Keynote lecture: Why knowing more about interactions between wood in rivers and river flows helps tailoring hydraulic works

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Large wood pieces are transported by river flows mostly by floating. In channels wide enough to allow their movement, large wood pieces move when flow depth is sufficient to decrease – below a certain threshold of motion – their friction with the banks, the channel bed and other fixed elements (standing trees, protruding boulders, structures). Along their movement, large wood pieces may be stopped in shallow areas or against obstacles. If this obstacle is an infrastructure, e.g. a bridge or a weir, accumulating large wood pieces might divert flow, enhance scouring and trigger hydraulic head losses, with eventual adverse consequences. How large wood pieces accumulate against such obstacle, e.g. as a floating carpet or as denser multi-layers jam has key consequences on the cascading side-effects of the log jam presence. In this keynote lecture, we seek to highlight recent research result addressing interactions between large wood pieces and flow conditions. The analysis of the ratio between the drag force and the buoyancy, at least of proxies of each force, proved a useful dimensionless parameter to anticipate the type of jam that is likely to form e.g. against piles or weirs. In addition, large wood pieces blocking against structures is a problem, but their sudden release for even more extreme flow conditions can be another very dangerous issue. The suddenly released log raft might clog further structures very efficiently. The intensity of flow conditions that lead to sudden release of large wood jams varies with the type of large wood jam: loose floating carpets are easier to release than tightly entangled multilayer accumulations. We also show in this lecture that the buoyancy to drag force ratio helps to predict the range of conditions leading to such sudden releases. Overall, we show that relatively simple hydraulic computation might help to anticipate the type of large wood jam that might emerge for various flow discharge at a certain structure allowing tailoring a better-adapted structure or a management policy if adaptation is unfeasible.

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