Tuesday, April 19, 2005

The Sofitel Hotel • 425 Sam Houston Pkwy. North
Social 11:15 a.m., Luncheon 11:30 a.m.

Cost: $31 Preregistered members; $35 Nonmembers & Walk-ups

The HGS prefers that you make your reservations on-line through the HGS website at www.hgs.org. If you have no Internet access, you can e-mail reservations@hgs.org, or call the office at 713-463-9476 (include your name, e-mail address, meeting you are attending, phone number and membership ID#).

by ***Daniel L. Orange***
AOA Geophysics Inc

Advances in Hydrographic Systems Aid Hydrocarbon Exploration and Geohazard Evaluation

The article has been abridged. See the *Bulletin* Web version for the full abstract and images: /www.hgs.org/2005/April

In this presentation, we will discuss the application of hydrographic techniques to both exploration and geohazards.

Exploration

In exploration, a hydrographic survey can be the foundation of a two-stage field program whose objective is to reduce exploration risk or rank prospect areas, typically in a block with little previous exploration and no known discoveries. We typically begin with an analysis of satellite-derived synthetic aperture radar (SAR) images, which can image sea surface slicks. Slicks may provide an indication of hydrocarbon seepage to the sea surface, and the location of the slicks can be tied to the possible seafloor origination points of the seeps. Our approach for the first stage of the survey is to combine a hull-mounted survey system (multibeam) with other acquisition programs that are amenable to a "mowing the lawn" survey strategy; this can include the acquisition of gravity, magnetics and sub-bottom profiler. The combination of these data sets can define the tectonic fabric within a block, indicate the presence **Northsiders** *continued on page 31*

In exploration, a hydrographic survey can be the foundation of a two-stage field program whose objective is to reduce exploration risk or rank prospect areas, typically in a block with little previous exploration and no known discoveries.

of volcanics or the location of thick basin sequences, image shallow faults and provide an indication of fluids at and immediately below the mud-line.

The process of seepage elevates subsurface geochemical boundaries that are normally buried to, or near to, the sediment-water interface. Cores that contain evidence of hydrocarbons may provide direct samples of the fluids present in a basin without drilling and may provide information regarding source, maturity, and degradation. The distribution of seeps on the seafloor may provide information about the extent of the hydrocarbon system or information regarding migration conduits.

Geohazards

For deep water geohazard applications, there have been two trends that have revolutionized deepwater geohazard surveys and interpretations. First, there have been improvements in the acquisition systems themselves, allowing for very high frequency (high resolution) acquisition in water up to 4000m deep. Secondly, there have been dramatic improvements in delivery platforms, including the commercial availability of autonomous underwater vehicles (AUVs) that get the sensors close to the seafloor without the need for a tether for deepwater surveys.

Summary:

Geophysical systems that can be used to evaluate the impedance/roughness and the shape (bathymetry) of the seafloor, and to identify zones of potential fluid expulsion, range from near-bottom, high frequency (up to 100s of kHz) to regional hydrographic survey systems (10s of Hz), to exploration seismic data (10s to <100 Hz).

In deep water, the application of hydrographic survey technologies to exploration may have a disproportionately high impact due to the high cost of drilling, and the comparitively low cost of surveying and sampling. The high cost of facilities and drilling in deep water also drives high-resolution acquisition of hydrographic data from near-seafloor platforms, and integration of these data with high-resolution seismic surveys and geotechnical boreholes. 100% maps of the seafloor, for both exploration and geohazards, allows for more robust process-oriented interpretations to be made of a field area, reducing exploration risk or improving the geohazard evaluation. ■

Biographical Sketch

DANIEL L. ORANGE is President and CEO of AOA Geophysics Inc., with offices in Houston, Austin, and Moss Landing, California. He is also a research associate at the University of California, Santa Cruz. He is a marine geologist and geophysicist with bachelor's and master's degrees from MIT, and a PhD from U.C. Santa Cruz. He is also chairman of the AAPG Program Committee for the Offshore Technology Conference, where he is working to increase the geoscience component of the meeting.