



Debris flows on 13 August 2010 in the Wenchuan Earthquake disaster area in Qingping town, Mianyuan River Basin, China

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From 12 to 14 of August 2010, heavy rain dropped in Wenchuan Earthquake disaster area, Sichuan province, China. The heavy rain triggered the simultaneous occurrence of many debris flows in Qingping town in Mianzhu city, Yingxiu town in Wenchuan county, and Longchi town in Dujiangyan county, resulting in heavy casualty and property loss. We made a detailed survey on the simultaneous debris flows on August 13 in Qingping town and an interpretation on the material sources of the debris flows with post-earthquake aerial images. Within the range of 4 kilometers in Qingping Segment of Mianyuan River, 20 debris flows occurred simultaneously and the total runout deposits were about $600 \times 10^4 \text{ m}^3$ mainly from Wenjia and Zoumalong gully. Those debris flows caused the death of 7 persons, disappearance of 7 persons, injury of 33 persons and damage of 379 houses, and the direct economic loss 600 million RMB. Yingxiu-Beichuan fault, the seismogenic fault of Wenchuan Earthquake, just went through this area, and all debris flow gullies were within the range of 5km from the seismogenic fault. The earthquake triggered a large number of landslides in this area, especially on the slope on the left side of Mianyuan River. The largest landslide area covered 46% of the drainage area of debris flows. Those loose debris caused by landslides accumulated in the gullies or on the slope provided abundant material sources for the simultaneous occurrence of debris flows. All 12 gullies on the left slope of Mianyuan River had debris flows taking place. The largest one was Wenjiagou which covered a drainage area of 7.8 km^2 with the runout quantity of $400 \times 10^4 \text{ m}^3$ and the maximum accumulation thickness of 40m. Judging by the starting mode, the debris flows could be classified into three types: the first type is gully erosion, such as Wenjiagou debris flow, which is started by undercutting the landslide accumulation in the gully of the middle and downstream area. The second type is branch gully starting. The debris flow occurs in the branch gullies first, merge into the main gully, so the debris flow then occurred in the main gully. The debris flow of Zoumalong was of this type and debris flows in the 7 branch gullies on the left side occurred at the same time. The third type is source area starting. The material sources of debris flows were distributed at the back edge of the gully. The debris flow starts from the slope accumulation of back edge, the bottom tearing scouring happens at the downstream area, and then the debris flow formed. Other debris flows belong to such type. After the occurrence, a lot of loose debris still exist in the gullies, indicating the probability of debris flows in the future, thus it is necessary to strengthen the prevention and treatment work in the earthquake disaster area.