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SECTION DE GÉNIE CIVIL

Riverbed - fine sediment interaction under variable flow conditions

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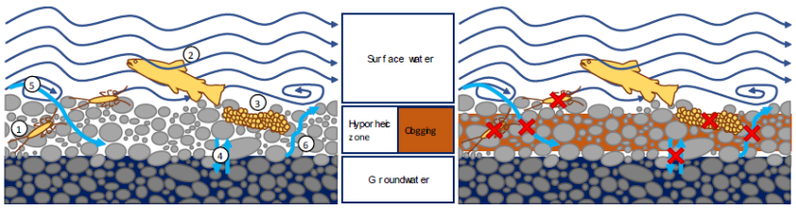
[1] Plateforme de Construction Hydraulique (PL-LCH) EPFL

Clogging

Fine particles deposition in the hyporheic zone, affecting the fauna



The hyporheic layer as a primary habitat for interstitial organisms like macroinvertebrates (1). Gravel-spawning fish (2) bury their eggs (3) in the substrate, where conditions are suitable (Kondolf, 2000). (4) exchange between groundwater and river, (5,6) exchanges between hyporheic layer and surface flow.

R. Dubuis et al., "Vertical connectivity – impact of clogging", 2021.

Declogging

Clogging in river Spöl caused by dam operations, flushing out large amount of fine sediments

Declogged river Spöl after rinsing with clear water

G. de Cesare et al., Störfall vom 30. März 2013 bei der Staumauer Punt dal Gall, «Wasser Energie Luft» 2015

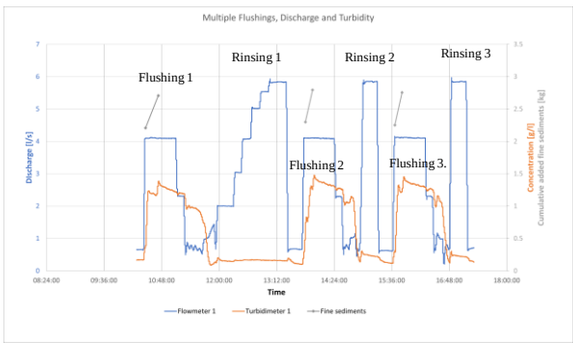
How can a flood naturally declog a riverbed?
What is the best way to flush out sediments from dam reservoir ?

Experiments

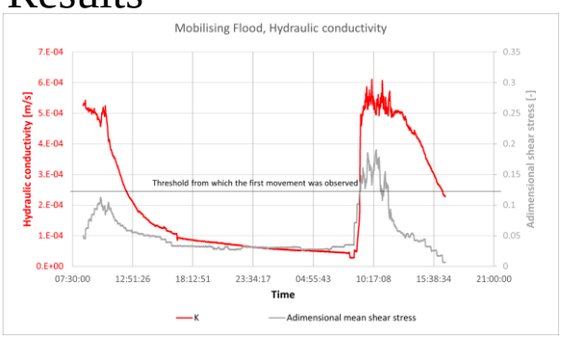
2 groups of experiments:
Mobilising vs Non mobilising flood
Multiple vs Unique flushing

Management:
Hydraulic gradient, mass balance during bed load transport, fine sediments addition

Data acquisition:
turbidity, water height, pressure, infiltration



Results



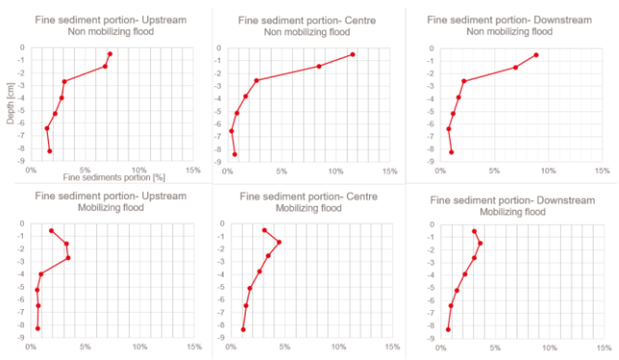
Large shear stress provokes declogging, immediately followed by re-clogging due to high concentration of fine sediments during the flood

Floods

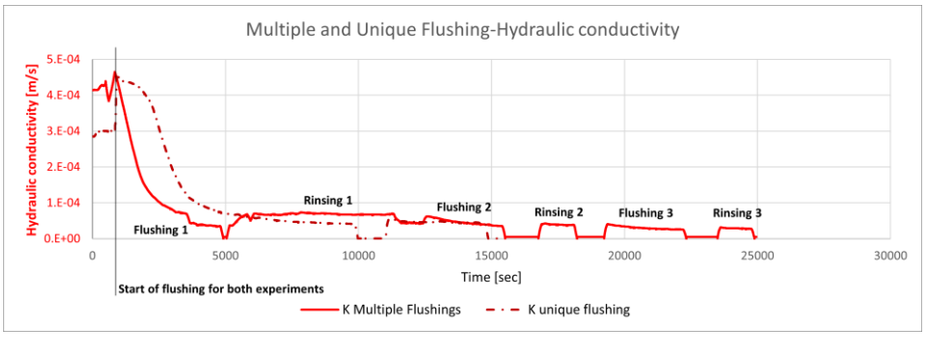
The **mobilising flood** enabled to declog partially the riverbed

Declogging was observed **before bed load transport**, in accordance with the scientific literature

High concentration led to rapid clogging after the flood



The first layer of riverbed was declogged by the mobilising flood, thus showing a smaller portion of fine sediments



Flushings

Superficial clogging affected the measurements

Multiple flushing worsen the clogging at each peak

Unique flushing is favourable for the riverbed

Rinsing at relatielly low discharge was not efficient