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量纲分析应用于地震预测的探索

刘月¹, 尹祥础^{1,2}, 袁帅¹, 张浪平^{2*}

1. 中国科学院力学研究所 非线性力学国家重点实验室, 北京 100190;
2. 中国地震局地震预测研究所, 北京 100036

Exploration study of dimension analysis applying to earthquake prediction

LIU Yue¹, YIN Xiang-Chu^{1,2}, YUAN Shuai¹, ZHANG Lang-Ping^{2*}

1. State Key Laboratory of Nonlinear Mechanics, Institute of Mechanics, Chinese Academy of Sciences, Beijing 100190, China;
2. Institute of Earthquake Science, China Earthquake Administration, Beijing 100036, China

摘要

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摘要 加卸载响应比(LURR)的基本思路是希望能够通过刻画震源区介质的损伤程度,反映地震孕育的进程,从而预测地震.近30年来,很多人对加卸载响应比做了大量基础研究,取得了一系列新的进展.加卸载响应比在地震预测实践中也取得了一定的效果,异常区与地震发生的位置有较好的对应性,但是预测效果仍不够理想.究其原因主要是:在实际预测中对当地的地球物理情况考虑的不够.本文采用量纲分析与加卸载响应比结合的方法,综合考虑当地的地球物理情况,例如剪应变率和平均地震波能量等因素的影响.文中选取1970年以来发生在中国大陆的34个震例资料,通过分析得到了与发震震级和时间相关的无量纲量 n_1 和 n_3 ,根据对实际数据的拟合, n_1 和 n_3 均与震级成指数关系.在应用于地震预测实践时,首先根据LURR空间扫描结果选取异常区,然后确定异常区的地球物理参数,通过 n_1 确定震级 M ,再由 n_3 确定发震时间 T .

关键词 加卸载响应比, 量纲分析, 地震预测

Abstract: The Load/Unload Response Ratio(LURR) theory is a new method in earthquake prediction. LURR is defined as the medium's response to loading divided by the response to unloading. For the earth medium, the earth tide provides a natural way to load and unload. Benioff strain is selected as the response quantity. Through space-time scanning in Chinese mainland as well as other regions, the abnormal region where an earthquake may occur can be got. Then we hope the LURR in the abnormal region can reflect the preparation process of earthquake through depicting the damage of seismogenic zone, and then predict earthquake. It's about thirty years since LURR was put forward. These years many people have done a series research on LURR, and have got some achievements. In practice of earthquake prediction, LURR has achieved success to some extent. Many earthquakes occurred in the abnormal zones from LURR's space-time scanning. But the result is not as good as we wished, the main reason is that we don't consider the geophysical condition enough. In this paper, we combine dimensional analysis with LURR method, considering the local geophysical condition, for example the shear strain rate and the average seismic wave energy etc. Using the data of 34 seismic cases which occurred in Chinese mainland since 1970, we obtain two dimensionless quantities n_1 and n_3 related with the earthquake magnitude and occurrence time. Through the process of data fitting, the relationships between n_1 and magnitude and between n_3 and occurrence time have been obtained. Applying the result to earthquake prediction, we should determine the seismogenic zone according to LURR's space-time scanning result at first; then after determining the geophysical parameters of the specific seismogenic zone, we can get the magnitude and the occurrence time for the future earthquake through n_1 and n_3 separately.

Keywords [Load/Unload Response Ratio\(LURR\)](#), [Dimensional analysis](#), [Earthquake prediction](#)

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Corresponding Authors: 张浪平, 1982年生, 博士, 副研究员, 2009年毕业于中国科学院力学研究所, 主要从事脆性介质破坏前兆、地震力学与地震活动性方面的研究. E-mail: zlp@seis.ac.cn Email: zlp@seis.ac.cn

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