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Stuctural Control on the Upper Pleistocene Ignimbrite Eruptions in the Neapolitan Area: Regional Faults Versus Caldera Faults Hypothesis

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The relationship between tectonic faults, due to the regional stress field, volcanotectonic faults and ignimbrite eruptions is a fundamental research topic in the volcanological literature. In particular, high-volume ignimbrite eruptions are frequently associated to the collapse of a coherent crustal block along a ring fault or to regional fault systems.

The regional structure of the Campania continental margin, is characterized by upper Miocene carbonatic nappes of the Apennine chain overprinted by Lower Pleistocene NW-SE normal faults, followed by post-700 ka NE-SW normal faults. The NE trending normal faults form an asymmetrical system featuring an half graben in Naples Bay and Campi Flegrei region. They accomodate much of the crustal extension of the Campania margin strictly controlling the site of Quaternary volcanism (Ischia, Procida and Campi Flegrei) and sedimentation.

Recent volcanological work documented that numerous ignimbrites were emplaced over the entire Campanian Plain in the last 300 ka, but the relationships between these ignimbrite eruptions and the structure of the Campania continental margin is still a matter of debate. The 39 ka old Campania Ignimbrite is the most widespread (about 6000 km^2) and the largest (200 km^3 Dense Rock Equivalent) volcanic deposit in the Campania margin. Two cooling units are the striking feature of the CI. The lower unit (unit-1) is grey and welded in its lower part and grades upward into grey partially welded to unwelded tuff. The upper unit (unit-2) is lithic-rich at its base grading into

pumiceous, non-welded ignimbrite. On the basis of the onland product distribution of proximal breccia deposits some authors proposed a fissural eruption mechanism, controlled by pre-existing regional normal faults located north of Campi Flegrei, for the emplacement of the Campania Ignimbrite. On the contrary, many researchers suggest that a piston –like caldera is present in the Campi Flegrei and northern of Naples bay linked to the large-volume eruption of the Campania Ignimbrite.

Our work is an interdisciplinary study based on the geological interpretation of onshore (outcrops and cores) and offshore data (seismic reflection profiles) acquired in the Neapolitan area. Indeed, a geochemical and geocronological study of Upper Pleistocene ignimbrites and of the 39 ka-old Campania Ignimbrite was performed in the onshore area. In addition, a very large seismic data set was aquired in Naples Bay that permitted the investigation of the shallow and deep structure of Naples Bay and Pozzuoli Bay and the detection of two chaotic facies/seismic units that corresponds to the Campania Ignimbrite and to older ignimbrite units.

The integration of onshore and offshore data permitted a stratigraphic correlation of these ignimbrites from Naples Bay to Naples city. Basin morphology preceding the eruption of the older ignimbrite, map distribution and isopachs of both ignimbrites and structural pattern were also reconstructed.

In conclusion the main results of this work are the recognition that large volume ignimbrites older than the Campania Ignimbrite gave rise in Naples city to a volcanic relief and that a complex fault pattern occurs in the same area that does not fit with the ring faults but correspond to regional faults.

We suggest that some of the regional faults acted as vents and large volumes of ignimbritic magma were erupted in the last 300 ka.