

Response of mud volcanoes to earthquakes: role of static strains and frequency-dependence of ground motion

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Distant earthquakes can trigger the eruption of mud volcanoes. We report observations of the response of the Davis-Schrimpf, California, mud volcanoes to 2 earthquakes and non-response to 4 other earthquakes. We find that eruptions are triggered by dynamic stresses and that the mud volcanoes are more sensitive to long period seismic waves than short period waves with the same amplitude. These observations are consistent with models in which fluid mobility is enhanced by dislodging bubbles by the time-varying flows produced by seismic waves.

In the Northern Apennines, Italy, we document responses and non-responses to the May-June 2012 Emilia seismic sequence. Here we find that discharge only increases where dikes under the vents are unclamped by the static stresses produced by the earthquakes.

Mud volcanoes can thus respond to static stress changes (if feeder dikes are unclamped) and dynamic stresses produced by seismic waves (possibly by mobilizing bubbles).