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基于改进型图像信息方法的汶川地震前电离层参量时空特征研究

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On the spatial-temporal characteristics of ionospheric parameters before Wenchuan earthquake with the MPI method

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摘要 震前加速破坏阶段地壳岩石破裂过程中可能辐射电磁信号,提取与之相关的电磁信号异常有助于认识地震孕育及破坏过程,从而为防震减灾提供支持.本文提出了改进型图像信息方法(Modified Pattern Informatics Method,MPI方法),并用于汶川地震前电离层参量时空特征信息的提取.通过分析对比处理前后的DEMETER电磁卫星时空图像可以发现,原始时空图像一般存在季节性和空间性的变化规律,较难获得有意义的信息;而采用MPI方法处理后,则发现汶川大地震前,电离层参量存在明显的异常变化.从而,证明了MPI方法具有消除背景趋势、突出短期变化的能力,可以有效地提取强震相关的电磁前兆信息.

关键词: 改进型PI方法(MPI方法) 电离层参量 时空图像 汶川地震

Abstract: During the acceleration failure stage before earthquakes, electromagnetic signals radiate in the rupture processes of crustal rocks and the anomalous signals can be retrieved for studying the seismogenic and earthquake rupture processes and used for earthquake prevention and disaster reduction. The modified PI (Modified Pattern Informatics, MPI) method is proposed and used to retrieve the spatial-temporal characteristic information of ionospheric parameters before the Wenchuan earthquake. By comparing the electromagnetic images of DEMETER before and after processing with MPI method, it is found that the original images have seasonal and spatial trends which shadow the meaningful information related to earthquakes; while the satellite data were processed with the MPI method, significant anomalies of ionospheric parameters were found before the Wenchuan earthquake. Conclusively, the MPI is effective in retrieving the precursor information of strong earthquakes through eliminating the background trends and highlighting significant short-term variations.

Keywords: Modified Pattern Informatics (MPI) Ionospheric parameters Spatial-temporal pattern Wenchuan Earthquake

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