地球物理学报 » 2010, Vol. 53 » Issue (7) :1699-1709 DOI: 10.3969/j.issn.0001-5733.2010.07.021
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适于大规模数据的三维Kirchhoff 积分法体偏移实现方案

王华忠[1],蔡杰雄[2],孔祥宁[2],张 兵[1,2],朱海波[2],方伍宝[2]*
1. 同济大学海洋与地球科学学院海洋地质国家重点实验室,上海 200092;
2. 中国石油化工股份有限公司石油物探技术研究院,南京 210014

An implementation of Kirchhoff integral prestack migration for large-scale data

WANG Hua-Zhong[1],CAI Jie-Xiong[2],KONG Xiang-Ning[2],ZHANG Bin[1,2],ZHU Hai-Bo[2],FANG Wu-Bao[2]*
1. School of Marine & Earth Science, State Key Laboratory of Marine Geology, Tongji University, Shanghai 200092, China;
2. SINOPEC Geophysical Research Institute, Nanjing 210014, China

摘要 参考文献 相关文章
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摘要 为适应实际生产中对大规模三维工区数据处理的效果及效率的要求,提出了按三维成像体输出成像结果的3D Kirchhoff积分法偏移实现方案.将地震数据按共偏移距道集形式排放,每个共偏移距数据的偏移类似于一个3D叠后Kirchhoff积分偏移,极大地降低了对计算机内存和局部盘及I/O通讯率的要求.每个地震道的成像(输出等时面)在由炮检点连线定义的旋转坐标系中进行,更好地考虑了偏移孔径计算及反假频处理.同时兼顾了超大规模地震数据PSTM成像处理中内存需求量、I/O通讯问题、并行处理方案及效率优化的细节问题.并行计算用偏移距号和每个共偏移距数据体中的线号作为一级和二级索引进行任务分解,更适应当前计算机集群中计算节点比较多的情况.最后考虑了在基本不影响效率的前提下的断点保护处理方案.理论及实际数据测试结果说明了该方案的可行性,与商业软件的对比验证了该方案的优越性.在此较完善的实现方案基础上,可以容易地把更优越的积分类偏移方法迅速推向实用化.

关键词： Kirchhoff叠前时间偏移 共偏移距道集 体偏移 偏移孔径 断点保护

Abstract： In order to produce an accurate and efficient imaging result by 3D Kirchhoff Prestack Time Migration (PSTM) from large-scale field data for widespread usage in practice, we adopt the strategy to output an image volume instead of an image profile. Firstly, common-offset gathers are created, each 3D common-offset gather is migrated independently like a Poststack 3D Kirchhoff integral migration. This will greatly reduce the requirements for inner memory, local hard disk and I/O efficiency. The migration of each input trace is implemented in the rotated coordinates which is formed according to the azimuth angle of the connecting line of the shot point and the receiver point. In the coordinates, it is easy to deal with the anti-aliasing and migration aperture estimation. The parallel strategy with two-rank indices, one for the common-offset number and the other the line number in a common-offset data set, is used for creating well-designed parallel tasks. The breakpoint saving is also considered. Numerical tests and a comparison with one commercial software system demonstrate that the 3D Kirchhoff PSTM implementation strategy has many advantages. Based on it, many new integral prestack migrations can be easily put into practical use.

Keywords： Kirchhoff PSTM Common-offset gather Volume migration Migration aperture Breakpoint saving

Received 2009-06-23; published 2010-06-23

Fund:

国家高技术研究发展计划(863)(2006AA09Z323)及国家重点基础研究计划(973) 项目(2006CB202402),中国石化集团科技部资助.

About author: 王华忠,男, 1964年生,教授,博士生导师,主要从事地震波传播、偏移成像与反演、近地表与中深层速度分析(反演)和速度模型建立、地震数据的规则化处理等方面的研究工作.E-mail:herbhuak@vip.163.com

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引用本文:
王华忠, 蔡杰雄, 孔祥宁, 张兵, 朱海波, 方伍宝.适于大规模数据的三维Kirchhoff 积分法体偏移实现方案[J] 地球物理学报, 2010,V53(7): 1699-1709

WANG Hua-Zhong, CAI Jie-Xiong, KONG Xiang-Ning, ZHANG Bing, ZHU Hai-Bei, FANG Wu-Bao.An implementation of Kirchhoff integral prestack migration for large-scale data[J] Chinese Journal Geophysics, 2010,V53(7): 1699-1709

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