

PP- and PS-wave AVO responses and thin-interbed inversion

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The seismic prediction of thin interbed is always the difficulty of stratigraphic lithologic reservoir exploration. The main reason is that the seismic response of thin interbed is complicated because of the variety of internal structure. The AVO theories for single-interface model based on Zoeppritz equations are not suitable for the study of thin interbed. The present situation has restricted the study and development of the seismic prediction techniques for thin interbed. To solve this problem, we study on PP- and PS-wave AVO responses and inversion method for thin interbed. First, we start with the foundation composition of thin interbed, namely single thin bed, and deduce approximate analytic solutions of reflection coefficient spectrum for single thin bed under a series of assumed conditions. By analyzing on the approximate analytic solutions of reflection coefficient spectrum in different conditions of lithology and oil/gas, the AVO response principles have more definite physical meanings. Then, we deduce the approximate analytic solutions of reflection coefficient spectrum for single thin bed in a thin interbed using quasi-anisotropy method. Thus, we analyze the correlation between seismic frequencies, reflection coefficient, interbed number, single bed thickness and anisotropic parameters. Finally, we study the method of joint AVO inversion on thin interbed. Our study will provide theoretical support for the prediction of thin interbed and promote the development of stratigraphic lithologic reservoir seismic exploration techniques.