Lab 1 worksheet

Tracer method

Principle of calculation

$$Q=\frac{V1C1}{\int_0^\infty (C-Cb)dt} \quad \text{Eq.1}$$

Q: Discharge of the stream

V1: The volume of the tracer solution introduced into the stream (2L)

C1: The concentration of the tracer solution injected into the stream (conductivity~350000μS/cm, 184000mg/L (0.737kg salt into 4L water))

C: Is the measured concentration at a given time at the downstream sampling site

Cb: Is background concentration of the stream

t: Is time

$\int_0^\infty (C-Cb)dt$ (Area under concentration curve) can be estimated by $\sum_{i=1}^{N}(Ci-Cb)(ti+1-ti-1)/2$

i: the sequence of the sample

N: the total number of the sample

ti: is the time when a sample Ci is collected

note: The established relationship between salt solution concentration and conductivity is approximately:

NaCl (mg/L) =conductivity (μScm^{-1}) ×0.46

Work sheet for tracer study in the field

Group member:

Time:

Background conductivity(µs/cm):

Time(s)	Conductivity (µs/cm)
0	
10	
20	
30	
40	
.	
.	
.	

Write down the conductivity of downstream until it reaches back to background

Work sheet to work on after the lab(better do it in excel)

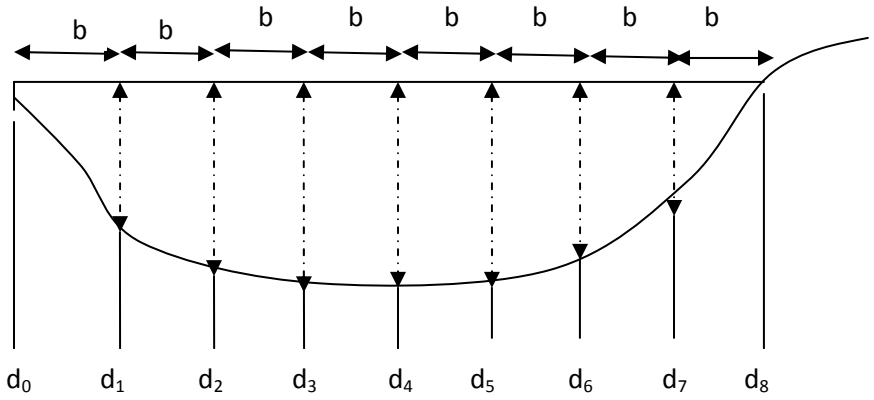
A	B	C	D	E	F	G
N(i)	t(sec)	Ci(mg/L)	Cb(mg/L)	Ci-Cb(mg/L)	$(t_{i+1}-t_{i-1})/2$	$(Ci-Cb)\times(t_{i+1}-t_{i-1})$
0	0					
1	10					
2	20					
3	30					
4	40					
5	50					
Continue….						
N						

Sum up the data on column G to be used as “Area under concentration curve”, and use eq1 to calculate the discharge

Current meter method

Principle of calculation

$$Q=\sum\left[\frac{d_n+d_{n-1}}{2}\right][v_n+v_{n+1}]/2]\,b \quad \text{Eq.2}$$



Work sheet for current meter method in the field

Measure around 10 intervals across the width

Time:

Location:

Distance from bank(ft)	Depth(d) (ft)	Flow velocity(ft/s)	Pannel width(ft)

Work sheet to work on after the lab(better do it in excel)

A	B	C	D
$[(d_n+d_{n-1})/2]$	$[(v_n+v_{n+1})/2]$	b	Q

Discharge Q is calculated using Eq.2

Sum up the data on column D to give you discharge directly.

Float method

Use the data from current meter method to get the cross section area. The location for current meter method needs to be where the floating marker stopped (downstream)

Questions included in results and discussion

Calculate discharge using the three methods and answer the in-situ questions and ex-situ questions.