



## **Simultaneous magma and gas eruptions at three volcanoes in southern Italy: an earthquake trigger?**

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In September 2002, a series of tectonic earthquakes occurred north of Sicily, Italy, followed by three events of volcanic unrest within 150 km. On October 28, 2002, Mt. Etna erupted; on November 3, 2002, submarine degassing occurred near Panarea Island; and on December 28, 2002, Stromboli Island erupted. All of these events were considered unusual: the Mt. Etna NE-rift eruption was the largest in 55 yr, the Panarea degassing was one of the strongest ever detected there, and the Stromboli eruption, which produced a landslide and tsunami, was the largest effusive eruption in 17 yr. Here, we investigate the synchronous occurrence of these clustered unrest events, and develop a possible explanatory model. We compute short-term earthquake-induced dynamic strain changes and compare them to long-term tectonic effects. Results suggest that the earthquake-induced strain changes exceeded annual tectonic strains by at least an order of magnitude. This agitation occurred in seconds, and may have induced fluid and gas pressure migration within the already active hydrothermal and magmatic systems.