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Correlation between seismic and volcanic activity: A tale of three eruptive episodes at Mount Etna (Italy) in November 2006

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Three eruptive episodes of the Southeast Crater at the summit of Mount Etna in November 2006 were exceptionally well documented by visual, seismic and thermal monitoring. In terms of volcanic activity, the three paroxysms showed marked differences among each other. The first one (16 November) was a strongly explosive event, with vigorous Strombolian activity and ash emission from multiple vents, lava emission, and phreatomagmatic explosions generating pyroclastic density currents. In contrast, the second episode (19 November) was a rather weakly explosive event, with mild Strombolian activity but more voluminous lava emission. Finally, the third paroxysm (24 November) was a moderately explosive event, with intermittent lava fountaining and generation of a tephra column as well as lava emission and pyroclastic flows. Data recorded by a thermal monitoring camera clearly document the different phases of each paroxysm, although weather clouds occasionally hampered thermal monitoring. The images show a rapid onset of the volcanic activity, which reached a peak in eruptive (and thermal) intensity, and then decreased gradually. The analysis of seismic activity highlights a wide range of different types of signals, reflecting remarkable complexities in the dynamics of the eruptive events. The different explosive intensities are well reflected in the volcanic tremor amplitude, although the three episodes show common features, such as a maximum in tremor amplitude during their first hour, and a number of strong explosive events during the waning phases of each paroxysm. A neat correlation between typologies of seismic signals and eruptive styles and intensities can be established from the data. However, the strong phreatomagmatic explosions

and pyroclastic density currents on 16 and 24 November did not yield any distinguishable seismic signal. On the other hand, the 16 November paroxysm was preceded by a sequence of transient signals that showed strikingly regular intervals and durations. These signals are interpreted as the effect of hydrothermal boiling mechanisms that might have played a significant role in the phreatomagmatic explosions observed on 16 November.