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Seismic traveltimes inversion based on tomographic equation without integral terms

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Abstract: The Jacobian matrix in the seismic traveltimes tomographic equations usually contains several integral terms. These integral expressions not only greatly increase the computational complexity of seismic traveltimes tomography, but also increase difficulty for programming these expressions. Therefore, if these integral expressions of the Jacobian matrix can be eliminated, the program of seismic traveltimes tomography can be greatly simplified. In order to solve the computational complexity of the traditional seismic traveltimes tomography, we found an anisotropic seismic traveltimes tomographic equation which doesn't contain integral expressions. Then, it is degenerated into an isotropic seismic traveltimes tomographic equation. In order to verify the effectiveness of this seismic traveltimes tomographic equation based on the node network, a program has been coded to execute seismic traveltimes inversion. For a crosswell checkerboard velocity model, the same results are obtained by this proposed tomographic method and the traditional method (with integral terms). Besides, two undulating topography velocity models are used as testing models. Numerical simulation results show that this proposed tomographic method can achieve good tomograms. Finally, this proposed tomographic method is used to

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