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Test of the pre-shock accelerating moment release (AMR) by the case of the December 26, 2004, Indonesia M_W9.0 earthquake

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The 'unexpected' occurrence of the December 26, 2004, Indonesia M_W9.0 earthquake provided a unique opportunity to test some of the hypotheses/models proposed for the study and prediction of earthquakes. One of the frequently cited hypotheses is the so-called accelerating moment release (AMR) before large earthquakes, one of the controversial arguments which is regarded as one of the observational evidences for the critical-point-like model of earthquake generation, having obvious potential of application to intermediate-term medium-range earthquake prediction if confirmed to be correct. In this study, the December 26, 2004, Indonesia M_W9.0 earthquake is taken as an example to explore whether or not there exists a pre-shock accelerating moment release (AMR) process. Different from traditional approaches which used cumulative Benioff strain calculated from magnitude, in this investigation, the Harvard CMT catalogue is used to calculate the cumulative moment release; Scaling coefficient is calculated for different spatio-temporal ranges to test the robustness of the accelerating property against the selection of spatio-temporal parameters. The case study shows that there exists a pre-shock accelerating moment release process before this great earthquake. Therefore, seen in the perspective of pre-shock AMR the occurrence of the M_W 9.0 earthquake is physically expected.

Keywords**:** accelerating moment release (AMR); the 2004 Indonesia great earthquake; CMT catalogue.