From passive seismology to induced polarization, and a special section on multiscale seismology, the March–April 2009 issue of GEOPHYSICS has something of interest for everyone. Here are a few highlights.

Imaging a hydrate-related cold vent

Contributing associate editor: David Nobes. Gas hydrates and associated cold vents have been known to occur in many areas, especially along the Cascadia Margin off the northwest coast of the United States. He et al. use careful analysis of acquisition parameters for a deep-towed, multichannel seismic survey to show that shallow, high-resolution seafloor stratigraphy can be imaged, even going so far as to use a genetic algorithm to model the cable shape. They also carry out detailed velocity analyses.

Figure 1 shows some results obtained in their case history of cold-vent imaging. This illustrates their ability to resolve shallow layering and structure, even in seismic wipeout zones, which likely represent fluid-venting sites.

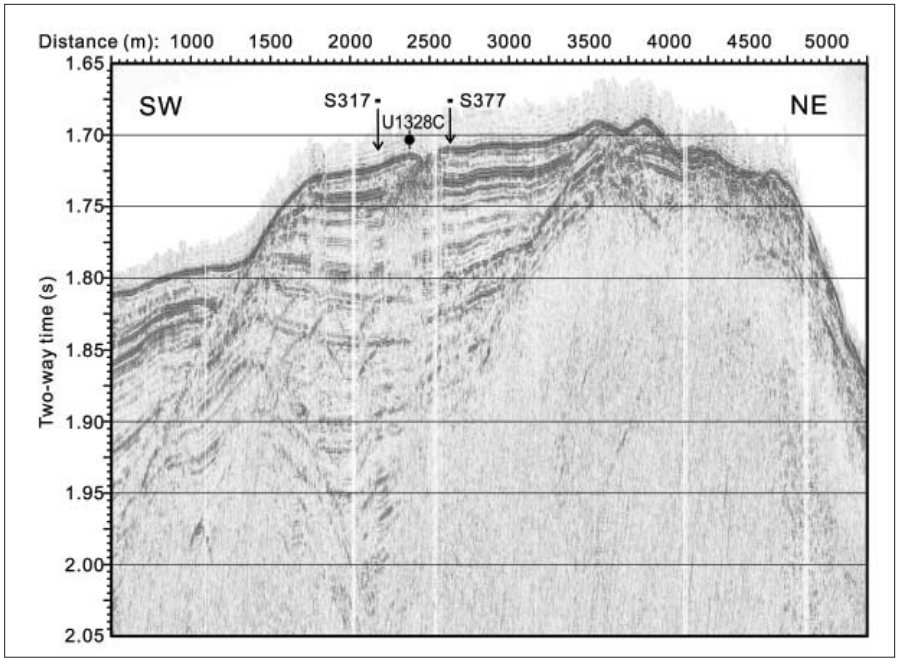

Figure 1. *Acoustic image (100% coverage) of the survey line DT09, showing high resolution of subsea floor structures laterally and vertically. The location of IODP drill site U1328C is labeled. S317 and S377 label two locations where conventional velocity analysis was carried out. (Figure 7 from "Imaging a hydrate-related cold vent offshore Vancouver Island from deep-towed multichannel seismic data" by He et al.)*

Analytic variable density gravity modeling

Contributing associate editor: John Peirce. Xiaobing Zhou has developed line integrals for calculating gravity anomalies for irregular 2D masses with horizontal and vertical density variations in "General line integrals for gravity anomalies of irregular two-dimensional (2D) masses with horizontally and vertically dependent density contrast." His approach is computationally efficient and handles more complex density functions than the many previous methods that have expanded on the original Talwani line-integral approach published 50 years ago.

Zhou's generalized density-contrast model includes a horizontal function, a vertical function, and a cross-term function. Previously published models have dealt with density-contrast variations in one dimension only but not both simultaneously. Zhou's approach allows for a solution of a 2D body with any reasonable cross section and 2D variation of density. He has tested his method against several published models with excellent results.

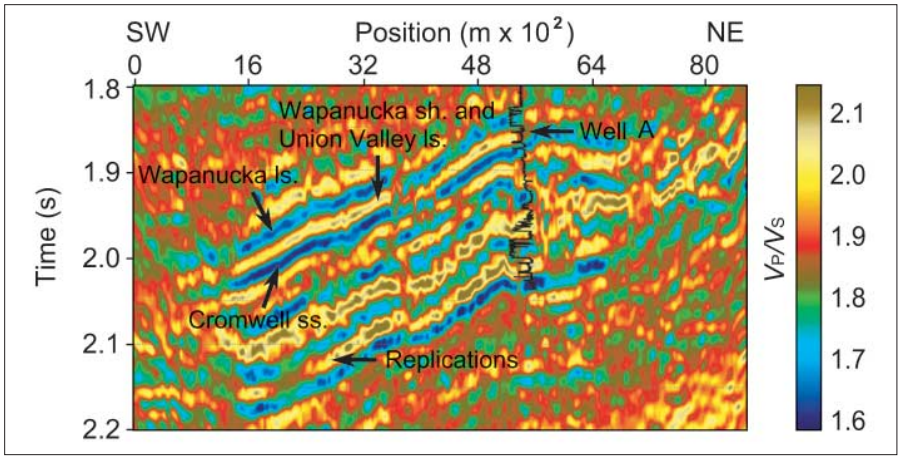

Figure 2. V_P/V_S *ratio section (Figure 9 from "Inversion and interpretation of a 3D seismic data set from the Ouachita Mountains, Oklahoma" by Aibaidula and McMechan).*

Interpretation of land seismic data from Oklahoma

Contributing associate editor: Sergio Chavez-Perez. Aibaidula and McMechan use acoustic and elastic impedance inversions to image the Wapanucka and Cromwell structures from the Ouachita Mountains of southern Oklahoma, and they propose new potential reservoirs. The V_P/V_S ratio section (Figure 2) shows locally low values in the Wapanucka limestone, the Cromwell sandstone, and their replications. This is consistent with the Cromwell sandstone being either water-saturated or partially gas-saturated. They find the estimated impedances and the derived Lamé parameter sections are consistent with the interpretation that parts of the imaged structures contain potential gas reservoirs in fault-bounded compartments. This leads them to propose a single new well location that would penetrate the two main inferred reservoirs. TLE