# Change in stress and seismicity after the 2016 Kumamoto, Japan, earthquake sequence and implication on regional seismic hazard

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We evaluate evolution of stress and seismicity after the 2016 Kumamoto earthquake sequence and assess rupture probability for the neighbouring active faults. Following the Kumamoto earthquakes, including the April 14$^{th}$ $M_W$ 6.1 and the April 16$^{th}$ $M_W$ 7.0 events, consequent aftershocks took place both north-eastward and south-westward along the Futagawa-Hinagu fault system. In addition to the strike-slip mechanism, which is consistent with the behaviour of the Futagawa-Hinagu fault system, some aftershocks with normal mechanisms were observed. Such aftershock patterns in space and mechanism could be associated with coseismic Coulomb stress change on optimally oriented planes (OOPs), determined based on the stress perturbation of an earthquake and prior regional stress. The model shows significant stress increase along the Futagawa-Hinagu fault system and the OOP were favorable to either strike-slip or normal faulting, consistent with observations. In addition to spatial distribution of consequent events, we forecasted their temporal distribution through the modified Omori Law. In comparing with background seismicity rate, this sequence could last for ca. 1 year, similar as the duration of the sequence that follows the 2000 M5.0 earthquake took place in this region. To assess regional seismic hazard after the mainshock, we evalauted short-term rate change on neighboring active faults through the rate-and-state friction model. Due to stress enhanced, seismicity rate elevation for more than 4 times is expected on the Takano-Shirahata and Hinagu segments of the Hinagu fault zone. Considering their long-term rupture probability of 6 % in the coming 30 years, the hazard near these segments are further elevated after the Kumamoto earthquakes. Our results provide the basis to rapidly re-assess seismic hazard, which would be beneficial for emergency response regarding victim relocation and building reinforcement.

Keywords: Kumamoto sequence, Coulomb stress change, modified Omori Law, rate-and-state friction model, seismic hazard assessment

 