D106-P001 **Room: Poster Session Hall** **Time: May 22**

A Local Absolute Gravity Network Established at Honghe Fault Zone in Western Yunnan Province of China

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The Tibetan Plateau is the highest and largest plateau on planet Earth. The pressure of continued northward motion of the Indian continental mass caused large sections of Plateau crust to fold, then rise on east-west trending deep seated thrust faults. The huge mass of Asia to the west and north blocked movement of Tibetan crustal material in these directions as India pushed into Asia. As a result, northward motion on the deep seated thrust faults was transferred to east and southeast strike slip motion. Many large earthquakes occurred in the past seventy five years on the Red River. Western Yunnan has experienced at least ten earthquakes greater than M=7.0 during the past 75 years. The high seismicity and recent displacements on these faults is almost certainly related to India's continued penetration into China. As shown by Wang et al. (2001), the western Yunnan region is undergoing an average velocity of 6 to 11 mm/year with respect to stable Eurasia. While the entire South China block behaves as a rigid block without internal deformation. The Tibetan plateau undergoes substantial internal shortening, with the direction of maximum shortening in N21E, with about 38 mm/year convergence rate between the Indian plate and the rigid Alashan block north of the Qilian Shan. The average convergence strain rate in this direction is about 2X10-8 per year. More than 30% of the total India-Eurasia convergence is absorbed by internal shortening of the plateau. Thus, continuum rather than block-like deformation appears to characterize present-day tectonics of the Tibetan Plateau. This continuum deformation, however, seems to be limited to the plateau itself. Rigid block-like motion appears to characterize deformation of the regions to the north, north-east, and east, and there are zones of concentrated contraction at both the north and south margins of the plateau. Therefore it is interested to observe how gravity behaves in such a contraction areas. It is expected that gravity increases due to the contraction with increasing density beneath crust. To monitor the gravity changes caused by the increasing density and the seismic activity, and to investigate the tectonic structure at the edge area of Tibet plateau through gravity changes caused by the movement of the large scale fault system, a local gravity network is designed in the south margin of the Tibet plateau - the Dali county of Yunnan province. This project is cooperated by Earthquake Research Institute, the University of Tokyo, the Institute of Seismology and Yunnan Seismological Bureau, China Earthquake Administrations. The first observation champion was performed in September of 2005. This paper presents the observed gravity results. The observed gravity values can serve as standard for future measurement and can be used to compute gravity anomaly and to inverse the inner structure and the fault movement. The gravity network is composed of four absolute and 41 relative stations. The four absolute stations are Midu, Dali, Eryuan and Jianchuan located in Dali county of Yunnan province, China. The four stations were measured by Micro-g Solutions FG5 #212 absolute gravimeter. Taking each absolute gravity station as a center, four relative gravity profiles were designed and measured by 5 LocosteRomberg model G Gravimeters #581, #793, #854, #1003 and #1132. Each profile has 10 stations. Absolute gravity was observed at the four stations from Sept. 3 to 13, about two full days for each station. The standard deviation for all the set gravity is less than 1.2 microgal.