

# 地球物理学报 (月刊)

DIQIU WULI XUEBAO

2025 年 6 月 第 68 卷 第 6 期

目次



## 综述

- 2003 海洋声学环境对反射地震观测数据的影响,  
I: 海面的影响 ..... 孙建国

## 空间与大气物理学·大地测量学

- 2028 2023 年 12 月 1—2 日磁暴期间北京上空热层  
响应研究 ..... 李韶阳, 任志鹏, 于婷婷,  
刘立波, 乐新安, 李国主, 魏勇
- 2039 张衡一号卫星观测的甘肃积石山地震前后空  
间电场时空演化特征 ..... 宋俊杰, 黄健平,  
李忠, 李兴潮, 霍禹萌, 杨瑞琦
- 2055 自动气象站数据同化密度对 WRF 模式降雨  
预报的影响 ..... 乔泽宇, 李步, 龚傲凡,  
倪广恒
- 2066 顾及先验误差的加权时空滤波对 GNSS 坐标  
时序噪声特性及站速度估计的影响 .....  
..... 鲁铁定, 杨厚明, 孙喜文, 金振吴
- 2079 GRACE 型重力卫星质心定标算法 .....  
..... 黄志勇, 李姗姗, 蔡林, 李桢, 黄令勇,  
肖云, 李世忠, 周泽兵

## 地球动力学·地震学

- 2092 火幔对流对火壳二分性和火幔热-化学结构长  
期演化的影响: 三维动力学数值模拟 .....  
..... 刘瑞熙, 李杨, 张志刚, 何雨旸,  
徐长仪, 王巍, 孙伟家, 惠鹤九,  
陈凌, 潘永信
- 2112 辉石岩电导率对克拉通岩石圈高导异常的  
启示 ..... 朱屹欣, 徐义贤, 杨晓志,  
费宏展, 刘汉永, 李满
- 2129 一种适用于噪声源非均匀分布的背景噪声面  
波相速度频散曲线测量方法 ..... 伍晗,

宁杰远, 蒋一然, 温景充, 王晓山

- 2151 半空间弹性饱和土中半圆形覆水河谷对 P 波  
的散射 ..... 段雪良, 金立国, 周正华,  
邢浩洁
- 2162 一致黏弹性人工边界的二维场地出平面地震  
响应的等效线性化计算方法 .....  
..... 陈三红, 张郁山
- 2173 2023 年 12 月 18 日 M<sub>6.2</sub> 甘肃积石山地震的  
震源机制与破裂过程 .....  
..... 汪贞杰, 郭祥云, 陈依妮
- 2186 巴颜喀拉块体东缘强震发生前后六盘山构造  
带存在应力调整的观测现象研究 .....  
..... 崔瑾, 王静, 罗恒之, 岳冲
- 2201 DAS 和节点地震仪联合探测北京黄庄—高丽  
营断裂 ..... 吕恒茹, 王伟君, 闫坤, 茶文剑
- 2216 钻孔面应变周年变化的动力学诊断: 以新疆  
乌什台为例 ..... 杨小林, 李航, 杨锦玲,  
危自根
- 2230 松辽盆地地震前气体地球化学异常与应力应  
变场关系研究: 以 2019 年 5 月 18 日吉林宁江  
M<sub>s</sub>5.1 和 2020 年 2 月 7 日黑龙江嫩江 M<sub>L</sub>4.6  
地震为例 ..... 李继业, 常金龙, 康健,  
刘兆飞, 胡澜滨, 马龙辰

## 地磁学·地热学·海洋地球物理学

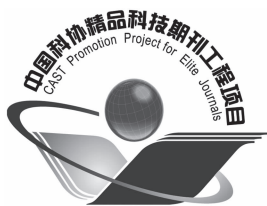
- 2245 EMM2017 地磁场模型在中国地区的精度评  
估及初步改进 ..... 杨琳青, 赵旭东,  
阿里木江·麦麦提依明, 何宇飞
- 2262 岩溶热储地下水对流活动聚热效应的影响因  
素研究: 以冀中坳陷为例 ..... 饶松, 罗洋,  
张英, 王社教, 胡圣标, 李王鹏
- 2276 沉浮式海洋地震仪数据分析及南海北部深部

- 结构 … 刘博文, 李家彪, 牛雄伟, 丁巍伟, 朱心科, 于志腾, 汪贞杰, 侯斐, 王天睿
- 2292 粤东三维地震探测 OBS 时间记录问题分析与处理 …… 温庚庚, 叶秀薇, 吕作勇, 张严心

应用地球物理学

- 2307 弹性参数初始模型约束的深度学习储层物性参数反演方法 …… 陈怀震, 罗任, 张明, 姜晓宇, 王本锋
- 2320 多阶面波频散全参数全局反演的冰川结构研究 …… 艾寒冰, 李红星, 宋先海, 李涛, 苏可嘉, 陈昊, 付宇, 梅竹虚
- 2348 基于  $L_1/L_2$  正则化的高分辨率 Radon 变换反演方法 …… 薛亚茹, 张程, 冯璐瑜, 苏军利, 梁琪
- 2364 基于平均导数 21 点差分格式的二维声波方

- 程频率域正演模拟方法 …… 曲英铭, 谢龙福, 朱江贵, 李自正, 邢伯申, 李振春
- 2375 基于 U-Net++ 的混合震源地震数据分离研究 …… 魏亚杰, 朱煜嘉, 曹静杰, 韩立国, 杨歧焱, 刘强
- 2390 融合注意力机制的深度残差网络在一维大地电磁反演中的应用 …… 封常青, 李予国, 杜志俊, 李盼
- 2404 基于角谱法的偶极 SH 横波远探测声场模拟方法 …… 陈声远, 苏远大, 段文星, 李盛清, 唐晓明
- 2416 稳定平台式旋转导向工具测控系统 …… 刘庆波, 底青云, 王向阳, 杨永友, 谢棋军, 马良令



Contents

Review

2003 The influence of the ocean acoustic environment on the recorded reflection seismic data, Part I: The influence of the sea surface ..... SUN JianGuo

Space and Atmospheric physics  
Geodesy

2028 Study of the thermospheric responses over Beijing during the geomagnetic storm on December 1-2, 2023 ..... LI ShaoYang, REN ZhiPeng, YU TingTing, LIU LiBo, YUE XinAn, LI GuoZhu, WEI Yong

2039 The spatiotemporal evolution characteristics of spatial electric field before and after the Gansu Jishishan earthquake observed by the China Seismo-electromagnetic Satellite ..... SONG JunJie, HUANG JianPing, LI Zhong, LI XingSu, HUO YuMeng, YANG RuiQi

2055 Impact of Automatic Weather Station data assimilation density on the WRF model rainfall forecasts ..... QIAO ZeYu, LI Bu, GONG AoFan, NI GuangHeng

2066 The influence of weighted spatiotemporal filtering considering prior error on GNSS coordinate temporal noise characteristics and station velocity estimation ..... LU TieDing, YANG HouMing, SUN XiWen, JIN ZhenWu

2079 Center of mass calibration algorithm of GRACE-type satellites ..... HUANG ZhiYong, LI ShanShan, CAI Lin, LI Zhen, HUANG LingYong, XIAO Yun, LI ShiZhong, ZHOU ZeBing

Geodynamics·Seismology

2092 Influence of mantle convection on the Martian crustal

dichotomy and the long-term evolution of the thermochemical structure of Martian mantle: Insights from 3-D geodynamic models ..... LIU RuiXi, LI Yang, ZHANG ZhiGang, HE YuYang, XU ChangYi, WANG Wei, SUN WeiJia, HUI HeJiu, CHEN Ling, PAN YongXin

2112 Electrical conductivity of pyroxenite and implications for the high conductivity anomalies in cratonic lithosphere ..... ZHU YiXin, XU YiXian, YANG XiaoZhi, FEI HongZhan, LIU HanYong, LI Man

2129 A method for measuring ambient noise surface wave phase velocity dispersion curves suitable for non-uniform noise source distributions ..... WU Han, NING JieYuan, JIANG YiRan, WEN JingChong, WANG XiaoShan

2151 P wave scattering by semi-circular valley filled with water in elastic saturated half-space ..... DUAN XueLiang, JIN LiGuo, ZHOU ZhengHua, XING HaoJie

2162 Equivalent linearized calculation method for antiplane seismic response of two-dimensional field based on uniform viscoelastic artificial boundaries ..... CHEN SanHong, ZHANG YuShan

2173 Focal mechanism and rupture evolution of the December 18<sup>th</sup> 2023 Jishishan M6.2 earthquake ..... WANG ZhenJie, GUO XiangYun, CHEN YiNi

2186 Stress adjustment phenomena in the Liupanshan tectonic belt: observation associated with strong earthquake along the eastern margin of the Bayan Har block ..... CUI Jing, WANG Jin, LUO HengZhi, YUE Chong

2201 Joint exploration of the Beijing Huangzhuang-Gaoliying

fault using DAS and nodal seismometers .....

..... LÜ HengRu, WANG WeiJun, YAN Kun,  
CHA WenJian

2216 Investigating the physical mechanism of annual variations in  
borehole areal strain: a case study of the Uqturpan station,  
Xinjiang Province, NW China ..... YANG XiaoLin,

LI Hang, YANG JinLing, WEI ZiGen

2230 Study on the relationship between pre-earthquake gas  
geochemical anomalies and stress-strain fields in the  
Songliao basin: A case study of the Ningjiang  $M_s5.1$   
earthquake, Jilin on May 18, 2019, and the Nenjiang  
 $M_L4.6$  earthquake, Heilongjiang on February 7, 2020 ···

..... LI JiYe, CHANG JinLong, KANG Jian,

**Geomagnetism · Geothermics ·  
Marine Geophysics**

**2245 Accuracy assessment and initial improvements of the  
EMM2017 Model in China ..... YANG LinQing,**

ZHAO XuDong, Alimujiang Maimaitiyim, HE YuFei

2262 Research on the influencing factors of the heat accumulation  
effect of groundwater convective activities in karst geothermal  
reservoir: An example from Jizhong Depression .....

..... RAO Song, LUO Yang, ZHANG Ying,

2276 Floating ocean seismometer data analysis and deep  
structure in the northern South China Sea .....

..... LIU BoWen, LI JiaBiao, NIU XiongWei,

2292    **Analysis and processing of OBS clock error based on the**  
3D seismic data in eastern Guangdong .....

..... WEN GengGeng, YE XiuWei, LÜ ZuoYong,

# Applied geophysics

2307 Deep learning based reservoir physical parameters  
inversion assisted by initial elastic parameter models ····

..... CHEN HuaiZhen, LUO Ren, ZHANG Ming,

2320 **Global and full-parametric optimization of multi-mode**  
**Rayleigh wave dispersion curves for estimating glacial ice**  
**structure** ... AI HanBing, LI HongXing, SONG XianHai,

LI Tao, SU KeJia, CHEN Hao, FU Yu, MEI ZhuXu

**2348 High-resolution Radon transform inversion based on  $L_1/L_2$  regularization ····· XUE YaRu, ZHANG Cheng,**

FENG LuYu, SU JunLi, LIANG Qi

2364 Forward modeling of the two-dimensional acoustic wave  
equation based on the average-derivative 21-point difference  
scheme in frequency-domain .....

..... OU YingMing, XIE LongFu, ZHU JiangGui.

**2375 Research on simultaneous-source data deblending based on U-Net + + ···· WEI YaJie, ZHU YuJia, CAO JingJie,**

HAN LiGuo, YANG QiYan, LIU Qiang

**2390**   **ADRN: Attention-based deep residual network for**  
**Magnetotellurics (MT) inversion** .....

····· FENG ChangQing, LI YuGuo, DU ZhiJun, LI Pan

**2404    Simulation method of the SH wavefield for dipole acoustic reflection imaging based on the angular spectrum method**

..... CHEN ShengYuan, SU YuanDa, DUAN WenXing,

**2416 Measurement and control system of the stabilized  
platform rotary steerable system .....**

..... LIU QingBo, DI QingYun, WANG XiangYang,