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# Influence of pre-salt topographic features on supra-salt deformation in Mediterranean basins: Geology vs. physical models

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The presence of a thick Messinian evaporite unit is a well known feature of the Mediterranean basins. This salt unit is composed of three sub-units (Lower, Mobile and Upper Units) in the Northwest Mediterranean. In contrast, in the Eastern Mediterranean it is characterized by a multilayered evaporite sequence. In both regions the salt acted as a detachment favoring the downslope gravitational failure of the overlying sediments in a thin-skinned deformation regime (e.g. Liguro-Provençal or Levant basins). As a result, these salt-bearing passive margins exhibit the classical three-domain structural zonation characterized by upslope extension, intermediate translation and downslope contraction. Nevertheless, the presence of pre-salt reliefs (e.g. irregularly eroded palaeotopography or volcanic edifices) is rather common in the translational domain of the Northwestern Mediterranean (e.g. Liguro-Provençal and West Corsica margins). In this scenario, pre-salt reliefs act as flow barriers and hinder salt drainage. When their summit lies close or above the top salt, these structures may partially or fully block salt flow. They also disrupt locally the structural zonation of the passive margin and constrain cover deformation. In contrast, in the Eastern Mediterranean the Eratosthenes seamount is characterized by a large scale submerged massif (ca. 120 km in size) that significantly influenced the structural evolution of the surrounding areas. This inherited relief acted as a buttress and deflected the Messinian salt flow constraining supra-salt deformation (e.g. Levant Basin and Nile margin). In addition, the geometry of the Eratosthenes seamount also restrained the structural style of the allochthonous salt that was expulsed during the development of the Cyprus subduction zone to the north.

Using an experimental approach (sandbox models) and new analysis techniques, we investigate salt and supra-salt deformation in response to two different types of pre-salt relief: 1) local seamounts during gravitational gliding (Western Mediterranean) and, 2) large regional reliefs during the emplacement of a thrust system (Eastern Mediterranean). The experimental results of the Western Mediterranean show that the geometry, continuity and orientation of these reliefs with respect to the margin slope are key factors during gravitational failure and influence supra-salt deformation. Experimental results in the Eastern Mediterranean indicate that different responses are obtained along-strike as a consequence of shortening when modeling the Eratosthenes seamount. These differences were basically controlled by the location of the seamount, that was a topographic high during the deposition of the Messinian evaporites. The presence of seamounts in the contractional domain, instead, initially enhanced salt inflation by buttressing and the subsequent development of salt sheets with the formation of an escarpment at the edge of the salt. The experimental results also provide geometrical constraints to bear in mind during interpretation of these structures and associated hydrocarbon plays, which are commonly poorly imaged in seismic data.