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Dynamics of 2004-2005 Mt. Etna eruption as inferred from monitoring of glass and bulk rocks compositions

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Petrologic monitoring of volcanics erupted during effusive and explosive activity of Sicilian volcanoes as Etna and Stromboli provides fundamental information about the dynamics of magmas inside the plumbing system. The comprehension of intra-telluric processes represents a fundamental goal to infer the temporal evolution of the eruptive activity and to forecast any possible change of eruptive conditions. Such almost real-time information is strongly demanded by Civil Protection Institutions in order to promptly warn the threatened population. In this framework, the last eruption of Mount Etna occurring from September 2004 to March 2005 represents an interesting "case study" that highlighted the significance of petrologic monitoring in response to an eruptive crisis, when the absence of seismicity and ground deformations necessarily minimized the role of geophysical monitoring techniques. Features of 2004-2005 activity were significantly different from those of recent 2001 and 2002-2003 eruptions. For instance, during 2004-2005 eruption the eruptive fissures (respectively at 2920, 2820, 2620 and 2320 m a.s.l.) propagated progressively down slope and emitted exclusively lava flows, without evidence of tephra. Furthermore, the vents were located in an area difficult to reach and to sample, specially during the winter. These conditions obliged us to adapt and "calibrate" the previously consolidated monitoring techniques for these specific eruptive conditions. This approach provided in almost real-time, "basic" and "quick" information based essentially on textural observations and compositional measurements of glassy water-quenched samples, daily collected near the vents. Data interpretation unveiled a temporal evolution of the composition and temperature of magmas erupted by different vents during the first days of activity. Noteworthy, no significant change of compositional parameter has been measured in products emitted throughout the eruption. This information proved particularly use-

ful during the first days of activity, when the scientific community was involved to understand if the progressive propagation of eruptive/dry fissures might herald the arrival of a new, volatile-richer magma, potentially dangerous for its stronger explosivity. Complete and detailed petrologic information based on more sophisticated techniques, requires longer time to acquire and elaborate data. Petrography, mineral chemistry, geochemistry and Sr-Nd isotopes of products erupted by different eruptive vents throughout the eruption have been integrated with previously described real-time data, allowing to get insights the geometry of the magma reservoir and the dynamics of the magmatic processes inside the plumbing system.