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Tectonic and stratigraphic evolution of the Western Alboran Sea basin since the last 25 Myrs

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The Western Alboran Basin (WAB) formation has always been a matter of debate and was either considered as a backarc or a forearc basin. Based on stratigraphic analysis of high-resolution 2D seismic profiles mostly located offshore Morocco, the tectonic and stratigraphic history of the WAB is clarified. A thick pre-rift sequence is observed beneath the Miocene basin and interpreted as the topmost Malaguide/Ghomaride complex composing the Alboran domain. The structural position of this unit compared with the HP-LT exhumed Alpujarride/Sebtide metamorphic basement, leads us to link the Early Miocene subsidence of the basin with an extensional detachment. Above the Early Miocene, a thick Serravallian sequence marked by siliciclastic deposits is nearly devoid of extensional structures. Its overall landward to basinward onlap geometry indicates that the WAB has behaved as a sag basin during most of its evolution, from the Serravallian to the Late Tortonian. Tectonic reconstructions in map view and cross-section further suggest that the basin has always represented a strongly subsiding topographic low without internal deformation that has migrated westward together with the retreating slab. We propose that the subsidence of the WAB was controlled by the pull of the dipping subducting lithosphere explaining the large thickness (10 km) of the mostly undeformed sedimentary infill.