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Mio-Pliocene evolution of the Gharb Sub-Basin, offshore Morocco

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This study focuses on the underexplored offshore Gharb Sub-Basin, which is part of the foreland Gharb-Prerif Basin. The Gharb- Prerif basin is bound to the north by thrust faults associated with the Rif Orogen; to the south, the basin onlaps the Moroccan Meseta. The Gharb Sub-Basin is situated in northwestern Morocco and extends westward into the adjoining offshore area of the Atlantic Ocean.

The Gharb-Sub basin also corresponds to the western end of the Rifian corridor. During the Late Miocene, two corridors, the Rifian and Betic connected the Mediterranean and the Atlantic. During the Messinian however the Rifian is considered to be the most important corridor.

The accretionary prism of the Rif orogeny, also referred to as the Prerifaine Nappe became unstable and collapsed during Late Miocene. This gravitational collapse and the related plastic deformation processes resulted in the formation of mixed extensional-compressional basins limited by listric faults, toe thrusts and shale ridges.

2D and 3D seismic data covering ca. 2200 km^2 and four wells with wireline and cutting samples are utilized in order to reconstruct the Miocene-Pliocene evolution of the western end of the Rifian corridor (Offshore Gharb Sub-basin). New biostratigraphic framework is generated, which gives new insights into time constrains and aids the reconstruction of the geometry and stratigraphy of the basin fill. Additionally the studied succession represents an exploration target.

The Gharb-Sub basin is associated with a series of satellite extensional mini-basins that are filled with thick Upper Miocene (Upper Tortonian) to Pleistocene clastics. These mini-basins formed at the late stages of the Rif-Betic orogeny due to the collapse of the accretionary wedge at Tortonian-Messinian times. Late Miocene gravitational normal faulting and related growth generated subsidence and sedimentation into the mini-basins.

This integrated study aims to provide better understanding of the offshore Gharb-Sub basin geometry, Mio-Pliocene palaeogeography and tectono-sedimentary evolution. This will compliment related studies focusing on the analogous Mio-Pliocene succession onshore.