



## The survey and mapping of sand-boil landforms related to the Emilia 2012 earthquakes: preliminary results

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### Abstract

Sand boils, which are also known as sand blows or sand volcanoes, are among the most common superficial effects induced by high-magnitude earthquakes. These generally occur in or close to alluvial plains when a strong earthquake ( $M > 5$ ) strikes on a lens of saturated and unconsolidated sand deposits that are constrained between silt-clay layers [Ambraseys 1988, Carter and Seed 1988, Galli 2000, Tuttle 2001, Obermeier et al. 2005], where the sediments are converted into a fluid suspension. The liquefaction phenomena requires the presence of saturated and uncompacted sand, and a groundwater table near the ground surface. This geological–geomorphological setting is common and widespread for the Po Plain (Italy) [Castiglioni et al. 1997]. The Po Plain (ca. 46,000 km<sup>2</sup>) represents 15% of the Italian territory. It hosts a population of about 20 million people (mean density of 450 people/km<sup>2</sup>) and many infrastructures. Thus, the Po Plain is an area of high vulnerability when considering the liquefaction potential in the case of a strong earthquake. Despite the potential, such phenomena are rarely observed in northern Italy [Cavallin et al. 1977, Galli 2000], because strong earthquakes are not frequent in this region; e.g., historical data report soil liquefaction near Ferrara in 1570 ( $M 5.3$ ) and in Argenta 1624 ( $M 5.5$ ) [Prestinanzi and Romeo 2000, Galli 2000]. In the Emilia quakes of May 20 and 29, 2012, the most widespread coseismic effects were soil liquefaction and ground cracks, which occurred over wide areas in the Provinces of Modena, Ferrara, Bologna, Reggio Emilia and Mantova (Figure 1). [...]

### Keywords

Geomorphology; Sand boils; Digital elevation model; Liquefaction; Earthquake; Italy

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### References

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