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Resurgent uplift at large calderas and relationship to caldera-forming faults and the magma reservoir: new insights from the Neapolitan Yellow Tuff caldera (Italy)

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Resurgence uplift is the rising of the caldera floor, mainly due to pressure or volume changes in the magma reservoir. Identifying resurgence structures and understanding their relationship to the magmatic reservoir is challenging. We investigate the resurgence structures of the Neapolitan Yellow Tuff (NYT) caldera (Italy) by integrating bathymetric data, high-resolution seismic profiles and Differential Synthetic-Aperture Radar Interferometry data. Our results show that the resurgent area is manifested as 1) a central dome constituted by two main blocks bounded by NNE-SSW trending faults, 2) an apical graben developed on top of the most uplifted block, 3) a peripheral zone including several uplifted and tilted blocks, bounded by inward-dipping faults. The onset of the uplift of the central dome occurred through re-activation, in reverse motion, of normal faults formed during the caldera collapse, and located in the peripheral zone. During periods of unrests, the blocks of the central dome move independently at different velocities, and the peripheral zone accommodates the deformation. The restless behaviour of the NYT caldera is the result of a shallow magmatic reservoir located at 3.5 ± 0.7 km, and characterised by a width that roughly corresponds to the extension of the overlaying resurgent area. Defining the caldera-forming fault system and identifying the area involved by the resurgence is crucial for estimating depth and width of the magma reservoir, and predicting the caldera behaviour during periods of unrest by localising possible vents and sectors that will deform. This knowledge contributes to the evaluation of the volcanic hazard.