

论文

倾斜界面绕射波时距曲线特征及其应用

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摘要:

根据几何地震学原理推导了倾斜界面情况下的绕射波时距曲线方程,采用2种方法证明倾斜界面反射波与绕射波交点位置解的存在性及其唯一性.理论分析表明,倾斜界面绕射波时距曲线仍具有双曲线特征,且最小旅行时点的位置始终在绕射点正上方,与地层倾角等因素无关,是水平界面情况的一般形式.定性和定量研究了交点坐标趋向于无穷大时的临界参数计算公式,数值实例验证了这一结论.采用实际地震资料指出了常规地震容易导致的解释误区.

关键词: 倾斜界面 绕射波 时距曲线方程 地震波 交点位置

Diffraction wave time-distance curve character and its application

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Abstract:

The diffraction wave time-distance curve equation with tilted interface was derived on the basis of geometric seismology theorem, and the existence and uniqueness of the crossover point between the reflection wave and diffraction wave was proved using two methods. Theoretical analyses show that the diffraction wave time-distance curve equation with tilted interface still has the character of hyperbolic curve and that irrespective of facets such as formational dip angle, the location of the minimum travel-time is still above the diffraction point, representing the general form of the horizontal interface condition. The critical parameter computational equation with the coordinates of the crossing point approaching the infinity was studied, and the numerical examples confirmed verified the conclusions. Errors in the conventional seismic interpretation based on practical seismic data were pointed out.

Keywords: tilted interface diffraction wave time-distance curve equation seismic wave crossover point position

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参考文献:

[1] 马文蔚,解希顺,谈瀛梅,等.物理学(下册)[M].第4版.北京:高等教育出版社,1999.

[2] 陆基孟.地震勘探原理(上、下册)[M].北京:石油大学出版社,2004.

[3] Claerbout J F.地球物理数据处理基础[M].北京:石油工业出版社,1976.

[4] 张玉芬.反射波地震勘探原理和资料解释[M].北京:地质出版社,2007.

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- [5] 陈仲候,王兴泰,杜世汉.工程与环境物探教程  
[M].北京:地质出版社,1993.
- [6] 尼基金BH.工程地震勘探原理  
[M].刘统畏,译.北京:地震出版社,1987.
- [7] 何樵登.地震勘探原理和方法  
[M].北京:地质出版社,1986.
- [8] Sun C Y. Filtering characters of seismic reflection wavefield on coarse interface  
[J]. OGP, 2004, 39(1):24-28(in Chinese). 孙成禹. 粗糙界面地震反射波场的滤波特性  
[J]. 石油地球物理勘探,2004,39(1):24-28.
- [9] Liu H, Yuan J H, Gou Y F. Spectral factorization of wavefield and operator in seismic inverse scattering  
[J]. Chinese J Geophys, 2007,50(1):240-247(in Chinese). 刘洪,袁江华,勾永峰,等.地震逆散射波场和算子的谱分解  
[J]. 地球物理学报,2007,50(1):240-247.
- [10] Ding K, Song S G, Xie Z Q. Development and future application of inverse scattering theory  
[J]. Progress in Geophysics,2005,20(3): 661-666(in Chinese). 丁科,宋守根,谢忠球.逆散射理论的发展及应用前景  
[J]. 地球物理学进展, 2005,20(3): 661-666.
- [11] De Hoop M V, Le Rousseau J H, Wu R S. Generalization of the phase-screen approximation for the scattering of acoustic waves  
[J]. Wave Motion, 2000,31: 43-70.
- [12] 李录明,李正文.地震勘探原理、方法和解释  
[M].北京:地质出版社,2007.
- [13] 姚姚.地震波场与地震勘探  
[M].北京:地质出版社,2006.
- [14] 伊尔马滋 渥.地震数据处理  
[M].黄绪德,袁明德,等译.北京:石油工业出版社,1994.
- [15] 滕吉文,张中杰,白武明.岩石圈物理学  
[M].北京:科学出版社,2000.
- [16] 滕吉文.固体地球物理学概论  
[M].北京:地震出版社,2003.
- [17] 张中杰.多分量地震资料的各向异性处理与解释方法  
[M].哈尔滨:黑龙江教育出版社,2002.
- [18] 杨德义,王赞,王辉.陷落柱的绕射波  
[J].石油物探,2000,39(4): 82-86.
- [19] 潘宏勋,周庆,邓道静.弯曲地表反射波的时距曲线方程  
[J].勘探地球物理进展,2007,30(5):1- 4.
- [20] 陈可洋.高阶弹性波动方程正演模拟及其逆时偏移成像研究 .大庆:大庆石油学院,2009.
- [21] Chen K Y. High-order staggered-grid finite difference scheme for scalar acoustic wave equation  
[J]. China Offshore Oil and Gas, 2009,21(4):232-236(in Chinese). 陈可洋.标量声波波动方程高阶交错网格有限差分法  
[J]. 中国海上油气,2009,21(4):232-236.
- [22] 董良国,马在田,曹景忠.一阶弹性波方程交错网格高阶差分法稳定性研究  
[J]. 地球物理学报,2000,43(6): 856-864.
- [23] Chen K Y, Yang W, Wu Q L, et al. Comparison of several seismic wave post-stack depth migration

methods

[J]. Progress in Exploration Geophysics,2009,32(4): 257-260 (in Chinese). 陈可洋,杨微,吴清岭,等.几种地震波叠后深度偏移方法的比较

[J]. 勘探地球物理进展,2009,32(4): 257-260.

[24] 伊尔马滋 渥. 地震资料分析——地震资料处理、反演和解释(上、下册)

[M]. 刘怀山,等译. 北京:石油工业出版社,2006.

[25] 牟永光.地震勘探资料数字处理方法

[M].北京:石油工业出版社,1981.

[26] 凌云.地震数据采集·处理·解释·一体化实践与探索

[M].北京:石油工业出版社,2007.

[27] Chen K Y. Evaluation on the bordering method of the absorbing boundary condition

[J]. Journal of the Graduate School of the Chinese Academy of Sciences,2010,27(2): 170-175 (in Chinese). 陈可洋.边界吸收中镶边法的评价

[J].中国科学院研究生院学报, 2010,27(2):170-175.

[28] Chen K Y.Seismic wave travel-time computational method and its model experiment analysis

[J]. Geophysical Prospecting for Petroleum,2010,49(2): 153-157(in Chinese). 陈可洋.地震波旅行时计算方法及其模型试验分析

[J].石油物探,2010,49(2): 153-157.

[29] Chen K Y. Wave equation pre-stack reverse-time migration scheme based on high-order finite-difference

[J].Geophysical Prospecting for Petroleum,2009,48(5):475-478 (in Chinese). 陈可洋.基于高阶有限差分的波动方程叠前逆时偏移方法

[J].石油物探,2009,48(5): 475-478.

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2. 王多君, 易丽.地球深部的水[J]. 中国科学院研究生院学报, 2009,26(6): 721-730