

## High-resolution and small-scale marine sparker multichannel seismic imaging of mud volcano

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Marine multichannel small-scale and high resolution marine sparker multi-channel seismic surveys using large energy sparkers are characterized by a high dominant frequency of the seismic source, wide bandwidth, and a high resolution. The technology with a high-resolution and high-detection precision was designed to improve the imaging quality of shallow sedimentary. The technology has obvious advantages to study mud volcanoes than sub-bottom and multi-beam. In the study, a 20KJ sparker and 24-channel streamer cable with a 6.25m group interval were used as a seismic source and receiver system, respectively. The data in this study has some characteristics below: 1. Small maximum offsets are adverse to velocity analysis and multiple attenuation. 2. Lack of low frequency information, that is, information less than 100Hz are invisible. 3. Low S/N ratio since less coverage times (only 12 times). These characteristics make it difficult to reach the targets of seismic imaging. In the study, the target processing methods are used to improve the seismic imaging quality of mud volcanoes. First, some technologies of noise suppression are combined used in pre-stack seismic data to suppression of seismic noise and improve the S/N ratio. These technologies including a spectrum sharing noise elimination method, median filtering and exogenous interference suppression method. Second, the combined method of three technologies including SRME,  $\tau$ -p deconvolution and high precision Radon transformation is used to remove multiples. Third, spread amplification technology based on similarity theory, can effectively enhance focusing of energy group in velocity spectrum, and improve the precision of velocity analysis, to ensure the accuracy of seismic data imaging processing. Fifth, pre-stack deconvolution processing technology is used to compensate for low frequency energy and suppress of ghost, thus formation reflection characteristics are highlighted.

The result shows that the small-scale and high resolution marine sparker multi-channel seismic surveys are very effective in improving the resolution and quality of mud volcanoes imaging than the conventional seismic acquisition technology.