Geophysical Research Abstracts
Vol. 12, EGU2010-1924-1, 2010
EGU General Assembly 2010

Large woody debris mobility and accumulation by an extreme flood - an example from the Dyje River, Czech Republic

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Large woody debris (LWD) in the form of logs, branches and their fragments play an important geomorphic and ecological role in forested watersheds. Especially when organized in accumulations and jams, LWD have been found to change hydraulic, morphological, sedimentary and biological characteristics of fluvial ecosystems. Our study focuses on LWD jams distribution and properties within the 44 km long forested reach of the Dyje River in south-eastern Czech Republic. The study reach is located between two large water reservoirs and the flow is regulated showing significant daily fluctuation of discharges due to water releases for power generation. River flows in the deeply incised meandering valley with the narrow and patchy floodplain. In 2002, and especially 2006 large volumes of LWD have been transported by river and the water reservoir downstream was congested with wood. Peak discharge of 2006 flood equalled 306 m3.s-1 which was estimated as 500 year flood. The flood caused significant mobility and redistribution of woody debris as in aquatic, so in riparian segment of the river corridor. The high rate of LWD transport is favoured by large bankfull channel width which exceeds the average tree height. LWD jams were defined as aggregations of three or more wood pieces with diameter $\geq$ 0.1 m and length $\geq$ 1 m. We surveyed LWD jams in 62 river reaches, which have been located at meander apexes, inflections and intermediate positions; the length of the reaches was 200 m. The overall number of registered LWD jams was 200. Majority of jams consist of solely allochthonous (transported) wood pieces (65 %), some jams are combination of large key trees and trapped transported pieces (29%), and only small proportion are jams formed by locally uprooted trees (12,6%). Number of wood pieces varies greatly from 3 to 98, the most common being the interval 5 – 10 pieces per jam. Spatial distribution of jams is longitudinally and transversally irregular within the river corridor. Distinctive groups of jams exists along the river course, the largest concentration of jams being in the downstream quarter of the surveyed river reach. Spatial distribution of jams does not seem to be very sensitive to the valley pattern. There is not a significant difference between the number of jams at meander apexes, inflections or intermediate positions. Most of the jams are deposited in the riparian zone or at the terrestrial/aquatic transition and only minor proportion of them are situated within the river channel. Transport rate of LWD is strongly conditioned by the ratio between wood length and channel width. The bankfull channel width varies between 40 and 60 m, whilst the typical LWD length is between 3 and 6 m; thus, river system is strongly transport susceptible. On the other hand, the LWD transport is inhibited by the trapping of wood on riparian trees, large boulders and large immobile fallen trees (key members). Most jams were deposited due to the blockage of transport by standing trees within the riparian zone (74 %). Intensive LWD transport is rather episodic in nature, which comes from the flow regulation by upstream water reservoir. Smaller floods are eliminated, thus large quantities of LWD gradually accumulate in the riparian zone. Rare, large magnitude floods than mobilize and redeposit large volumes of LWD which become aggregated into jams. Input processes – wind throws, diseases, parasites, bank erosion – deliver trees rather randomly to the river corridor. On the other hand, floods increase the degree of LWD spatial organisation. The research was supported by Czech Science Foundation, grant no. 205/08/0926.