



Identifying soil erosion sources to better anticipate in and off site degradations in a tropical highland catchment of central Mexico

S. Ayrault (a), P Bonté (a), C Duvert (b), M Esteves (b), O Evrard (a), N Gratiot (b), I Lefèvre (a), J Némery (c), J Poulénard (d), C Prat (b), and C Saenz-Romero (e)

(a) Laboratoire des Sciences du Climat et de l'Environnement (LSCE/IPSL) – Unité Mixte de Recherche 8212, (b) IRD/Université Grenoble 1/CNRS, Laboratoire d'étude des Transferts en Hydrologie et Environnement UMR 5564, Grenoble, France, (c) G-INP/Université Grenoble 1, Laboratoire d'étude des Transferts en Hydrologie et Environnement UMR 5564, Grenoble, France, (d) Université de Savoie, Environnements Dynamiques et Territoires de Montagne (EDYTEM), Savoie, (e) Instituto de Investigaciones Agropecuarias y Forestales, Universidad Michoacana de San Nicolas de Hidalgo, Tarimbaro, Michoacan, Mexico

Land degradation is intense in tropical regions where it causes for instance a decline in soil fertility and reservoir siltation. Two fingerprinting approaches (i.e. the conventional approach based on radionuclide and geochemical concentrations and the alternative DRIFT spectroscopy method) were conducted independently to outline the sources delivering sediment to the river network draining into the Cointzio reservoir, in Mexican tropical highlands. This study was conducted all throughout the rainy season in 2009 in three subcatchments representative of the different environments characterised by very altered soils and the dominance of Andisols and Acrisols. Both fingerprinting methods pointed out the dominant impact of gullies on sediment load at the outlet of the Huertita subcatchment. In contrast, in La Cortina subcatchment dominated by Andisols, the bulk of sediment was supplied by cropland. Sediment originating from Potrerillos subcatchment characterised by a mix of Acrisols and Andisols was supplied by both gullies and rangeland/cropland. In this latter subcatchment, results provided by both fingerprinting methods strongly differed. Our results outline the need to take the organic matter content of soils into account and the difficulty to use geochemical properties to fingerprint sediment in very altered volcanic catchments. However, combining our fingerprinting results with sediment export data provide a way to prioritise the implementation of erosion control measures to mitigate sediment supply to the Cointzio reservoir supplying drinking water to Morelia city. Such information will be particularly crucial in the coming years, as an increase of the aridity, combined with an increase of flood intensity are anticipated.