

Coseismic change in groundwater level after the 2016 Kumamoto earthquake

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Opportunities to observe coseismic hydrological changes in generation of new fault systems are rare. We provide direct evidence of significant groundwater drawdowns (4.65 m maximum over a 160 km² area) along crustal ruptures associated with the 2016 Kumamoto earthquake using extensive high-resolution water level monitoring records. In the localized fault area, approximately 106 m³ of groundwater was transferred into crustal ruptures extending to a depth of ~5 km. The groundwater filled open cracks within 35 minutes after the shock to compensate for the vacuum pressure generated in the deep opening in the crust. There was no evidence of a coseismic surface water response to offset the loss of groundwater. Observed water drawdown should be considered an important mechanism of coseismic hydrological change. In this presentation we will report comprehensive coseismic groundwater level change mechanism after the 2016 Kumamoto earthquake.

Keywords: Kumamoto earthquake, Groundwater flow system, Groundwater level change, Crustal ruptures