Estimation of erosion with remote sensing data on a large scale  
– an approach for Tibet

MATHIAS LEIDIGa* and RICHARD GLOAGUENa

aRemote Sensing Group, Institute for Geology, TU-Bergakademie, B. von-Cottastr. 2, 09599 Freiberg, Germany  
*Corresponding Author Email : mathias.leidig@web.de

Abstract:

The aim of this project is to estimate and calculate the erosion based on interactions of the morphology with precipitation in a very active area. Tibet and the Himalayas are among a tectonically very active area, where faulting and rock uplift are responsible for a rugged topography and a unique relief. Relief reflects the interplay between tectonics and erosion. The coupling of crustal deformation and erosion results in the kinematics of mountain building. Erosion influences tectonic processes by controlling boundary conditions at the Earth’s surface through denudation and deposition. Consequently erosion depends on climate and with this on precipitation, especially in a region where monsoon is active.

It has been shown, e.g. in numerical simulations, that relief is primarily controlled by climate and uplift rate and that mountain building is a complex cycle with different feedback mechanisms that link crustal deformation, denudation and climate.

In most studies uniform climate and with this uniform precipitation is considered, which remains doubtful when examining a large area like whole Tibet.

Beside river profile analysis that appear to be a suitable method for erosion estimation in many different regions in the world, there is the need of erosion estimation on larger scales. The understanding of the spatial structure in precipitation regime shape (seasonal variability) and size (magnitude) may help to understand and estimate the amount of erosion also in extrem physical environments where climatological patterns are complex and consequently hardly known.

Precipitation displays small-scale variability that requires frequent, closely spaced observations for an adequate representation. Such observations are not possible for whole globe when depending on surface based measurements. Consequently observations depend on a variety of satellites to estimate precipitation on a global basis.

This approach is aimed at the estimation and (relative) calculation of erosion using SRTM (Shuttle Radar Topography Mission) and Landsat data in combination with other different remote-sensing data obtained e.g. from the Tropical Rainfall Measuring Mission (TRMM) or the Moderate-resolution Imaging Spectroradiometer (MODIS).