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Geometry and evolution of the Ouarzazate basin in the foreland of the High Atlas Mountains (Morocco)

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The Ouarzazate basin (Morocco), constitutes the best and almost the unique synorogenic record of the Atlas building. It is a small basin (150 x 35 km max., and 700 m deep), located in the southern margin of the central High Atlas. To the north, the Ouarzazate basin is flanked by the marginal thrust belt of the High Atlas (the Sub-Atlas zone) involving proximal foreland deposits, and to the south it is bordered by the Precambrian of the Anti-Atlas massif, a wide, 100 km-scale arch that plunges beneath the basin. The elevation of the present-day surface of the basin ranges between 1600 (north) and 1200 m (south). Analysis of the synorogenic record and tectonics-sedimentation relationships in the northern border of the basin, indicates basin activity and syntectonic agradation from late Eocene to late Pliocene times. During the late Eocene and the Oligocene, deformation was concentrated in the distant High Atlas hinterland, whereas the marginal thrust belt of the Sub-Atlas zone was scarcely deformed. Deformation jumped forelandwards in late Oligocene to early Miocene time, when complex sequences of synchronous thrusting created the Sub-Atlas zone up to Pliocene time, entraining the earliest sediments and locally-sourced terrigenous and lacustrine deposits, attested by growth strata and numerous angular unconformities. Shallow (4 s TWTT) vertical incidence seismic profiles acquired by ONAREP provide an excellent control of the basin basement and main buried structures. In the regions without seismic coverage, the basin architecture was determined taking and modelling bouguer anomaly in detailed gravity profiles.

A previous research taking into account geological evidence and modelling of potential fields, reveals a thinned lithosphere structure under the High Atlas and Ouarzazate basin that induce a buoyant load and topographic rise in the area.

Flexural modelling taking into account pysical parameters (density of geological bodies, effective elastic thickness of the lithosphere, mathematical approaches to surface processes, sediment, thrusting + sedimentary infill + lithospheric structure) and time frame of geological processes (chronology of thrusting and timing of lithospheric thining) permits the understanding of the main singular features of the Ouarzazate basin and a approximative cuantification of the role of thrust and buoyant loads governing the evolution of the basin.