



## **An Early Warning System for major explosions at Stromboli volcano based on strainmeter and seismic data.**

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In 2017 – 2018 Stromboli showed a reawakening phase after a period characterized by minor eruptive activity, started at the end of 2014. In May 2017, the INGV geophysical and geochemical networks started to register an increase of the typical Strombolian explosion occurrence rate, an increase of the seismic tremor amplitude, an increase of the CO<sub>2</sub> soil degassing and modest deformations of the volcanic edifice. Moreover, between July 2017 and August 2018, nine major explosions occurred, namely explosive events that can throw scoria and lapilli into the area surrounding the craters, which is visited by tourists. For this reason the major explosions are one of the volcanic hazards at Stromboli. Among the major explosions mentioned above, the one on December 1, 2017 was well recorded by seven seismic stations and two strainmeters. We analyzed the signals of this major explosion and we found short-term precursors both in the strainmeter and the seismic data. We propose an automatic Early Warning system, tested on the explosion of December 1, 2017, which recognizes the strainmeter and seismic precursors 77 and 38 seconds before the explosion onset, respectively.