River's Rise Correlated to Oklahoma's Largest Earthquake

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for research papers:

Manga, M., C.-Y. Wang, and M. Shirzaei (2016), Increased stream discharge after the 3 September 2016 Mw 5.8 Pawnee, Oklahoma earthquake, *Geophys. Res. Lett.*, 43, 11,588–11,594, doi:10.1002/2016GL071268.

This research revealed that there was a significant increasing of stream discharge within few hours after Mw 5.8 Pawnee earthquake in Oklahoma. From many of USGS stream gauges in that area, only one closest gauge recorded this increased discharge in distance about 15 km from epicenter. This Mw 5.8 earthquake also resulted in liquefaction in northwest and south of earthquake focus. Interaction between earthquake and hydrological response in crust is quite interested in this area due to the fact that seismicity was also induced by waste-water disposal injection. The precipitation and slope changes data were shown to confirm that the river's level rise was more likely caused by earthquake. Upstream of this particular gauge was located in Pawnee Lake which is very close to corresponding gauge. The site of this measurement was in southeast direction of mainshock epicenter. Calculation of volumetric strain and dynamic strain imparted by earthquake showed that this hydrological change was considered due to transient wave (~6.2 cm/s) instead of small dilatation value. A one-dimensional conceptual model is built to understand the physical mechanism of the system. Simulation showed that by using some assumptions to make a simple model, the total water discharge induced by earthquake is about $5.22 \pm 0.09 \times 10^4$ m^3, give best fitting parameters. Overall, because the changes in discharge after earthquake are usually small compared to annual water budget, there is no significant impact for water supplies and availability in near future. This research successfully added new observation of fluid-induced seismicity can induce hydrological responses. This research can be expanded to understand the river system in Oklahoma area by imaging the sources of water that were not well-defined before.

Keywords: Earthquake-triggered stream discharge, Static and dynamic stresses; Oklahoma earthquake