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Paleostress Reconstruction of Micangshan Anticlinorium on the Southern Margin of Qinling Orogenic Belts, China

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Brittle deformations in rock of different ages can be used for paleostress calculations to establish the tectonic evolution of orogenic belt (Pollard and Aydin, 1988; Saintot et al., 2002; Arlegui et al., 2001; Bergbauer and Pollard, 2004; Kounov et al., 2011; Hippolyte et al., 2012). Micangshan locates at the southern margin of Qinling orogenic belt between SE trending Longmenshan fold-and-thrust belt and NE trending Dabashan thrust-and-fold belt with arc geometry (Liu et al., 2011; Li et al., 2011). The E-W trending Micangshan is classically described as an anticlinorium along the northeast boundary of Sichuan basin (Figure 1). Pre-Sinian crystalline basement are present in its core, whereas Late Sinian to Middle Triassic marine carbonate deposits and Late Triassic–Cretaceous terrestrial detrital rocks lied on its flank (Du et al., 1998). The contact between its basement and overlying sedimentary cover is an angle unconformity or fault surface. The two dominant structural grains of Micangshan anticlinorium are trending with E-W and NE-SE, expressed by main thrusts and folds. To increase the knowledge on the tectonic evolution in study area, we measured a lot of brittle deformations at more than 80 sites in Micangshan area, including fault surfaces with striae, joint sets. The inversion of about 1874 brittle structural data has allowed reconstruction of local stress states, and some sites revealed polyphase tectonics (Figure 2). In order to determinate the relative chronology of tectonic activation recorded by fault-slip and joints data, we intend to cover a wide range of rock age from basement to Cretaceous. A back-titling was performed where the activation of faults pre-dated folding or tilting. The faults with striae were calculated by Win-Tensor software. Joint sets were analysed on the assumption that the acute bisector of conjugate joints indicates the

maximum principle stress in most cases.

E-W trending Zhengyuan-Zhujiaba fault (ZZF) was thrusting toward south in the southern margin of Micangshan basement. NW-vergent Dahe-Shangliang fault (DSF) with NE-SW trending was interpreted as a left-lateral strike-slip thrust, cutting off ZZF in the center of Micangshan. The cross-cutting relationship of faults indicated that DSF was formed later than ZZF. Shuimo-Guanba fault (SGF) on the left side of DSF is almost parallel to it and its kinematic characterizes are as same as DSF, with left-lateral strike-slip reverse movement, but the southwest end of the fault was terminated by ZZF. Roughly NE-SW trending Taoyuan-Moujiaba fault (TMF) were thrusting toward southeast on the northwest margin of Micangshan basement.

The inversion of fault-slip and joints data illustrated that multiphase paleostress fields occurred in the evolution of E-W trending Micangshan anticlinorium since Middle Triassic. First, the extension regime with σ_3 trending to roughly N-S mainly affected the basement and related to the Micangshan uplift. Because there are at least three tectonic uplifts in Micangshan since Middle Triassic times in term of thermochronology data (Chang et al., 2012), so it's difficult to distinguish the same orientation extension at different times. Second, the N-S strike-slip transpressional regime occurred in the incipient of the oblique collision between North China and South China in Middle–Late Triassic (Meng and Zhang, 2000; Dong et al., 2011). Third, the N-S compressional event was the most important paleostress affected the entire Micangshan zone. South-vergence Upper Cretaceous on the southern margin of Micangshan were involved in the deformation of N-S compressional stress, showing that the last N-S compression began after Late Cretaceous. Four, NW-vergence thrusts developed under NW-SE compressional event related to Longmenshan thrust belts in the Middle-

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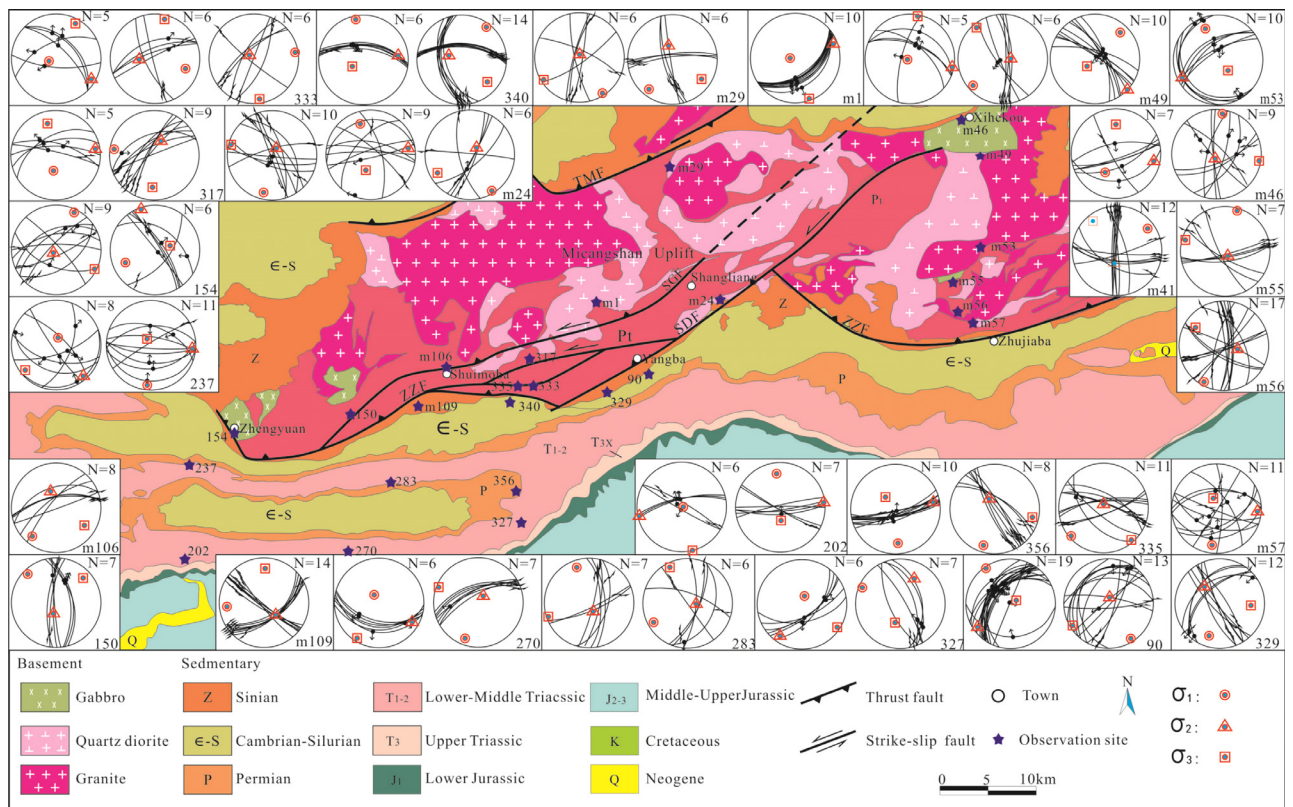


Figure1 Geology map of Micangshan and Fault-slip data.Stereogram are lower-hemisphere,Schmidt projection.

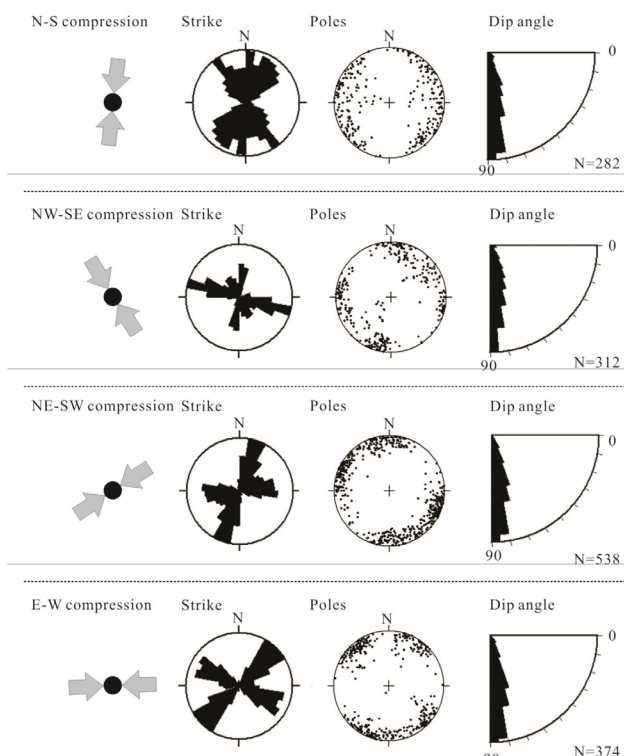


Figure2 Paleostress map of Micangshan zone on the south margin of Qinling orogenic belts .A back-titling were performed where the conjugate joints pre-dates folding or tilting . Stereogram are lower-hemisphere,Schmidt projection.Gray arrows indicate the orientation of maximum stress axes.The long big white and black arrow represents the tectonic sequence .

Late Triassic(Liu et al,2011;Li et al.,2011) .Sun et al. reported that E-W trending folds were imposed by NW-SE compression and superpose folds prevailed in the western Micangshan(Sun et al.,2011).It indicated that NW-SE compression followed the N-S compression. Five, NE-SW transpressional paleostress field was reconstructed between DSF and TMF. Under this field, NE-SW trending thrusts have rework as left-lateral strike-slip faults.Six,the E-W compression was calculated at the eastern Micahngshan.It followed N-S compression inferred from the superposition folds (Hu et al.,2012).

Key words:Micangshan, Fault-slip, Joint, Paleostress

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