6th Symposium on Urbanization and Stream Ecology

Low-cost turbidity sensors to understand suspended sediment dynamics in complex landscapes

Supervisors - Australia:
Dr. Kathryn Russell
Prof. Dr. Tim Fletcher

Supervisors - France:
Prof. Dr. Frédéric Cherqui
Prof. Dr. Oldrich Navratil
Prof. Dr. Etienne Cossart

M.Sc. Paulo Vitor R. M. da Silva
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Motivation

Conceptual sediment yield curve

Russell et al. (2017)

United Nations et al. (2019)
Stages of Urban Development

Russell, K. (2021)
Sampling

- Time-consuming
- High costs
- Low temporal and spatial resolution

Turbidity sensors

Commercial turbidity sensors

- High costs
- Low spatial resolution
- Hard to integrate with other sensors within the station

Low-cost turbidity sensors

- High spatial and temporal resolution
- Open-source
- Easy to integrate with other sensors within the station
- Real-time data
Mobile Turbidity Sensor Unit

- Pump
- Water Level sensor
- Turbidity and Temperature sensors
- Batteries
- Switch
- Arduino Board
- Light Source
- Sample
- Light Detector

Light attenuation method
Laboratory Experiments

✓ Results

\[ \text{Turbidity} = 44228.22 \times \text{Voltage}^{-0.2} - 4.02 \times \text{Temp} - 8376.82 \]

\[ R^2 = 0.9986 \]

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<th>Sample</th>
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<th>YSI Probe</th>
<th>Median</th>
<th># of measurements</th>
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Lab Experiment - Calibration
Conclusions and Expectations

- Powerful monitoring tool;
- Continuous monitoring of Turbidity and Suspended Solids Concentration (SSC);
- High turbidity range (0 – 4000 FNU) / SSC (0 – 10 g/L);
- Temperature compensation and control of ambient light;
- Improvement of spatial and temporal resolution of data;
- Allows a better understanding of the main sources of suspended sediments and their spatial and temporal variability in peri-urban catchments.
Acknowledgments

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pribeiomarq@student.unimelb.edu.au