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New technologies to improve the monitoring of tephra fallouts from Etna: the collaborative system Tefranet

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During early December 2015, Mt. Etna (Italy) produced 4 paroxysmal events from the Voragine crater in just 3 days. This activity caused ash and lapilli fallout over a wide area extending from the volcanic slopes up to ∼100 km from the volcano, affecting numerous villages and the cities of Messina and Reggio Calabria. Monitoring this kind of volcanic activity in order to know the dispersal of tephra fallout in quasi-real time can prove challenging, especially when several paroxysmal events follow each other as during these latest eruptions in December. To tackle similar recurring periods of frequent activity, which have occurred a number of times at Etna over recent years, we devised a collaborative system named Tefranet. The system is easy to use but at the same time designed to rapidly retrieve useful georeferenced information on tephra fallouts from Etna's explosive activity.
Tefranet includes a mobile application and a web site, with particular attention to an administration backend tool, making owners of smartphones or other mobile devices participants. The system aims to involve citizens living not only in eastern Sicily (i.e. the area most affected by fallout based on the prevailing winds blowing on Etna), but also those resident at some distance, in areas potentially covered by tephra (more than 60-80 km from the volcano) and that are difficult to reach before the original amounts of tephra on the ground may become altered by anthropic (e.g. car traffic) and atmospheric (wind and rain) factors. The Tefranet community will be informed by the INGV specialists via mobile device in case explosive activity resumes, with users able to visualize all the tephra signals on a map in real time. All kinds of information concerning start/end of the tephra fallout, estimation of the clast dimensions, thickness of the deposit, level of tephra cover on the ground, will be welcomed, especially if accompanied by photos of the deposit and of the eruption plume. Here, we present a simulation of a real eruption case in order to show the potential of the system on improving the mapping of the fallout deposits, reducing the time needed to collect tephra samples and extending the sampling area, and finally helping effectively the study of fallout deposits and explosive eruptions also for research purposes.