

论文

用卫星热红外信息研究关联断层活动的时空变化——以南北地震构造带为例

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收稿日期 2005-7-20 修回日期 2005-12-5 网络版发布日期 接受日期

摘要 断层活动不是孤立的, 一条断层的活动可能影响其他断层, 并引起这些断层的活动, 这些相互作用的断层称为关联断层. 本文利用卫星热红外信息以南北地震构造带为例, 分析了关联断层活动的时空变化, 所使用的信息是经过处理的地表亮温残差低频分量  $T_{LOW}$ . 结果表明, 在一定时段内研究区一些断层间除地震活动表现出相互呼应关系外, 其地表亮温残差低频分量  $T_{LOW}$  曲线相似, 相关系数高, 说明热红外信息与地震信息共同反映一个地区断层的关联活动. 此外, 也存在单独由地表亮温残差低频分量  $T_{LOW}$  相关表现断层关联活动的情形, 即断层间无地震活动的呼应关系, 但也存在  $T_{LOW}$  曲线的相关性, 同样显示关联断层的相互作用. 对  $T_{LOW}$  的时空过程分析表明, 关联活动组合可随时间发生变化. 例如, 1988~1994年间红河断裂与澜沧-耿马断裂、金沙江断裂等构成关联活动组合, 1994~1998年又与小金河断裂、安宁河-小江断裂构成关联活动组合, 这样的时空变化过程可能是地壳应力场重新分配的反映. 本文的研究结果证明, 卫星热红外信息有望成为研究断层相互作用的一个新的独立物理量, 并将对地震动力学和构造物理学的发展有重要意义.

关键词 [断层相互作用](#) [关联断层](#) [关联活动时段](#) [卫星热红外](#) [地表亮温残差低频分量](#)

分类号

DOI:

**Temporal spatial variations of associated faulting inferred from satellite infrared information: A case study of the N S seismo tectonic zone in China**

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Received 2005-7-20 Revised 2005-12-5 Online Accepted

**Abstract** Activities on a fault are not isolated. Motion of one fault can affect other faults and trigger activities on them. These interacting faults are called associated faults. In this study, with the N S seismotectonic zone in China as a case, we use satellite infrared information to analyze temporal spatial variations of associated faulting. The information used is the low frequency component  $T_{LOW}$  of residual land surface brightness temperature, derived from satellite infrared data. The result shows that for a certain time period some faults in the study area have similar curves  $T_{LOW}$  with high correlation coefficients, in addition to corresponding relationship between their seismicities. It indicates that both infrared information and seismicity reflect associated faulting in the area. Besides, there is also situations that associated faulting is revealed by only the correlation of  $T_{LOW}$  curves. It means that there exist correlation relationships of  $T_{LOW}$  curves between faults, exhibiting interaction of associated faults, while no corresponding relation in seismicity appears on these faults. Analysis of the temporal spatial processes of  $T_{LOW}$  demonstrates that associated faulting pattern can change with time. For instance, during 1988-1994 the Honghe fault conjoined with the Lancang Gengma fault and the Jinshajiang fault to constitute an associated faulting pattern. During 1994~1998, the Honghe fault combined with the Xiaojinhe fault and the Anninghe Xiaojiang fault to form another associated faulting pattern. Such a temporal spatial change may be the reflection of re partition of stress field in the crust. The result of this study shows that satellite infrared information can become a new independent physical parameter for research of fault interaction, and would be of great significance for development of earthquake dynamics and tectonophysics.

**Key words** [Fault interaction](#); [Associated faults](#); [Period of associated faulting](#); [Satellite infrared](#); [Residual of land bright temperature](#)

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