

## **Drilling Risk Assessment through Joint EM and Seismic Data Integrated Interpretation**

**Zhanxiang He<sup>1</sup> and Gang Yu<sup>1</sup>**

<sup>1</sup>BGP

### **Abstract**

Electromagnetic method is one of the important approaches to hydrocarbon prospecting. This paper describes an approach to invert resistivity and induced polarization (IP) using the combined constrain of seismic and electric logging data. As a result, the accuracy of hydrocarbon reservoir distribution prediction based on formation's electrical properties is significantly improved. The paper presents an example illustrating that joint constrained inversion and integrated interpretation workflow of electromagnetic properties (resistivity and polarization), seismic traps as well as seismic attributes, can significantly reduce drilling risks for oil and gas exploration. The statistic number on practical projects also supports the conclusion. The paper also discussed how the joint inversion and interpretation workflow works at different stages of oil and gas exploration and production with very positive results.

EM-Seismic interpretation fully makes use of the advantages of both EM and seismic methods. It is an alliance between giants. It can help to solve some problems such as the complexity of oil and gas exploration and the ambiguity of geophysical methods, reducing prospecting and drilling risks. The alliance is a new and effective indicator for oil and gas exploration. The integrated EM-Seismic interpretation can be used at the different stages of oil and gas exploration. In an under-explored area where only 2D seismic survey is conducted, joint EM-Seismic data can help to assess the hydrocarbon possibility of the traps interpreted by 2D seismic data, providing information for 3D seismic design or exploration well planning. In a well explored area where 3D seismic has been completed, joint EM-Seismic data interpretation can help to propose drilling site for the traps interpreted by 3D seismic data, improving drilling success rate. In a well-developed and matured oilfield where there are enough seismic data and many wells, EM-Seismic interpretation aims to search for residual or bypassed oil and gas, map oil-water contact, and increase recovering rate. Presently, the joint EM-Seismic interpretation has been widely used for drilling target evaluation, but the technique is still at the developing stage, especially the effective joint inversion algorithms development.