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Quaternary faulting of the Qianliyan Uplift in the northern South Yellow Sea and its relationship with the earthquake hazard

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The Qianliyan Uplift bounded by Qianliyan fault on the north and Jiashan-Xiangshui fault on the south is part of the Sulu Orogen which was caused by South China Block (SCB)-North China Block (NCB) collision in latest Paleozoic-Early Mesozoic and is considered as the eastward extension of Qinling-Dabie Orogen. This uplift located in the northern South Yellow Sea south to the Shandong Peninsula. So its neotectonic study will help evaluate the seismic risk and guide the human activity in coastal and offshore area. By far, there have been only a few neotectonic studies of the Qianliyan Uplift. Recent years, we have gathered single-channel seismic data covering all the Qianliyan Uplift. Constrained by well data, we interpreted three major Quaternary faults/fault zones. They are Jiashan-Xiangshui fault zone (JXFZ), F3 and F2 from south to north, respectively. These faults are almost parallel each other and trend northeastward. The structure of the JXFZ is quite complex: the north boundary is clear in all seismic profiles while the south boundary remains unclear in some lines. Strata in the JXFZ are faulted and folded intensely and the deformation intensity is not continuous along strike. The deformation intensity of the JXFZ is bigger on Line 22 and Line 19, decreasing northeastward and southwestward respectively. Compared to the JXFZ, the F2 and F3 are shorter in length, less in deformation intensity. Nevertheless, the deformation intensity pattern of the F2 and F3 is similar to that of the JXFZ, bigger on Line 22 and Line 19, decreasing northeastward and southwestward respectively. The bigger deformation intensity is consistent with the bend at the south margin of the Qianliyan Uplift. Therefore, we propose here that the bend was a restraining bend formed during the N-S convergence between SCB and NCB, but had a key effect on the deformation pattern of the Qianliyan Uplift. The map of instrumented earthquake epicenters (>= Ms3.0) shows that there is no earthquake in the interior of the Qianliyan Uplift meanwhile several earthquakes roughly along the south margin of the Qianliyan Uplift where the marginal JXFZ has benn active in Quaternary. Besides, in the year 1932, there was a historic earthquake (Ms61/4) taking place roughly at the west extend of F2, which inferred a westward migration of the active faulting and potential ruptures of F2 in the future. The northern marginal fault—Qianliyan fault has few obvious evidence for Quaternary active faulting according to the seismic profiles although some author pointed out that the northern segment of the Qianliyan fault has been active since Late Pleistocene after interpreting of the shallow seismic profiles. This discrepancy maybe results from the different vertical resolution between our single-channel seismic data and the shallow seismic profiles from others.