Rifting and Post-Rift Reactivation of The Eastern Sardinian Margin (Western Tyrrhenian Back-Arc Basin) Evidenced by the Messinian Salinity Crisis Markers and Salt Tectonics ("METYSS" Project)

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The Eastern Sardinian margin formed during the opening of the Tyrrhenian Sea, which is a back-arc basin created by continental rifting and oceanic spreading related to the eastward migrating Apennine subduction system from middle Miocene to Pliocene times. We carried out the "METYSS" project aiming at better understanding the Miocene-Pliocene relationships between crustal tectonics and salt tectonics in this key-area, where rifting is *pro parte* coeval with the Messinian Salinity Crisis (MSC, 5.96-5.33 Ma) and Messinian salt *décollement* creates thin-skinned tectonics. Thereby, we use the MSC seismic markers and the deformation of viscous salt and its brittle overburden as proxies to better delineate the timing of rifting and post-rift reactivation, and especially to quantifying vertical and horizontal movements. Our mapping of the Messinian Erosion Surface and of Messinian Upper and Mobile Units shows that a rifted basin already existed by the Messinian times, revealing a major pre-MSC rifting episode across the entire domain. Because salt tectonics can create fan-shaped geometries in sediments, syn-rift deposits have to be carefully re-examined in order to decipher the effects of crustal tectonics (rifting) and salt tectonics. Our data surprisingly showed that there are no clues for Messinian syn-rift sediments along the East-Sardinia Basin and Cornaglia Terrace, hence no evidence for rifting after Late Tortonian times. Nevertheless, widespread deformation occurred during the Pliocene and is attributed to post-rift reactivation. Some Pliocene vertical movements have been evidenced by discovering localized gravity gliding of the salt and its Late Messinian (UU) and Early Pliocene overburden. To the South, crustal-scale southward tilting triggered along-strike gravity gliding of salt and cover recorded by upslope extension and downslope shortening. To the North, East of the Baronie Ridge, there was some post-salt crustal activity along a narrow N-S basement trough, bounded by crustal faults. The salt geometry would suggest that nothing happened after Messinian times, but some structural features (confirmed by analogue modelling) show that basement fault slip was accommodated by lateral salt flow, which thinned upslope and inflated downslope, while the overlying sediments remained sub-horizontal.