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Drift induced by repeated hydropeaking waves in controlled conditions

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Repeated hydropeaking events characterize most alpine rivers downstream of power plants fed by high elevation reservoirs. The effects of hydropeaking on the benthic communities are well known, and usually each hydropeaking wave causes an increase in tractive force and changes in temperature and water quality. Simulations of hydropeaking in artificial system can help to disentangle the direct effects of the modified flow regime from impacts associated with other associated physio-chemical changes, and with the effects of river regulation and land-use changes that often accompany water resource development. In September 2013 we conducted a set of controlled simulations in five steel flumes fed by an Alpine stream (Fersina stream, Adige River catchment, Trentino, Italy), where benthic invertebrates can freely colonize the flumes. One flume was used as control with no change in flow, in the other four flumes we simulated an hydropeaking wave lasting six hours, and repeated for five consecutive days. Flow was increased by twice baseflow in two flumes, and three times in the other two.
We collected benthic samples before the beginning (morning of day 1) and after the end (afternoon of day 5) of the set of simulations to evaluate changes in the benthic communities due to induced drift migration. During each simulation, we collected drifting organisms at short time intervals to assess the responses to: 1) the initial discharge increase, 2) the persistence of high flows for several hours; 3) the decrease of discharge to the baseflow; 4) the change in drift with each successive day.
Preliminary results indicate typical strong increases of catastrophic drift on the onset of each simulated hydropeaking, drift responses proportional to the absolute discharge increase, a decrease in the drift responses over successive days. Different taxa responded with different patterns: taxa which resist tractive force increased in drift only during the periods of baseflow that follow the habitat stress (behavioral drift) (e.g., Simuliidae, behavioral drift); other taxa which can not resist the increase in tractive force, drifted from the beginning of the simulation (e.g., Chironomidae, catastrophic drift).