APPLICATION OF SEISMICS TO STUDY GAS HYDRATE IN VIETNAM

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Introduction

For a long time, gas hydrate (GH) has been found in many places in the world such as in Siberia, Mesoyakha gas field in 1969, or in Mount Elbert, Alaska in 2007. In Asia, India, Korea, China and Japan GH has also been discovered and regarded as a potential source of energy in the future. Offshore Vietnam, GH signatures in deep water areas has also been investigated in recent years (Trung, 2012), not only because it's a potential energy source but also because of its possible negative impacts on environment. GH accumulated near seafloor surface can escape in gas form if there are changes in physical (temperature, pressure) or/ and chemical conditions leading to geological or environmental disasters.

In the early stages of GH exploration, the signatures are mainly determined by indirect methods such as seabed geomorphology, geochemical analysis of sediment samples or seismic survey, that are mainly obtained during the oil and gas exploration. In this study, the presence of GH offshore Vietnam is predicted based on typical characteristics on seismic data in areas of favorable pressure and temperature conditions.

Methods

From the initial factors such as tectonic characteristics, geothermal structures, pressure (water depth) and water conditions (salinity, temperature), the continental shelf offshore Vietnam can be zoned into areas with different levels of suitable conditions for GH formation. The most suitable area then is focused for further investigation, which is Tu Chinh - Vung May basin in the south east of Vietnamese water boundary where water depth varies from 1000m to 3000m and sea bottom temperature is about 2 - 3^0C. The study area is also a place with abundant sediment materials, rich in organic matter and quickly deposited. Organic matter is saturated and converted into biogas to become a source of GH. 2D seismic data with total length of 12000 km were processed by a common processing sequence. After seismic processing, seismic sections have been interpreted to identify typical characteristics for GH including:

- BSR – a reflector parallel to the sea bottom but reverse in phase and can cut through strata boundaries;
- Amplitude sudden change boundary parallel to the sea bottom.
- Amplitude blanking zone above BSR.

Results

From the interpretation of seismic sections, the seismic characteristics of GH were identified as shown in Figure 1, with above part expressing density and bottom part expressing wiggle seismic. The BSR was found with the seabed boundary interpreted as peak while the BSR interpreted as trough, confirming the polarity change. The BSR parallel to the seabed reflector and cut through the stratigraphic reflecting boundaries (above left), the blanking zone also appears, but in left side is not clear as right side. Gas column can also be observed as vertical amplitude disturbance. In addition, according to the reflection period of TWT bottom from 1,500 ms to 2,000 ms, the depth of GH exists compared to the sea level in the range of 1,200m ÷ 1,500 m and the thickness of the GH layer in the range 270 ÷ 350 m. These figures are relatively consistent with the research of Nguyen Nhu Trung (2012).

Conclusions

The GH signatures found on seismic data demonstrate that Tu Chinh - Vung May basin has GH potential and further study and sample acquisition should be implemented to confirm the GH volume and distribution. Special processing sequence and analysis techniques can be applied to improve the interpretation results.

References

Trung, N. N., 2012. The gas hydrate potential in the South China Sea. Journal of Petroleum Science and Engineering, 88, 41-47.

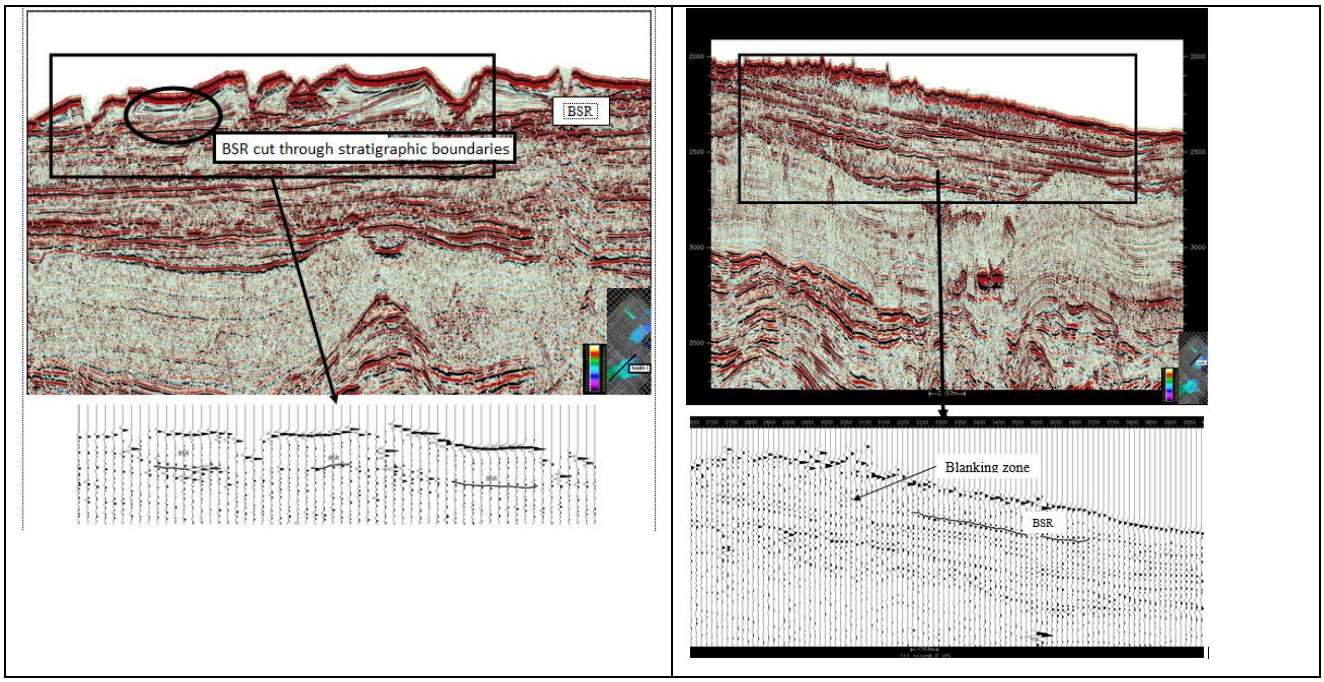

Figure 1 *Results of seismic interpretation, a) density seismic section b) detailed representation in the wiggle form.*