

DAS-VSP Application in Complex Structure of Western China

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ABSTRACT

Distributed Acoustic Sensing (DAS) technology for seismic data acquisition has rapidly developed. The first DAS-VSP application in China has carried out at X1 well of Bohai Bay Basin in 2014. The experiment has acquired high quality seismic data and the latest drilling results also confirm the application effect. However, in western China, because of the complex structure, the deep well conditions, high pressure and temperature, the popularization and application of DAS technology is relatively slow. With the deepening exploration in the complex structure area in western China for the past two years, there is an urgent need for using DAS technology in VSP data acquisition. In this research, the optical fiber seismic instruments have applied in the well in western China for the first time, and do the VSP acquisition in the complex structure area. Then we discuss the application effect and applicability of DAS-VSP in western China. The test well H6 locates in foreland thrust belt of north Taibei depression in Tuha basin. Because of the complex structure, the structural interpretation is not clear enough, and the identification of oil-gas reservoir is still of great difficulty. In order to describe the detail of complex structure, DAS optical and conventional receivers were used to observe jointly in this test. The observing system had 200 surface shots. DAS optical were used in the 0-1520m well segment and conventional receivers in 1520-3000m. After we piece and compare the data which the two kinds of receivers acquired, we consider that both the two parts data have clear firstbreak, continuous PP and PS down-going wavefield. But the signal-to-noise ratio of DAS-VSP data is lower than routine data. According to the seismic data which is required by two kinds of observation instruments, we propose a joint processing method about eliminating the characteristic differences of seismic wave. Therefore we obtain fidelity prestack seismic data ultimately, and then we get high resolution VSP imaging through migration. We put forward new structure interpretation scheme based on the VSP imaging, and it can recognize the fracture structure in detail. The study proves that DAS-VSP has achieved initial application effect in complex structure area in western China. But due to the low signal-to-noise ratio of DAS data, DAS-VSP can't take the place of the conventional VSP. The best transition way is to combine the two kinds of acquisition method.