Geophysical Research Abstracts
Vol. 12, EGU2010-7332-2, 2010
EGU General Assembly 2010

Influence of different forest management practices and vegetation cover on runoff generation and sediment flux in the Coastal Range of Southern Chile

Christian Mohr (1), Axel Bronstert (1), Anton Huber (2), and Andrés Iroumé (3)

(1) Institute of Earth and Environmental Sciences, University of Potsdam, Potsdam, Germany (cmohr@uni-potsdam.de, axelbron@uni-potsdam.de), (2) Institute of Geosciences, Faculty of Sciences, Universidad Austral de Chile, Valdivia, Chile, ahuber@uach.cl, (3) Institute of Forest Management, Faculty of Forest Sciences, Universidad Austral de Chile, Valdivia, Chile, airoume@uach.cl

Favorable climatic and hydrological conditions make Chile to one of the leading timber and cellulose exporting nations with one of the biggest growing rates worldwide. The intensification of this sector comes along with large-scale land use changes affecting the soil's water conservation function of the geoecosystem. This research focuses on the influence of different forest management practices and vegetation cover on the runoff-generation and the sediment transport in Pinus radiata D.Don planted micro-catchments in the coastal range of southern Chile. One catchment is kept as control without silvicultural intervention during the whole study (catchment Nr. 1) and another was thinned selectively in the rainy season 2009 (catchment Nr. 2). Two catchments are harvested by clear-cuts, whereby one clear-cut already took place in June-Aug. 2009 during the rainy season (catchment Nr. 3) and the other is planned for the dry season in February 2010 (catchment Nr. 4). One catchment – formerly planted with Pinus radiata – was already clear cut in 2007 (catchment Nr. 5). For long-term research, the catchments are equipped with V-notched weirs, sediment sampling devices, rainfall redistribution test-plots and TDR-clusters. Single events of stronger precipitation and runoff are sampled and a self-designed rainfall-simulator is used to gain additional information of the infiltration, overland flow and sediment transport processes. Annual interception loss is approx. 20 % of the yearly avaraged precipitation of 1300mm. During the calibration period, all catchments show high similarities in discharge and a dominance of subsurface flow. In all catchments, diel cycles of different amplitude within the streamflow were registered. By the beginning of the rainy season in May, the soils in all catchments were saturated completely up to depth of 250cm. Only catchment 5 showed higher and irregular contents of soil water due to missing vegetation cover and recent morphodynamics. To the end of the dry season in September the soil moisture reached values of less than 16 %, intensified by high evapotranspiration. Monthly values of sediment transport only reached noteworthy values in catchment 5 in Aug.-Sept. 2008 with 1,17t/ha. Rainfall simulations conducted prior to the clear-cut in catchment 3 revealed preferential flow patterns and highly variable infiltration rates. In contrast to the expected results, maximum infiltration took place on the steepest slopes. Although small differences already existed in the catchments during the calibration period, immediate consequences of the intervention could be documented: During the clear-cut in the rainy season 2009, daily transport of sediments during sampled events of precipitation reached 220kg/ha per day, with SSC up to 3600mg/l. In contrast to an expected increase in streamflow discharge, a decrease was registered. In comparison to the control-catchment, the ratio of event-flow to baseflow increased. Augmented percolation/infiltration and/or extension of catchment-size due to modification of timber roads by the use heavy equipment may be responsible. Post clear-cut infiltration experiments are going to be conducted in Jan.-March 2010.