**Mass Balance Calculation Workflow**

**Purpose:**

Used to estimate the relative contributions of direct capture and settling towards total particle removal in the flume test section.

Combined, direct capture and settling constitute the total particle removal rate in the test section. We measure their combined effect as a decrease in particle concentration over time.

**Part 1: Use sediment trap data to estimate particle removal due to settling**

1. Calculate the total mass of sediment that settles in the test section during the course of data collection using the sediment trap data.
   1. Calculate the mean sediment mass across all sediment traps.
   2. Calculate the cross sectional area of a single sediment trap.
   3. Calculate bed area of test section
   4. Total mass settled in test section = mean sediment mass per sediment trap \* bed area of test section / cross sectional area of sediment trap.
2. Use the result of Step 1 to predict the instantaneous difference in upstream vs downstream volume concentration.
   1. Calculate the mass of sediment settled per minute. Divide the total mass settled in the test section by the collection interval (in minutes).
   2. At 30 Hz, the flume flow rate is ~800 Liters/minute. Divide the quantity in part a) by 800 Liters/minute to yield the mass of sediment that settles out per liter of water that passes through the test section.
   3. The quantity calculated in b) is the contribution of settling towards the total particle removal rate.

*Assumptions:*

* *All sediment in the sediment traps settled within in a known time interval (e.g. the course of the experiment; sediment traps should be removed when the data collection period ends rather than allowing them to remain in the test section and accumulate additional sediment)*
* *Particle settling is constant in time and across all areas of the test section.*

**Part 2: Use peristaltic pump data to estimate total particle removal.**

1. Calculate volume concentration for each pump sample
2. Calculate the difference in volume concentration between upstream/downstream sample pairs (of the same height) by subtracting the downstream value from the upstream. The difference represents the total particle removal per liter at a specified height and time.
3. For all valid samples, calculate the mean difference in volume concentration across all times. This should yield three means at 5 cm, 14 cm and 27 cm.

**Part 3: Estimate particle removal due to direct capture by subtracting particle removal due to settling (part 1) from total particle removal (part 2).**