Geomorphic, Geologic and Bedrock Structures of Lijiang Basin, northwestern Yunnan, China, and Mechanism for Basin Genesis

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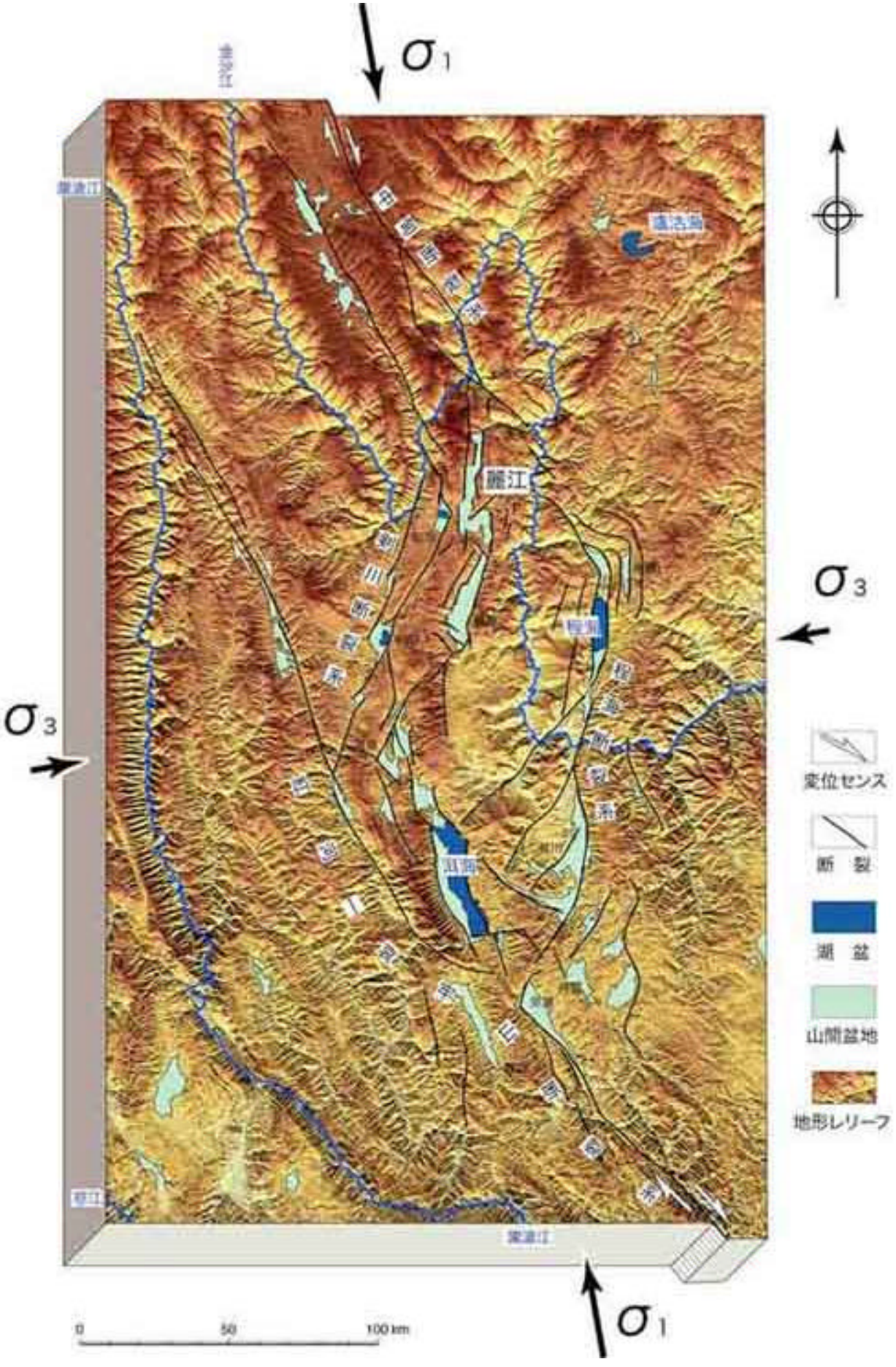
The 1996 Lijiang Earthquake of M7.0 brought serious damage to the Lijiang Basin. Although its seismogenic fault is considered to be the Xueshan Fault on the western edge of the basin, the severely damaged zone of the earthquake was located in the areas 1.5-2 km far from the basin edge, which area had been seriously suffered by previous earthquakes of different foci. There was a remarkable change in degree of damage near along the Lijiang-Jianchuan fault zone, which crosses the basin in the southern part. As an issue of microzoning, a comprehensive study of seismological, gravimetric, geomorphological and geological surveys was conducted, from 1997 through 2004, to reveal the subsurface structures of the basin and the mechanism of basin genesis. The study elucidates that neotectonics in a pull-apart setting has formed the acute bedrock relieves characterizing the major damage distribution of the Lijiang Basin.

The feature of Bouguer anomalies from dense measurements at 940 points shows the low anomaly elongated in the N-S direction, which anomaly fits in full to the topographic graben structure of the Lijiang Basin: (1) the bedrock subsides steeply on the east and west basin edges, (2) from 3-D gravity analysis, the bedrock depth reaches up to 2 km or more for the basin only 4 to 5 km wide. The Lijiang-Jianchuan Fault appears not to bring a clear gradient structure for the bedrock, from the gravity anomalies.

According to satellite images analysis, field survey and previous studies, eight active faults are recognizable around the Lijiang Basin. Active faults of NE-SW trend are of left-lateral strike-slip type, and those of N-S are of dip-slip. The coexistence of strike- and dip-slip faults indicates a stress field that the minimum compressive principle stress axis is in the E-W direction and the intermediate and maximum ones have similar absolute values mutually replaceable. The maximum one in the vertical direction caused dip-slip faulting to form grabens of N-S trend. Conversely, that in the N-S direction brought strike-slip faulting of NE-SW trend.

Our survey on regional tectonic structure indicates that the intramountain basins swarmed with the Lijiang Basin are the grabens formed in a giant rhombic pull-apart basin (100 km wide and 75 km long) at the right stepping of dextral strike-slip master faults of NNW-SSE trend (see the figure attached). The master faults on the southwestern and northeastern rims of the pull-apart basin are the Red River-Ailaoshan Fault and the Zhondian Fault, respectively. Among various formative mechanisms already proposed for the genesis of intramountain basins, our results thus support the dextral pull-apart mechanism due to the south-southeastward extrusion of the eastern Tibet. Lower crust of a lower seismic velocity under the pull-apart basin, as well as regional plateau uplifting, is requiring to revise the pull-apart model into a more realistic 3D one.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