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Palaeogegraphic and palaeotopography evolution of the chinese Tien Shan during the Mesozoic : a sedimentological synthesis

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The Tian Shan is one of the main ranges of Central Asia Orogenic Belt. The Tertiary deformation is driven by the India-Asia collision stress field. However, the deformation appears localised along inherited tectonic structures formed during the Palaeozoic - Early Mesozoic history of the range (e.g. Jolivet et al., 2010). Our aim is to reconstruct the pre-Tertiary history of relief building in the Chinese Tian Shan. We use the sedimentary facies, sediment provenances and paleocurrent directions of the exposed Mesozoic sections in the northern and southern piedmonts and inside the range. This will be used to understand the long-term reactivation pattern of the main inherited structures and to assess their influence on the localisation and propagation of the deformation. We first established 6 complete reference sections spanning from the Upper Triassic to the Palaeogene. These sections are interpreted in terms of sedimentary facies, palaeoenvironments and prograding-retrograding sequences. The correlation of these 6 sections allows us to propose some palaeogeographic maps for the middle Jurassic, the upper Jurassic – lower Cretaceous transition, the upper Cretaceous and the late Cretaceous – Paleogene transition. The dismantling of reliefs associated to the late-paleozoic range stops in the upper Trias. The Jurassic is characterised by a low tectonic activity and results in a general planation phase of the Tian Shan area. The supposed low relief is possibly associated to local activity of normal faults : this is attested by alluvial fan deposits on the internal sections, as well as paleocurrent directions to the North in the northern foothills and to the south in the southern foothills. These faults could belong to pull apart basins opening in a transtensive tectonic régime, under a humid climate, what is testified by numerous organic matter layers. The upper Jurassic – lower Cretaceous transition is characterized by a huge conglomeratic event at the scale of all the northern foothills, associated with some eolian deposits certified a arid climat at this period. We propose that alluvial fans are the result of the erosion of relatively small and local reliefs, caused by normal faults. This interpretation is in contradiction with all hypothesis of the literature supporting compressional tectonic and reactivation of the range during the Upper Jurassic. Nevertheless it fits to the interpretation of low thermochronology data. During the Upper Cretaceous, the widespread occurrence of alluvial fans indicates the ongoing erosion of a local positive topography in the Tian Shan area. A significant late Lower – early Upper Cretaceous unconformity is observable in the S-Junggar, N-Tarim and Turfan Basins (Hendrix et al., 1992). It is confirmed by low temperature thermochronology data that show a “major” late Lower Cretaceous unroofing event near Kuqa on the southern foothills (Dumitru et al., 2001) and some late Lower to early Upper Cretaceous exhumation ages within the range (Jolivet et al., 2010). This marks the onset of a new exhumation phase that goes on during the Upper Cretaceous and seems to stop after a peak in the late Upper Cretaceous. Following the Upper Cretaceous inversion episode, a tectonic quiet period characterises the late Upper Cretaceous – Early Paleogene and enables the formation of a widespread calcrete.