



Numerical Simulation of Response Characteristics of Audio-magnetotelluric for Gas Hydrate in the Qilian Mountain Permafrost, China

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A b s t r a c t

Audio-magnetotelluric (AMT) method is a kind of frequency-domain sounding technique, which can be applied to gas hydrate prospecting and assessments in the permafrost region due to its high frequency band. Based on the geological conditions of gas hydrate reservoir in the Qilian Mountain permafrost, by establishing high-resistance abnormal model for gas hydrate and carrying out numerical simulation using finite element method (FEM) and nonlinear conjugate gradient (NLCG) method, this paper analyzed the application range of AMT method and the best acquisition parameters setting scheme. When porosity of gas hydrate reservoir is less than 5%, gas hydrate saturation is greater than 70%, occurrence scale is less than 50 m, or bury depth is greater than 500 m, AMT technique cannot identify and delineate the favorable gas hydrate reservoir. Survey line should be more than twice the length of probable occurrence scale, while tripling the length will make the best result. The number of stations should be no less than 6, and 11

stations are optimal. At the high frequency section (10~1000 Hz), there should be no less than 3 frequency points, 4 being the best number.

Key words: Qilian Mountain permafrost, gas hydrate, AMT, response characteristic, numerical simulation.