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The evolution of stream coupled hillslopes by bedrock landsliding in a rapidly eroding mountain belt, Taiwan

Dirk Wenske (1), Chia-Hung Jen (2), Margot Böse (1), and Jiun-Chuan Lin (3)

(1) Freie Universitaet Berlin, Institute of Geographical Sciences, Malteserstr. 74-100, D-12249 Berlin (d.wenske@fu-berlin.de / +49 30 83870751), (2) National Kaoshiung Normal University, Department of Geography, 116, Ho-Ping 1st Rd, Kaohsiung, Taiwan (jenchh@gmail.com), (3) National Taiwan University, Department of Geography, No. 1, Sec. 4, Roosevelt Rd., Taipei 106, Taiwan (jclin@ntu.edu.tw)

Being affected frequently by violent weather condition such as typhoons and regular seismic activity, the high mountains of Taiwan belong to the earth's most dynamic landscapes. In the fast-eroding mountain belt of Taiwan, hillslopes and valley systems have been reported to show a high level of coupling (Hovius et al. 2000). In the catchment of the Tachia river numerous bedrock landslides occur frequently as a result of seismic events and typhoons (Lin et al. 2006).

This study attempts to take a closer look at the temporal and spatial pattern of hillslope evolution at two study sites in the upper catchement of the Tachia river. Therefore we have carried out a repeated field surveying of active slopes by means of traditional survey instruments and terrestrial laser scanning from early 2008 until late 2009 on a half year basis. Additionally, a set of aerial photos and satellite images from 1969, 1980,2001, 2004, 2007, 2008 and 2009 is used to assess the long-term and short-term changes of the river channel.

Near the town of Huan Shan, the valley bottom shows elevations around 1520 m above sea level and the river is draining and upstream area of 155 km^2. Downstream of Huan Shan lies the confluence of the Tachia River and two of its tributaries, namely the Nanhu River and the Hehuan River. Therefore, the catchment area upstream of second study area in Sung Mao is considerably larger being of 420 km^2, in that place, the current level of the channel varies around 1425 m above sea level. In the two study areas strong lateral erosion has been observed. In the case of the Sung Mao study area, the latter is linked to a severe aggradation of sediments in the channel since the building of the Dechi Dam downstream.

The active hillslopes have been surveyed and their reaction to the typhoons in 2008 and 2009 is studied. Rates of sediment yield from the slopes have been calculated for three periods between April 2008, November 2008, April 2009 and November 2009. Furthermore, the dataset collected allows estimations for the erosion depth of the bedrock landslide derived material.

A comparison between the two study sites allows to study the mechanisms of hillslope channel coupling under the influence of different fluvial dynamics.

References

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