Geophysical Research Abstracts
Vol. 14, EGU2012-13009, 2012
EGU General Assembly 2012

On the measure of large woody debris in an alpine catchment

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The management of large woody debris (LWD) in Alpine torrents is a complex and ambiguous task. On one side the presence of LWD contributes to in-channel and floodplain morphological processes and plays an important role in landscape ecology and biodiversity. On the other side LWD increases considerably flood hazards when some river cross-sections result critical for the human interface (e.g. culverts, bridges, artificial channels). Only few studies provide quantitative data of LWD volumes in Alpine torrents. Research is needed both at basin scale processes (LWD recruiting from hillslopes) and at channel scale processes (feeding from river bank, storage/transport/deposition of LWD along the river bed). Our study proposes an integrate field survey methodology to assess the overall LWD amount which can be entrained by a flood. This knowledge is mandatory for the scientific research, for the implementation of LWD transport models, and for a complete hazard management in mountain basins.
The study site is the high-relief basin of the Cordevole torrent (Belluno Province, Central Alps, Italy) whose outlet is located at the Saviner village (basin area of 109 square kilometers). In the November 1966 an extreme flood event occurred and some torrent reaches were heavily congested by LWD enhancing the overall damages due to long-duration overflows. Currently, the LWD recruitment seems to be strictly correlated with bank erosion and hillslope instability and the conditions of forest stand suggest LWD hazard is still high. Previous studies on subcatchments of the Cordevole torrent have also shown an inverse relation between the drainage area and the LWD storage in the river-bed.
Present contribution analyzes and quantifies the presence of LWD in the main valley channel of the Cordevole basin. A new sampling methodology was applied to integrate surveys of riparian vegetation and LWD storage. Data inventory confirms the previous relationship between LWD volumes and drainage area and indicates the floating as primary origin of LWD presence in the river bed. The total amount of LWD at the basin outlet resulted 1300 cubic meters corresponding to about 12 cubic meters per square kilometer of drainage area. Additional data about in-channel dynamics and threshold discharges to move LWD are in progress. These will be obtained through an innovative monitoring approach based on active transponders (RFID, Radio Frequency Identification). 70 transponder have been inserted in selected LWD samples and 70 transponders will be inserted in standardized artificial LWD to carry out experiments during the snowmelt season. A fixed antenna is located at the outlet section on a check-dam together with a video-camera and a hydrometer. The overall arrangement of the LWD monitoring system under test is then presented.