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New insights on the deep structure and evolution of the Gibraltar Arc System and Atlas Mountains: results from TOPOMED-TOPOEUROPE Project

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One of the target areas of the TOPO-MED CRP within the ESF TOPO-EUROPE EUROCORES Project is the westernmost Mediterranean region, which includes the Gibraltar Arc System (Betic-Rif orogen, Guadalquivir and Rharb foreland basins, Alboran back-arc basin and Gulf of Cadiz imbricated accretionary wedge) and the Atlas Mountains (High and Middle Atlas). Within this framework, several geological and geophysical surveys have been carried out including, among others, a 6-month deployment of OBSes in the Gulf of Cadiz and the Alboran basin, active seismic surveys combining MCS and OBS along five profiles on the Alboran and Algerian basins, a wide angle seismic profile across the Atlas Mountains, a deep MCS survey on the Alboran basin and the Gulf of Cadiz totaling 2560 km, a high resolution seismic survey on the Alboran basin, a back-scatter and high resolution topography survey on the Alboran Basin and several MT profiles across the Atlas mountains. The results of these surveys – some of them still preliminary and under processing - together with integrated models allow us to better define the geometries and properties of the crust and upper mantle structures and to link them with surface processes and the geodynamic evolution of the region. Outstanding results are the large crustal thickness variations between the Betic-Rif orogen and the Alboran basin, the very moderate crustal root beneath the Atlas Mountains and a conspicuous crust/mantle strain partitioning affecting most of the region. These results, together with those coming from the TOPO-IBERIA Spanish project, have allowed to propose different geodynamic models to explain the tectonic evolution of the region where the leading mechanism implies twisted mantle slab roll-back. In addition, modeling the Messinian salinity crisis including both the closure of the Mediterranean and desiccation and the re-opening and flooding have also been proposed.