



The Mesozoic palaeo-relief and immature front belt of northern Tianshan

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The modern Tianshan (central Asia) extends east-west on about 2500 km long with an average of more than 2000 m in altitude. At first order, the finite structure of this range obviously displays a crust-scale 'pop-up' of Palaeozoic rocks surrounded by two Cenozoic foreland basins. Up to now, this range is regarded as a direct consequence of the Neogene to recent reactivation of a Palaeozoic belt due to the India – Asia collision.

This study focuses on the structure of the northern front area of Tianshan and is mainly based on field structural works. In particular, relationships in between sedimentary cover and basement units allow discussing the tectonic and morphological evolution of the northern Tianshan during Mesozoic and Cenozoic times. The study area is about 250 km long, from Wusu to Urumqi, along the northern piedmont of the Tianshan. Continental sedimentary series of the basin as well as structure of the cover/basement interface can well be observed along several incised valleys. Sedimentological observations argue for a limited transport distance for Lower and Uppermost Jurassic deposits that are preserved within intra-mountainous basins or within the foreland basin, along the range front. Moreover, some of the studied geological sections show that Triassic to Jurassic sedimentary series can be continuously followed from the basin to the range where they unconformably overlie the Carboniferous basement. Such onlap type structures of the Jurassic series, on top of the Palaeozoic rock units, can also be observed at more local-scale (~a few 100 m). At different scales, our observations thus clearly evidence i) the existence of a substantial relief during Mesozoic times and ii) very limited deformation, after Mesozoic, along some segments of the northern range front. Yet, thrusting of the Palaeozoic basement on the Mesozoic or Cenozoic sedimentary series of the basin is also well exposed along some other river valleys. As a consequence, the northern front of Tianshan displays as very uncylindrical with rapid lateral transitions from one type to the other.

This study shows that the Cenozoic reactivation of the Tianshan range has not yielded important deformation along its contact with the juxtaposed Junggar basin, into the studied segment. Besides, the topography of the current northern Tianshan area can not be considered as the unique consequence of Cenozoic reactivation.

Finally, from a compilation of structural field observations with available seismic geophysical data, regional cross sections show only moderate shortening in the deformed belt of the northern piedmont of Tianshan. Structure of the fold-and-thrust belt looks controlled by several basement thrusts faults separating rigid blocks. This study suggests that the northern front of the intra-continental Tianshan range may be considered as an immature thrust belt and is still at an early developing stage of its orogenic evolution.