Architecture and 15 ka to present volcano-tectono-sedimentary evolution of the Neapolitan Yellow Tuff caldera offshore the Campi Flegrei, (Naples, Eastern Tyrrhenian Margin)

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The Campi Flegrei area is structurally dominated by the caldera associated with the eruption of the Neapolitan Yellow Tuff (NYT), a 40 km3 DRE ignimbrite dated at ca 15 ka BP [Deino et al., 2004], The volcanological evolution of the NYT caldera as been long described on the basis of outcrop and subsurface studies onland [Rosi & Sbrana, 1987; Orsi et al., 1996, and references therein; Di Vito et al., 1999; Perrotta et al., 2006; Fedele et al., 2011], but its offshore morphology, the stratal geometry of the volcaniclastic products and structures and the late-stage geodynamic evolution of the inner caldera resurgence are still poorly known.

We integrate geological and geophysical data obtained from high-resolution reflection seismic profiles (Sparker and Chirp sources) with gravity cores and swath bathymetry to better constrain the shallow structure and stratigraphic architecture and latest Quaternary to Holocene evolution of the submerged sector of the NYT caldera off the Pozzuoli Bay.

Our data clearly image, for the first time, the offshore geometry of the NYT caldera ring-fault zone, as well as the volcano-tectono-sedimentary evolution associated with the late stage evolution of the NYT inner caldera resurgence. Our interpretation suggests that since 15 ka the offshore sector of NYT inner caldera underwent significant deformation and uplift (with minor subsidence episodes) that occurred almost at the same rate as the post-glacial sea-level rise. Particularly, the inner Pozzuoli Bay started to deform soon after 15 ka BP, when the sea-level rise was initially faster than uplift. This caused a general increase of the accommodation space that was progressively filled up by volcaniclastic sediments. Since ca. 8 ka BP, along with the mid Holocene decrease in the rate of the sea-level rise, the early NYT resurgent structure was then uplifted up to the sea-level or even to partial subaerial exposure. From ca. 8 to 5 ka BP two distinct layers of resediments, mostly represented by density current deposits, separated by an interval of hemipelagic sediments. The two density flow units display a remarkable difference in their thickness and internal geometry. Across the bay, the lower unit is ca 5m thick in the western sector and reaches its maximum of ca 10 m in the central sector while it is absent towards the east. The upper unit, on the contrary, displays the minimum thickness of 10 m close to the central sector of the bay and increases up to ca 16 and 12 m in the western and eastern sector of the bay, respectively. The variation in thickness of the density flow deposits appears to be related with the amount of sediments available. The upper density flow deposits is also internally more chaotic respect to the lower one, suggesting higher energy and/or turbulence

A significant post 2 ka BP subsidence phase of ca 10 m is then recorded offshore Pozzuoli by the drowning of the infralittoral prograding wedge below the present-day fair-weather wave base. Sections clearly illustrate that the basin depocentre topography is not fixed at one position but migrates southwards in time.

We suggest that the uplift of the resurgent dome and subsidence of the southern sector, occurred after the eruption of the NYT, acted as a major control in the increase of the sea-floor gradient in the Pozzuoli bay. This may have triggered in turn, the deposition of gravity flow deposits along with a progressive migration of basin depocentres through time.

References

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