Promoting community-based monitoring approaches for the measurement of sediment fluxes in rivers by Clément Duvert

Societal and scientific context

In the mountainous regions of central Mexico, recent land use changes have caused an intensification of soil erosion. Such land degradation leads to unwelcome on-site impacts (e.g. reduction in the area of arable land), and off-site impacts (e.g. soil washed away, siltation of reservoirs), a situation particularly acute in the volcanic region of Michoacán. Against this background, a research team comprising scientists from both Mexican (UNAM, UMSNH, SEMARNAT, CP) and French (IRD) institutions visited local communities to discuss and study soil erosion and associated problems in the Cointzio catchment (630 km^2), close to the city of Morelia (Michoacán).

Dramatic erosion of soils, and loss of land for crops

Data acquisition

Part of this scientific effort was concentrated on a better understanding of the sediment transfers: sediment washed from hillslopes and through the river network to end up in reservoirs. A first step towards the implementation of better adapted land conservation practices is to provide accurate estimates of suspended sediment flux in upland catchments. We therefore carried out an intensive monitoring study of water and sediment fluxes within five contrasting areas of the Cointzio catchment. The objectives were (i) to quantify sediment loss at the catchment scale and compare the sensitivity to erosion among the study sites, (ii) to characterize the variability of fluxes in order to optimize sampling designs, (iii) to deduce relevant community-based monitoring strategies for the rural areas of Mexico.

Towards optimized community-based monitoring strategies

Concerning (iii), statistical techniques were used to evaluate the sampling frequency required to get reliable estimates at the five sites. We showed that the choice of an appropriate sampling time during the day would allow reduction of the frequency of measurement, due to a marked sub-daily variability in sediment fluxes. This result should lead to the proposal of useful decision-making tools to the local stakeholders, for the implementation of collaborative river monitoring procedures in ungauged catchments. This would allow collection of comprehensive databases on soil loss and land degradation, but also on the chemical and biological quality of rivers. Local communities can use this knowledge to determine where they can reduce the erosion of soil and sediments.

Measuring sediment and discharge in channels

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