

论文

三维Q值层析成像人机交互软件及其在地震数据处理中的应用

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摘要:

Q值结构对了解地壳的非弹性性质、地壳内部构造、热活动状态、地壳介质非均匀性以及断层分布有着重要的意义.编写了基于吸收特征时间t*的三维Q值层析成像人机交互软件,可以方便快捷地计算地震体波(P波和S波)的振幅谱并通过拟合振幅谱得到反映地震波衰减的吸收特征时间t*,并利用t*资料通过三维Q值层析成像方法得到三维Q值结构.实际观测资料处理结果表明,文中给出的方法和软件是有效且可行的.

关键词: 三维Q值层析成像 吸收特征时间 Q值结构 地震波形 人机交互软件

Interactive software for three-dimensional Q tomography and its application to seismic data processing

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Abstract:

Q-value structure of the crust is of great significance for understanding of non-elastic nature of crustal structure, thermal activity, crustal inhomogeneity, and fault distribution. We present an interactive software for three-dimensional Q tomography based on absorption characteristic time t*. Amplitude spectra of seismic data (P-wave and S-wave) can then be calculated quickly and easily, absorption characteristic times can be obtained through fitting amplitude spectra, and three-dimensional Q structure can be obtained by using the Q tomography method and t* data. The real example shows that the method and software are effective and feasible.

Keywords: three-dimensional Q tomography absorption characteristic time Q value structure seismic waveform interactive software

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参考文献:

[1] Best A I,McCann C,Sothcott J. The relationships between the velocities, attenuations, and petrophysical properties of reservoir sedimentary rocks [J].Geophys Prosp,1994,42: 151-178.

[2] Hong X H, Zhu J S, Chao J M, et al.Tomography of the 3-D S-wave quality factor of the crust and upper-mantle in China [J].Chinese Journal of Geophysics,2003,46(5): 642-651 (in Chinese). 洪学海,朱介寿,曹家敏,等. 中国大陆地壳上地幔 S波品质因子三维层析成像 [J]. 地球物理学报, 2003,46(5): 642-651.

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- [3] Zhou L Q, Zhao C P, Xiu J G, et al. Methods and developments of research on crustal Q value by using earthquakes
[J]. Recent Developments in World Seismology, 2008, 350(2): 1-11 (in Chinese). 周连庆, 赵翠萍, 修济刚, 等. 利用天然地震研究地壳 Q 值的方法和进展
[J]. 国际地震动态, 2008, 350(2): 1-11.
- [4] Ma Z J, Liu Y. A summary of research on seismic attenuation
[J]. Progress in Geophysics, 2005, 20(4): 1074-1082 (in Chinese). 马昭军, 刘洋. 地震波衰减反演研究综述
[J]. 地球物理学进展, 2005, 20(4): 1074-1082.
- [5] Xu Y, Su Y J, Qin J Z. Development of Q -value studies
[J]. Journal of Seismological Research, 2004, 27(4): 385-389 (in Chinese). 徐彦, 苏有锦, 秦嘉政. Q 值研究动态
[J]. 地震研究, 2004, 27(4): 385-389.
- [6] Youli Quan, Jerry M H. Seismic attenuation tomography using the frequency method
[J]. Geophysics, 1997, 62(3): 895-905.
- [7] Guo L C, Wen Z G, Yang H. Inversion of surface-wave Q -value using ART method
[J]. CT Theory and Applications, 1996, 5(4): 9-15 (in Chinese). 郭履灿, 闻则刚, 杨辉. 用代数重建法反演面波品质因数 Q 值空间分布
[J]. CT理论与应用研究, 1996, 5(4): 9-15.
- [8] Wang H, Chang X, Liu Y K, et al. Seismic neighboring traces attenuation tomography in time domain
[J]. Chinese Journal of Geophysics, 2001, 44(3): 396-403 (in Chinese). 王辉, 常旭, 刘伊克, 等. 时间域相邻道地震波衰减成像研究
[J]. 地球物理学报, 2001, 44(3): 396-403.
- [9] Wang S Y, Pei S P, Thomas M H. Crustal S-wave Q estimated from ML amplitude II: Q lateral variation in China
[J]. Chinese Journal of Geophysics, 2008, 51(1): 133-139 (in Chinese). 汪素云, 裴顺平, Thomas M H. 利用 ML 振幅研究地壳横波 Q 值 II: Q 横向变化特征
[J]. 地球物理学报, 2008, 51(1): 133-139.
- [10] He J D, Liang G H. Q -value inversion using nonlinear parameter curve fitting method
[J]. Global Geology, 1990, 9(2): 4-10 (in Chinese). 何樵登, 梁光河. 用非线性参数曲线拟合法反演 Q 值
[J]. 世界地质, 1990, 9(2): 4-10.
- [11] Liang G H, Liu Q L, He J D. Q -value inversion using nonlinear parameter curve fitting method
[J]. Oil Geophysical Prospecting, 1992, 27(2): 230-274 (in Chinese). 梁光河, 刘清林, 何樵登. 用非线性参数拟合法反演 Q 值
[J]. 石油地球物理勘探, 1992, 27(2): 230-274.
- [12] Jonathan M L, Grant T L. Three-dimensional attenuation tomography at Lomo Prieta-Inversion of t^* for Q
[J]. J Geophys Res, 1994, 99(134): 6843-6863.
- [13] Fan J C, Li S L, Lai X L, et al. Three dimensional Q structure in Jiashi earthquake region of Xinjiang region
[J]. Acta Seismologica Sinica, 2001, 23(6): 570-581 (in Chinese). 樊计昌, 李松林, 赖晓林, 等. 新疆伽师地震区三维 Q 值结构
[J]. 地震学报, 2001, 23(6): 570-581.
- [14] Zhao J M, Fan J C, Li Z C. Q value structure of geoscience transect from Korla to Jimsar and its geodynamic implication
[J]. Science in China (Ser D), 2003, 33(3): 202-209 (in Chinese). 赵俊猛, 樊计昌, 李植纯. 库尔勒-吉木萨尔剖面 Q 值结构及其动力学意义
[J]. 中国科学(D辑), 2003, 33(3): 202-209.
- [15] Li Z N, Zhou Z R, Lin S, et al. Joint inversion of Q -value, site response and focus parameters in Fujian area
[J]. Seismology and Geology, 2005, 27(3): 437-445 (in Chinese). 李祖宁, 周峥嵘, 林树, 等. 利用数字地震台网资料联合反演福建地区 Q 值、场地响应和震源参数
[J]. 地震地质, 2005, 27(3): 437-445.

[16] Knopoff L. Q
[J]. Rev of Geophys, 1964, 2(4): 625-660.

[17] Pock G, Clements J R. Attenuation of short-period P, PcP, ScP, and pP waves in the earth's mantle
[J]. J G R, 1982, 87: 3905-3918.

[18] Zohun A D, Alison C L. Methodologies for estimating $t^*(f)$ from short—period body waves and regional variations of t^* in the United States
[J]. Geophys J Rastr Soc, 1985, 82: 125-140.

[19] Aki K, Richards P G. Quantitative seismology
[M]. San Francisco: W H Freeman and Co, 1980: 168-169.

[20] Brune J N. Tectonic stress and the spectra of seismic shear waves from earthquakes
[J]. J Geophys Res, 1970, 75: 4997-5009.

[21] Hanks T C, Thatcher W. A graphical representation of seismic source parameters
[J]. J Geophys Res, 1972, 77, 4393-4405.

[22] 郑治真. 波谱分析基础
[M]. 北京: 地震出版社, 1979: 244-249.

[23] Fan J C, Liu M J, Zhao C B, et al. Three-dimensional Q value tomography for xiuyan meteorite impact crater
[J]. Chinese Journal of Geophysics, 2010, 53(10): 2367-2375 (in Chinese). 樊计昌, 刘明军, 赵成彬, 等. 岫岩陨石坑三维 Q 值层析成像
[J]. 地球物理学报, 2010, 53(10): 2367-2375.

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