Geophysical Research Abstracts
Vol. 15, EGU2013-182, 2013
EGU General Assembly 2013

Rock avalanche deposits in Alai Valley, Central Asia: misinterpretation of glacial record

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The reconstruction of Quaternary glaciations has been restricted by conventional approaches with resulting contradictions in interpretation of the regional glacial record, that recently have been subjected to critical re-evaluation. Along with uncertainties in dating techniques and their applicability to particular landforms (Kirkbride and Winkler, 2012), it has recently been demonstrated that the presence of rock avalanche debris in a landform can be unequivocally detected; this allows for the first time definitive identification of and distinction between glacial moraines and landslide deposits. It also identifies moraines that have formed due to rock avalanche deposition on glaciers, possibly with no associated climatic signal (Reznichenko et al., 2012). Confusion between landslide deposits and moraines is evident for ranges in Central Asia (e.g., Hewitt, 1999) where the least-studied glacial record is selectively correlated with established glacial chronologies in Alpine ranges, which in turn masks the actual glacial extent and their responses to climate change, tectonics and landsliding activity. We describe examples in the glaciated Alai Valley, large intermountain depression between the Zaalay Range of the Northern Pamir and the Alay Range of the Southern Tien-Shan, showing that some large Quaternary deposits classically interpreted as moraines are of rock avalanche origin. Sediment from these deposits has been tested for the presence of agglomerates that are only produced under high stress conditions during rock avalanche motion, and are absent from glacial sediments (Reznichenko et al., 2012). This reveals that morphologically-similar deposits have radically different geneses: rock avalanche origin for a deposit in the Komansu river catchment and glacial origin for deposits in the Ashiktash and Kyzylart catchments. The enormous Komansu rock avalanche deposit, probably triggered by a rupture of the Main Pamir thrust, currently covers about 100 km2 with a minimum estimated volume more than 1 x 109 m3. Another smaller rock avalanche deposit rests on the Lenin Glacial sediment in the neighbour Ashiktash river catchment, which was previously suggested to originate from Mt. Lenin (7134 m). The revised origin of these deposits highlights the role of rock avalanches in glacial activity and in the resulting glacial record in this valley and other actively tectonic areas of Central Asia. Although further investigation is required to detail the geneses, magnitudes and ages for these and other landforms in the valley, this study contributes explicit evidence for contamination of palaeoclimate proxies with data from non-climatic events, and reinforces the urgent need for revised interpretation of the glacial chronologies.

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