十、谷露—桑雄盆西边界断裂与 7.5 级地震破裂

谷露—桑雄盆西边界断裂从谷露地堑西南端的年波开始，向北经甲赤岗、顶莫多、巴仁多、嘎果穷果、过龙孔玛、烟它，一直延伸至怕里马西侧，全长约 52km。沿断裂发育高 200~300m 的基岩断层三角面，在山麓地带形成谷露温泉。主断裂整体走向 N10°E，倾向东，倾角 60±5°；次级断裂走向变化于 N20°W 和 N45°E 之间，形成锯齿状断续分布的多级断层陡坎和多期地震陡坎。断裂垂直错动基岩、冰碛物、洪积扇和河流阶地，形成宽约 1~2km 的断裂破碎带，包含 4~8 条次级断裂。全新世垂直运动速率为 1-3mm/a，平均运动速率为 2±1mm/a（吴珍汉等，2005）。

沿谷露—桑雄盆西边界断裂 1952 年发生 7.5 级强烈地震，在谷露盆地西缘和当雄盆地北缘形成规模较大的地震破裂带（吴章明等，1992）。1952 年地震破裂北起桑雄区烟它村，南至果青乡卓嘎若，全长约 68km，在谷露西侧形成 3-6 级地震陡坎，在断裂产状变化部位形成拉分盆地、地震鼓包和反向陡坎。地震破裂可划分为卓嘎若—加弄段、巴弄朗—年波段、甲赤岗—玛日布格段、巴仁多—过龙帕玛段和过龙孔玛—烟它段，极震区出现在谷露-乌玛塘一带，地震烈度达Ⅹ度。沿谷露盆西边界断裂全新世发育多期古地震事件，古地震重复周期约 2200~1600a 之间，平均为 1900±300a。

PART 10 WEST BOUNDARY FAULT OF GULU-SANGXUNG GRABEN AND SEISMIC FRACTURES OF THE Ms 7.5 JIUZILA EARTHQUAKE

West boundary fault of Gulu-Sangxiong graben is ~52km long from Nianbo village in south, via Jiachigang, Dingmoduo, Barenduo, Gagoqionggo, Guolonkonma and Yanta, to Palima in north. Along the fault developed bedrock facets of 200~300m high, hotsprings of high-temperature and seismic fractures and scarps of several earthquakes occurred in Late Quaternary. Generally, west boundary fault trends in N10ºE, dips eastward with dipping angle of 60±5º and vertically dislocated bedrock, glacial deposits, fluvial fans and river terraces, formed fault breccia of 1-2km wide and 4-8 branch faults in east piedmont of north Nyainqentanglha Mts. Holocene vertical slip rate of the boundary fault is 1~3mm/a with average rate of 2±1mm/a (Wu et al., 2005).

Ms 7.5 Jiuzila earthquake occurred in 1952 along west boundary fault of Gulu-Sangxiong graben, formed seismic fractures of 68km long from north boundary of Damxung basin to west boundary of Gulu basin (Wu et al., 1992) and 3-6 levels of seismic scarps. Seismic fracture zone can be divided into 5 sections with intensity of X degree occurred in Gulu and Wumatang areas for the Ms 7.5 Jiuzila earthquake in 1952. Several times of Ms 7.5-8.0 earthquake occurred along west boundary fault of Gulu-Sangxiong graben with seismic interval time of 2200~1600a averaging in 1900±300a in Holocene.



图 82 谷露—桑雄盆西主边界断裂构造地貌特征

谷露盆西边界断裂总体走向近南北向，构成盆—山构造地貌边界，在玛布格沟南形成高大的断层崖和多级断层陡坎；镜头方向 210°，摄于 2003 年 7 月。

Fig.82 View southwestward in July of 2003 at fault cliff in west boundary of Gulu basin



图 83 谷露盆地西南主边界断裂切割错断晚更新世和全新世河流阶地

（镜头向北，摄于 2003 年 7 月）

Fig.83 View northward in July of 2003 at west boundary fault cutting Late Pleistocene and Holocene deposits and terraces in southwest Gulu basin



图 84 谷露盆地西南主边界断裂错断全新世冲积扇

沿谷露盆西爬努玛边界断裂发育厚层断裂破碎带，由灰黑色断层角砾岩组成，部分断层角砾呈透镜状，长轴平行于主断裂面，镜头方向 20°。

Fig.84 View north northeastward at dark gray breccia of west boundary fault cutting Holocene alluvial deposits in southwest of Gulu basin



图 85 谷露盆西主边界多级断裂陡坎

（镜头向西，摄于 2003 年 7 月）

Fig.85 View westward in July of 2003 at multi-level scarps and cliffs along west boundary fault of Gulu basin



图 86 谷露—桑雄盆地中部西边界断裂 1952 年 7.5 级地震陡坎

（镜头向北，摄于 2004 年 3 月）

Fig.86 View northward in March of 2004 at multi-level seismic scarps of Ms 7.5 Jiuzila earthquake along west boundary fault of middle Gulu-Sangxiong graben



图 87 谷露盆地南部西边界断裂 1952 年 7.5 级地震陡坎

曲古沟口沿谷露盆西边界断裂保留有 1952 年 7.5 级地震形成的 3 级地震陡坎。地震陡坎既有正断滑动分量，形成陡坎地貌；又有左旋走滑分量，左旋错断现代冲沟；镜头向西，摄于 2003 年 7 月。

Fig.87 View westward in July of 2003 at seismic scarps and sinistral slip of Ms 7.5 Jiuzila earthquake occurred in 1952 in west boundary fault of south Gulu basin



图 88 谷露盆地北部西边界断裂 1952 年 7.5 级地震破裂切割现代河床形成高 2.5m 陡坎（镜头向西，摄于 2003 年 7 月）

Fig.88 View westward in July of 2003 at seismic scarp of 2.5m high formed in Ms 7.5 Jiuzila earthquake along west boundary fault of north Gulu basin



图 89 谷露盆西过龙孔玛沟口主边界断裂阶地状正断层陡坎

断裂切割晚更新世冰川高侧碛，形成多级陡坎和小型断陷谷地；镜头向南，摄于 2003 年 7 月。

Fig.89 View southward in July of 2003 at normal fault scarp formed in Late Pleistocene moraine in west boundary of Gulu basin



图 90 谷露盆西嘎果穷果沟口主边界断裂 1952 年 7.5 级地震破裂与拉分盆地

（镜头方向 210°，摄于 2003 年 7 月）

Fig.90 View southwestward in July of 2003 at seismic fracture and pull-apart basin of Ms 7.5 Jiuzila earthquake occurred in 1952 in west boundary fault of Gulu basin



图 91 谷露盆西巴仁多沟口主边界断裂 4.5m 高度的地震陡坎与悬谷地貌

（镜头方向 290°，摄于 2003 年 7 月）

Fig.91 View westward in July of 2003 at seismic scarp of 4.5m high and hanging valley along west boundary of Gulu basin in Barendo stream mouth



图 92 谷露盆西达昧沟口主边界断裂上覆 1952 年 7.5 级地震引发的雪崩沉积

（镜头向南西西方向，摄于 2003 年 7 月）

Fig.92 View west southwestward in July of 2003 at avalanche deposits formed in Ms 7.5 Jiuzila earthquake occurred in 1952 along west boundary fault of Gulu basin