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First result of a multi-parametric experiment conducted in the summit area of Mt Etna volcano

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Integrating a wide range of geophysical and geochemical techniques to examine a complex volcano such as Etna can be very challenging since distinct physical processes can simultaneously produce detectable signals from a wide range of sources. This complexity can be reduced by focusing attention in space and time on a single observable phenomenon and directing all instrumental efforts to interpreting the signals produced by that process. On 7th August 2007 we attempted to use this approach to try to answer a simple question: What are the physical processes involved in the impulsive quiescent degassing observed at the Northeast Crater (NEC) of Etna? This crater is continuously degassing, with clear occasional modulations to the degassing rate, sometimes with buoyant puffs being emitted suggesting variations in the temperature of the emitted gas. The processes controlling this easily observable behavior are unknown. We installed: (i) a gravimeter which outputs, beside gravity, ground tilt along two perpendicular directions; (ii) an ultraviolet spectrometer pointed at the point of gas emission to record variations in the path amounts of SO2 measurement in the NEC plume; (iii) a seismic array composed by four broad-band stations. The gravimeter and one of the seismometers were installed side-by-side on the uppermost slopes of the NEC vent. The other seismic stations were placed around the NEC at a distance from the vent within 1 km. These observations were augmented through the use of data recorded by both the permanent seismic network (four stations closest to the summit craters), and the new permanent infrasonic network. During the experi-

ment we recorded very good quality data linked to both continuous degassing activity and intra-crater moderate explosive phenomena. In spite of the technical difficulties arising from the joint analysis of non-homogeneous data (different sampling rate, instrumental dynamics, etc.), we evidence common seismic/gravity and seismic/acoustic anomalies and, in a few cases, joint seismic/gravity/acoustic anomalies. Conversely, no clear relationship between the geochemical and geophysical signals was detected. The observed coupling of geophysical signals allows us to propose an interpretation of the dynamic processes controlling the behaviour of the NEC. We believe that multiparametric experiments, conducted very close to the active structures of a volcano, can significantly improve the knowledgement of the short-term mechanisms behind the activity itself. We thus encourage similar studies to be further conducted, possibly over longer time intervals and using more instrumentation.