tell either porosity or TOC, with relative ease, from NCT data.