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Abstract

A Velocity Modeling Method of converted wave pre-stack depth migration and its application

At present, most multi-wave seismic exploration uses P-wave source and three-component receiver, so the multi-wave data processing includes both PP-wave and PS-waves. Recently, PP-wave PSDM (PreStack Depth Migration) has been developed into a conventional processing technology, and the PS-wave PSDM is becoming mature.

When modeling PP-wave PSDM velocity, only a single "P-wave velocity field" needs to be established. For PS-wave PSDM, it is necessary to establish "downward P-wave velocity field" and "upward S-wave velocity field" at the same time. Therefore, the velocity modeling process of PS-wave PSDM is more complicated and more difficult. So the PS-wave PSDM is few in practical production. In this paper, based on the principle of multi-wave, a method of velocity modeling of P-wave and S-wave based on horizon is proposed. Firstly, the P-wave velocity modeling of each layer data is completed in PP-wave PSDM. Considering the uniform depth of reflected PP-wave and PS-wave from the same point, the S-wave velocity field is established layer by layer, and the velocity field of P-wave and S-wave is finally completed.

The velocity analysis and modeling of PSDM for actual multi-wave seismic data are carried out, and the PSDM processing of PP-wave and PS-wave is completed. A good result is obtained. (1)The PSDM of converted wave can improve the imaging accuracy of complex area. (2) After completing the PSDM processing of multi-wave seismic data, the P-wave and S-wave horizon can be automatically matched in depth domain. The understanding of geological horizon of PP-wave and PS-wave is clearer, and the interpretation accuracy of multi-wave data is improved.

This method is easy to be realized in actual processing, but the accuracy depends on the accuracy of each layer velocity. If the shallow velocity error is large, the deep velocity analysis may inherit the error, which leads to the reduction of migration imaging accuracy.