Seismic signals analysis of the June 2017 Maoxian Landslide

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At about 5:39 (LT) on 24 June, 2017, a catastrophic landslide occurred on Fugui mountains at Xinmo village, Sichuan province, China. The landslide has a volume of about 8 million cubic meters, destroyed more than 64 buildings, blocked the Songpinggou River for about 2 kilometers and damaged about 1 kilometer national road. Villagers lived at the foot of the mountain were buried by the rock-soils, 10 people were killed and 73 were reported missing. Seismic waves generated before and during the landslide had been received by stations of China Seismic Network (CSN) and of a temporary seismic network set up by the State Key Laboratory of Geodesy and Earth's Dynamics (SKLGED). We intend to study the physics of the landslide nucleation process and restore landslide motions based on the analysis of these seismic signals.

We apply a matched filtering technique to the precursory signals, and find repetitive signals which is probably related to a nucleation process of the landslide.We also pick up eight sub-events in the course of the Maoxian landslide, invert for force history of each sub-event, and calculate their sliding paths. The terrains before and after the landslide both exert an impact on the motion of the sliding mass, this helps to relate the sub-events to the corresponding landforms, and to locate the starting point of each calculated sliding path.

We finally reveal a full view of the Maoxian landslide, which includes microseismic events before the landslide, collapse of giant rock at the beginning of the landslide, centripetal acceleration of the sliding body, deceleration and acceleration once again after overcoming the obstacles along the path.

Keywords: Maoxian Landslide, Force history, Waveform inversion

- HDS07-P09 -

(a)

N

A

A

A'

A'

(b)

Sub-events

Times (s)

1

2

3

4

5

6

7

-80   -40   0   40   80   120

(c)

(d)

0   400m

Landslide souce area I - huge rock

Landslide source area II - soil layer

Area with slopes from 24° to 31° (pre-landslide terrain)

Area with slopes from 6° to 12° (pre-landslide terrain)

Side wall (post-landslide terrain)

Landslid boudary

Area where sliding path stops in sub-events 2,3,5 and 6

Sliding path of the center of mass in sub-event 1

Sliding path of the center of mass in sub-event 4

Sliding path of the center of mass in sub-event 7

Azimuth of the resistance when the mass stops