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## 2010年玉树 $M_S$ 7.1地震前的中长期加速矩释放(AMR)问题

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Intermediate-term medium-range Accelerating Moment Release (AMR) priori to the 2010 Yushu  $M_S$ 7.1 earthquake

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摘要

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**摘要** 2010年4月14日青海玉树 $M_S$ 7.1地震前的加速矩释放(AMR)现象的研究,对理解这次地震的孕震过程、对于时间相依的地震危险性分析(或中长期地震预测)具有重要意义. 鉴于以往AMR研究中的争论,本文不刻意选取AMR分析的时空尺度,而是在已知发震时刻和震中位置情况下,对 $T$ - $R$ - $M_c$ 三维空间中矩释放指数 $m$ 值的分布进行分析,结果表明玉树 $M_S$ 7.1地震前在时间尺度 $T=10\sim 20y$ 和空间尺度 $R=50\sim 120$  km范围内,存在较稳定的AMR,但AMR的时、空尺度与以往研究中得到的AMR定标率不吻合. 在多时间尺度下,无法在空间上惟一地识别玉树 $M_S$ 7.1地震震中附近的AMR“热点”,但如借鉴“迁移图像”的做法考察AMR“热点”的演化,则可见震前似存在AMR逐渐向震中附近“迁移”的现象.

**关键词:** 时间相依的地震危险性分析 中长期地震预测 AMR现象 迁移图像 玉树地震

**Abstract:** Investigation of the accelerating moment release (AMR) phenomena plays an important role in understanding the preparation process of the April 14, 2010, Yushu  $M_S$ 7.1 earthquake, with implications to time-dependent seismic hazard assessment or intermediate-term medium-range earthquake forecast. Considering the debates related to AMR study, we avoid the special selection of the spatio-temporal ranges for the AMR analysis. Alternatively, we investigate the distribution of  $m$  value, the exponent in the power-law-like 'time-to-failure' function describing the moment release, in the  $(T-R-M_c)$  space, where  $T$  and  $R$  are the scales of temporal and spatial window, respectively, and  $M_c$  is the cutoff magnitude of earthquake catalogue in use. The failure time and center of the spatial range were fixed at the origin time and the epicenter of the mainshock. Stable pre-shock AMR can be observed at the time scale  $T=10\sim 20y$  and spatial range  $R=50\sim 120$  km. But such  $T$  and  $R$  are not consistent with those deduced from the scaling relation obtained by previous studies. With varying time scale  $T$ , it is difficult to find a self-similar pattern of AMR 'hot spots' around the epicenter of the Yushu  $M_S$ 7.1 earthquake. Using the 'migration pattern' method, it can be found that the AMR pattern migrated to the epicenter before the earthquake.

**Keywords:** Time-dependent seismic hazard Intermediate-term medium-range earthquake forecast Accelerating moment release (AMR) Migration pattern Yushu earthquake

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