SOLIDS: from inflow to outflow and insights

Evaluation of solids contributions at inflow, spatial and temporal variability and insights for laboratory analysis.

Context

Solid analysis allow a better understanding about inputs and transportation throught the reservoir.

Objectives/Goals

- Identify solids fractions and variability from river, reservoir and outflow
- Evaluate the relathionship between solids and turbidity and between solids and accoustic backscatter (ADP-M9 from Sontek®)
- Identify laboratory issues regarding to solids analysis

Methods

Total solids	– Sample is evaporated in a weighted dish and dried to constant weight – Fixed solids: drying oven at 100°C – Volatile solids: ignited at 550°C
Suspended solids	– Solid residue retained by filtering the sample aliquot through a specific pore size filter (0,6 µm) – Volumes from 100 mL up to 1L – Fixed solids: drying oven at 100°C – Volatile solids: ignited at 550°C
Dissolved solids	– Calculated by the difference between total solids and suspended solids

Results

- Good **relationship** between solids, flow and turbidity.
- Higher concentration of **dissolved solids.**
- Evidence of **deposition** throught the reservoir.
- **Low concentrations** demands special filter preparation and higher samples volumes.

Figure 1: Correlation between TS and TSS x Turbidity for three field campaings [Ago/1/, Feb/19, Apr/19]

✓ ST x Turbidity: r=0.6844 and SST x Turbidity: r=0.9653. Better correlation for SST. Dissolved compounds may have important contribution for Passauna's Reservoir.

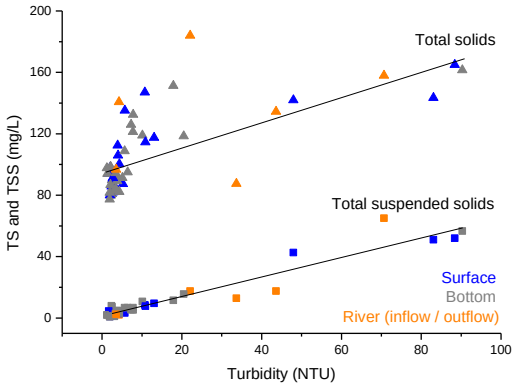
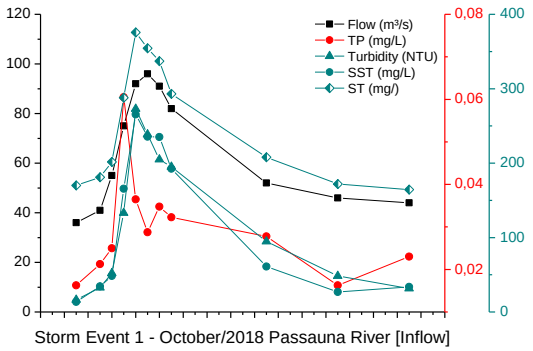


Figure 2: Variation of flow, total phosphorous, turbidity, total suspended solids and total solids during a storm event (October/18)



✓ correlation between TP, Turbidity, SST and ST with flow during a storm event.

✓ Evidence of solids and phosphorous input Good

Left : Image of samples collected at Passaúna's reservoir.

Right : Flow chart indicating the solids fractions considered during laboratory analysis (Source : APHA, 1998)

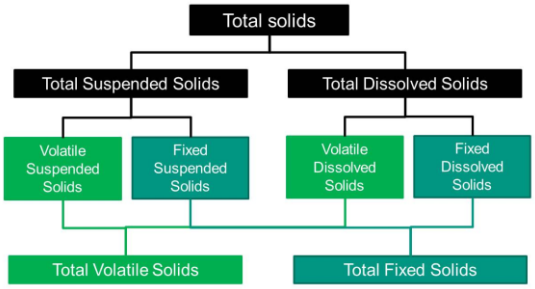
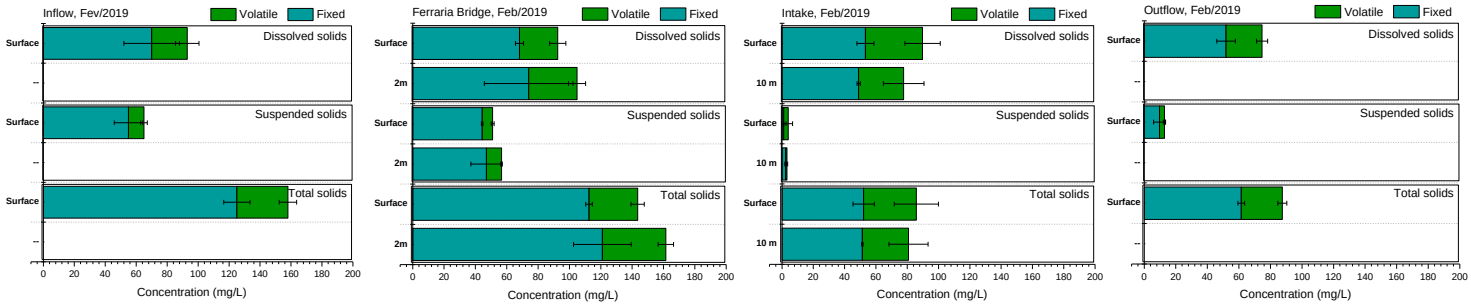
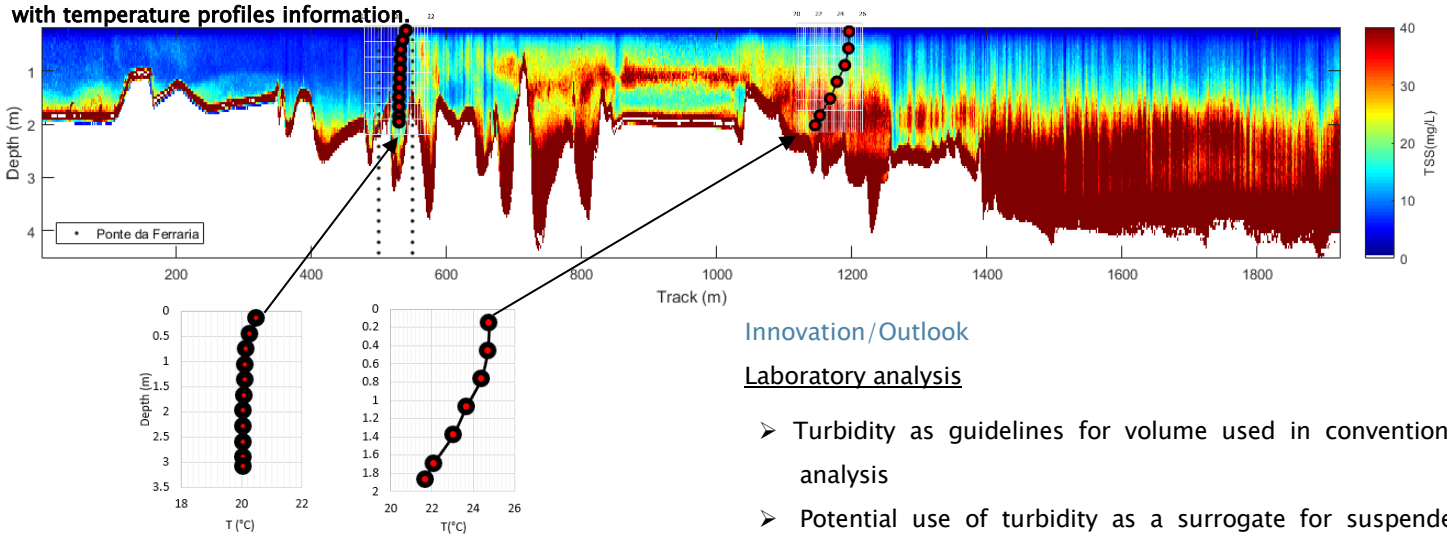


Figure 3: Variation of flow, total phosphorous, turbidity, total suspended solids and total solids during a storm event (October/18)



- ✓ Probable presence of dissolved inorganic substances due geological formation of the region (carbonate rocks)
- ✓ In average, dissolved fraction is 88% higher than the suspended fraction, with more fixed solids than volatile
- ✓ Evidence of deposition throught the reservoir (Inflow → Ferraria Bridge → Intake)

Figure 4: TSS gradient observed throughout the longitudinal transect from upstream to downstream at Passuna Reservoir, cross-checked with temperature profiles information.



- ➢ The use of the acoustic backscatter analysis indicated:
  - ➢ Good agreement between suspended solids and the corrected acoustic backscatter
  - ➢ Suspended solids spreading pattern toward the the reservoir
  - ➢ Cross-checking analysis within temperature profiles indicate a density current formation driven by temperature differences.

Innovation/Outlook

Laboratory analysis

- ➢ Turbidity as guidelines for volume used in conventional analysis
- ➢ Potential use of turbidity as a surrogate for suspended solids point quantification.
- ➢ Potential use of ADP corrected backscatter as surrogate tecnology for suspended solid mapping

Reservoir management

- ➢ Turbidity monitoring at Inflow/ Ferraria Bridge for solids evaluation:
  - ➢ Quantity/transport/ deposition during storm events.
  - ➢ Different loads due to land use modification.
  - ➢ Turbidity monitoring at Intake: water treatment operation.

Authors Heloise Knapik, Luziadne Gurski, Jullyane Oliveira, Liege Wosiacki Contact helogk@gmail.com / heloise.dhs@ufpr.br

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