I.S.RIVERS
LYON 2018

Debris plant flux in fresh water by acoustic echosounder

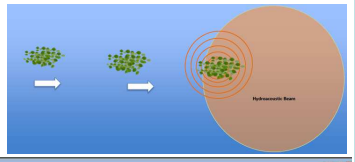
Évaluation du flux de débris végétaux aquatiques par sondeur acoustique

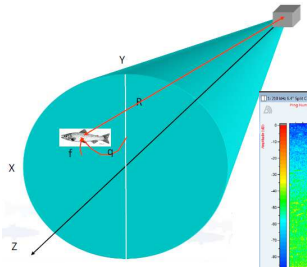
Objective

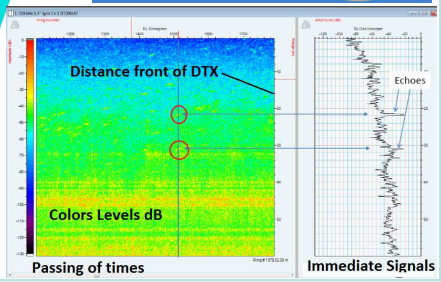
- Quantify the plant flux & dead wood flux to prevent the risk of obstruction of hydroelectric dam water intakes and nuclear power cooling water intakes. 6 trial years

Use DTX echosounder (BioSonics)

- Pings with single 200 kHz, 7° wide, circular beam
- Runs in split-beam mode
- Automatic target tracking
- Target characterization
  - Speed/Direction/Distance
  - Echo level (dB)

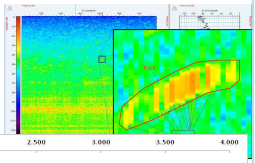


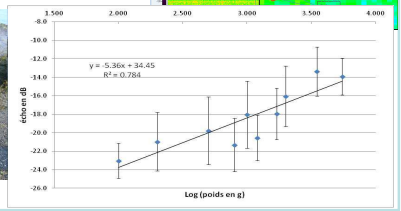




Calibration with weighed plants

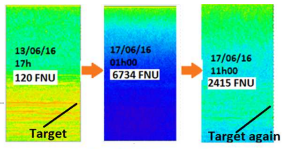
- Echo (dB) = k Log (exposed surface)
- Plant density = C^te & plant thickness ≈ C^te, echo(dB) = k' Log (plant weigh)
- Plant (*Elodea sp, Myriophyllum sp*) weigh from 100 g to 5 kg front of DTX on Rhône River & on Loire River
- Carried out k' (≈ 60 records per weight) with 35 FNU water turbidity :



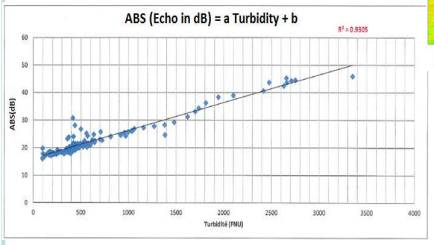


Correct echo level (dB) in turbidity

- Risk : Echo level (dB) attenuated with increased turbidity
- Experiment on Isère River
  - Fixed target at 40 m in front of DTX
  - Echo level at -20 dB with 50 FNU turbidity
  - Turbidity increased after bottom valves of dam opened
  - Determine relationship between increasing turbidity and attenuation of echo level (dB)

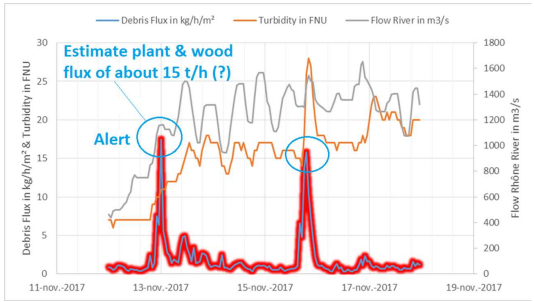


Screen shot of DTX Computer



Time series of plant flux tests

- Example of plant flux time series in November 2017 in Rhône River



- The dB value is translated to the equivalent dB at 35 FNU (clear water)
- With the relationship dB/kg known, the plant flux test is conducted
- R automatic script to treat data for remove fishes by observations of Directions distribution & speed values
- Next step : Observing the Distribution of the flux distance for adjust the flux value

F. NOZIERE[1], F. LAUTERS[1], E. MONDAY[2], B. MOORE[2], A. POIREL[1]

[1] EDF DTG Grenoble - France, [2] BioSonics Seattle - USA