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Preliminary paleostress analysis from Huaying Shan to Wuling Shan, Upper Yangtze Platform (Sichuan, Chongqing, Hubei and Hunan Provinces, China)

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A preliminary paleostress analysis was carried out along a latitudinal transect across a fold-and-thrust belt nowadays divided in two structural units. Westward, the eastern Sichuan belt comprises a succession of box synclines and NNE-SSW tight and nearly upright chevron anticlines (conformable relief of Huaying Shan, Mingyue Shan and Fangdou Shan) that involved sedimentary units up to Jurassic in age. Eastward from Qiyue Shan to Wuling Shan, the belt has a complex structure and comprises the lower Paleozoic sediments of the Upper Yangtze Platform. Regional faults striking nearly parallel to fold axes would correspond to mostly NW-vergent thrusts related to the fold-and-thrust belt development. The study based on fault slip data inversion in terms of paleostresses aims at unraveling the successive kinematics along these regional faults.
110 and 78 fault slip data were collected along the Huayingshan Fault and of the Qiyueshan Fault, respectively, in Permian to Triassic limestones in steep anticline limbs; 266 fault slip data were collected along the Cili-Baojing Fault in shallow-dipping Cambrian to Ordovician limestones in the hinge of a syncline of the Wuling Shan. Slip indicators are remarkable calcite steps and determination of senses of slips were straightforward.
Reverse faults striking parallel to the Huayingshan and Qiyueshan faults record the NW-SE compression, which is likely coeval to the fold-and-thrust belt development. Flexural slips are observed on bedding in the steep anticline limbs but normal displacements are conspicuous on these surfaces. The later may have originated in a successive NW-SE extensional stress field that reactivated the steep bed surfaces although no remaining reverse slips are observed with normal slips. The normal slips on bed surfaces may indicate that a component of diapirism has to be expected in the formation of the anticlines as salt walls; halite and gypsum being present in both the Cambrian and Lower Triassic sediments. In the last scenario, the en echelon arrangement of the anticlines of the belt would indicate sinistral slips along the major NE-SW faults. In this respect and close to the Qiyueshan Fault, sinistral slips prevail on NE-SW steep faults. Along both the Huayingshan and the Qiyueshan faults, oblique normal slips along NE-SW faults may correspond to a conjugate system of normal faults, which has been tilted by some 20 degrees to the SW although the origin of such rotation remains unclear. A conjugate system of normal faults indicates a NE-SW trend of extension which could have been at the origin of such block rotation.
Adjacent to the NE-SW Cili-Baojing Fault, parallel dextral faults are abundant and indicate a ca. N-S striking sigma1. A NW-SE extension is also recorded by mainly SE-dipping normal faults. Cross-cutting relationships between the normal and dextral slips have been observed on four faults and the normal stress regime predates the strike-slip one. NE-SW faults form a large set in which steep SE-dipping planes display normal slips and very steep NW-dipping planes, reverse slips. These reverse faults correspond to R-Riedel fractures of the steep SE-dipping normal faults.