



Changes in permeability caused by earthquakes

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Earthquakes induce a range of hydrological responses, including changes in streamflow and changes in the water level in wells. Here we show that many of these responses are caused the changes in permeability produced by the passage of seismic waves. First we analyze streams that were dry or nearly dry before the 2014 M6 Napa, California, earthquake but started to flow after the earthquake. We show that the new flows were meteoric in origin and originate in the nearby mountains. Responses are not correlated with the sign of static strains implying seismic waves liberated this water, presumably by changing permeability.

We also analyze a large network of wells in China that responded to 4 large earthquakes. We monitor permeability changes through their effect on the water level response to solid Earth tides. We find that when earthquakes produce sustained changes in water level, permeability also changes. Wells with water level changes that last for only days show no evidence for changes in aquifer permeability.