Geophysical Research Abstracts
Vol. 14, EGU2012-14468, 2012
EGU General Assembly 2012

Anthropogenic control on geomorphic process rates: can we slow down the erosion rates? (Geomorphology Outstanding Young Scientist Award & Penck Lecture)

V. Vanacker
Earth and Life Institute, University of Louvain, Belgium

The surface of the Earth is changing rapidly, largely in response to anthropogenic perturbation. Direct anthropogenic disturbance of natural environments may be much larger in many places than the (projected) indirect effects of climate change. There is now large evidence that humans have significantly altered geomorphic process rates, mainly through changes in vegetation composition, density and cover. While much attention has been given to the impact of vegetation degradation on geomorphic process rates, I suggest that the pathway of restoration is equally important to investigate.
First, vegetation recovery after crop abandonment has a rapid and drastic impact on geomorphic process rates. Our data from degraded catchments in the tropical Andes show that erosion rates can be reduced by up to 100 times when increasing the protective vegetation cover. During vegetation restoration, the combined effects of the reduction in surface runoff, sediment production and hydrological connectivity are stronger than the individual effects together. Therefore, changes in erosion and sedimentation during restoration are not simply the reverse of those observed during degradation.
Second, anthropogenic perturbation causes a profound but often temporary change in geomorphic process rates. Reconstruction of soil erosion rates in Spain shows us that modern erosion rates in well-vegetated areas are similar to long-term rates, despite evidence of strong pulses in historical erosion rates after vegetation clearance and agriculture. The soil vegetation system might be resilient to short pulses of accelerated erosion (and deposition), as there might exist a dynamic coupling between soil erosion and production also in degraded environments.