

**AAPG International Conference
Barcelona, Spain
September 21-24, 2003**

Nader C. Dutta¹, Lecia Mueller¹, Jon Dai¹, Randy Utech¹ (1) WesternGeco, Houston, TX

Seismic Detection of Gas Hydrates

Naturally occurring gas hydrates are found both under permafrost conditions (e.g. Alaska) and in deepwater (e.g. Japan, India and USA). USGS estimates suggest that the amount of gas within terrestrial gas hydrates (world wide) is 14 trillion cubic meters whereas the oceanic gas hydrate amount is 3100 trillion cubic meters (Meyer 1981). Various countries (e.g. Japan and India) are considering developing this resource in the near future. Gas hydrates also pose significant challenge to drilling and placement of facilities, especially in deep water, where shallow hazards (e.g. shallow water flow sands, shallow gas pockets) are known to occur. These hazards may be compounded by the presence of gas hydrates (Campbell, 1996). Thus, detection of gas hydrates by remote sensing technology, such as seismic, is of great current interest for both finding these zones for resource development point of view and avoiding the risk zones in deep water from drilling hazard avoidance point of view.

Since presence of Bottom Simulating Reflector (BSR) is not necessarily correlated to presence or absence of gas hydrates, we have developed a new methodology that integrates detailed gas hydrate rock models to seismic attributes that can be derived from seismic inversion: P and S velocity and bulk density. From prestack full waveform inversion of large offset reflection seismic data, we derive these three attributes with uncertainty estimates. These attributes are integrated with gas hydrate rock models (with proper up scaling) to seismic scale. This allows us to generate maps of gas hydrate and that of the free gas beneath the gas hydrate stability zone. We illustrate the methodology with examples from deep water.