The preliminary study on active faults and paleoearthquakes in the north fringe of Kashi depression

ZHAO Rui-bin (~, ~) LI Jun (~) SHEN Jun (~)
Seismological Bureau of Xinjiang Uygur Autonomous Region, Urumqi 830011, China

Key words: Kashi depression, paleoearthquake
CLC number: P542.3
Document code: A

1 Regional tectonic setting and activity

Located at the junction of three tectonic units, i.e., the South Tianshan, Pamir and Tarim, the north fringe of Kashi depression is one of the regions with strongest seismic activity in the Chinese mainland. In terms of tectonics, Kashi depression belongs to southwest depression of Tarim basin, and consists of South Tianshan fold belt in the north, the west Kunlun-Pamir fold belt in the southwest, and the Tarim basin in the south and east. Its structure form and activity are controlled by the opposite collision of the South Tianshan and the west Kunlun-Pamir. In other words, the active structures in the area extend in W-E or NEE direction, and they are mainly in form of compression and thrust with partial left-lateral strike-slip movement. The southwestern segment is characterized by northward arcuate belt. The southeastern segment, on the other hand, is predominated by northward thrust activity in the western section and by right-lateral movement in NW strike in the eastern section.

The major regional seismic structures include: Wulukeqiati fault, Kacikeaerte fault, Tuotegongbaizi-Aerpaleike fault, Maidan fault, Keping fault, Puchang fault. These faults basically control the positions where strong earthquakes occurred (Figure 1), and several earthquake rupture belts and paleoearthquake deformation belts have been found in the area.

Due to the southward thrusting of the south Tianshan and the northward pushing of Pamir, the Cenozoic strata in the north fringe of Kashi depression was strongly deformed, forming three rows of contemporary active thrust-and-fold belts (Figure 1). These thrust-and-fold belts are nearly in EW strike along the piedmont of South Tianshan. From the north to the south, they are the flank of the south Tianshan thrust-and-anticline, the Artux thrust- and-anticline, and the Kashi-Mingyaole thrust-and-anticline. Based on deformation extent and contact relationship of the strata grouping into the anticlines, it was derived that the principal deformation period of these thrust-and-anticlines was after the Early-Pleistocene (Wu, Liu, 1996) (Figure 2). The study on the terraces deformation survey (discussed in another paper) demonstrates that these thrust-and-anticlines are still active in up curvature deformation.

2 The active faults and paleoearthquakes in the north fringe of Kashi depression

The first row of thrust-and-anticline in the north fringe of Kashi depression is distributed in the front of the imbricate thrust-fold-structure in the south flank of the south Tianshan (Liu, et al., 1995). The anticline is tightly closed in shape with the dip angle of about 50° in south limb. The north limb of the anticline is truncated by the northward dipping Tuotegongbaizi-Aerpaleike fault. These thrust-and-anticlines are still active in up curvature deformation. The 1902 Artux 8½ earthquake occurred in the mid-section of the thrust-
Figure 1  Regional active structures and epicenter distribution

Figure 2  The profile of active folds in the north fringe of Kashi depression
(a) The Artux anticline  (b) The Kashi anticline

Q₁ stands for the upper Pleistocene-Holocene; Q₁ for upper Pleistocene; Q₂ for mid-Pleistocene; Q₃ denotes low-Pleistocene Xiyu series; N is Neogene

and-anticline, and some moderate-strong earthquakes still occurred occasionally. Artux thrust-and-anticline, the second row of thrust-and-anticline, consists of Miocene mud stone at the core and of the Pliocene and Quaternary sandstone and conglomerate in each of the limb. It has dissymmetry shape with gentle south limb (40°~60°) and steep north limb (50°~80°, or even overturn). A set of southward dip reverse thrust faults were developed at the north limb (Figure 2a). Kashi-Mingyaole thrust-and-anticline, the third row, consists of Neogene in core and Quaternary in two limbs. Similarly, it has a gentle south limb and steep north limb (Figure 2b). The southward dip reverse thrust fault developed under the anticline is in buried by seismic prospecting profile 0.

The thrust-and-anticline belts in the north fringe of the Kashi depression demonstrate strong activity in late