SECCHI DISC

Transparence

Alex, July 2004

Overview

its simplicity, it is certainly a useful clarity estimation tool

As the attenuation of light by dissolved colored matter or particles increases, the Secchi depth decreases. This inverse relationship produces the typical hyperbolic curve when Secchi depth is plotted against potential attenuating substances, such as algal chlorophyll, color, turbidity, or suspended solids.

- But …..
- to use the Secchi depths as surrogate measures of algal chlorophyll or algal biomass, and subsequently, as an indicator of the trophic state, then a number of other potential interferences become very important.
- Preisendorfer (1986) published “ten laws of the Secchi disk” in both verbal and mathematical

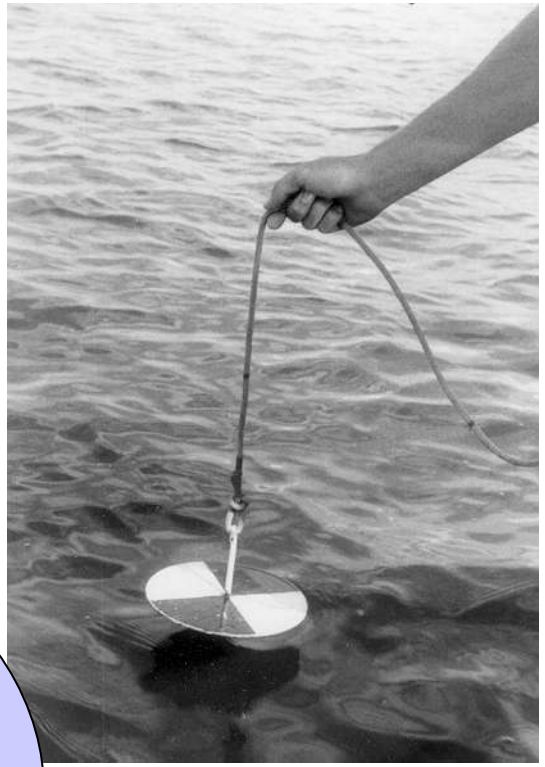
  form.

He stated that the depth of disappearance of the disk: = varias ^10

RESULTS

Three measurements at each cruise

- Cruise 1 = ~1-1.25 m
- Cruise 2 = 6.5 m



please keep in mind

Kd ⇨ Zsh Relationships

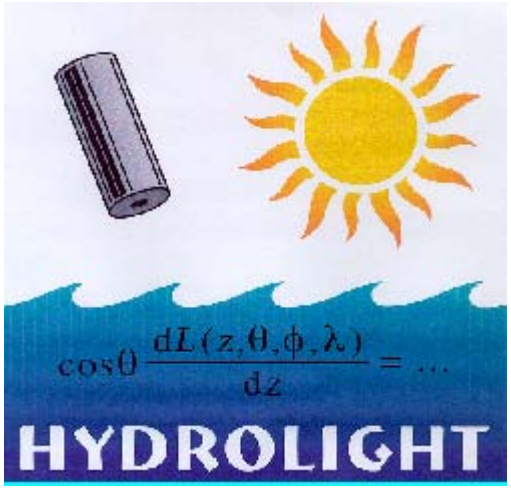
- Kd= 1.44/Zsh - Holmes (1970)

- (Kd+c) ~ 8.69/Zsh - Tyler (1968)
- (Kd+c) ~ 9.42/Zsh - Holmes (1970)
- (Kd+c) ~ 9/Zsh - Preisendorfer (1986)

Kd's estimation methods from IOPS

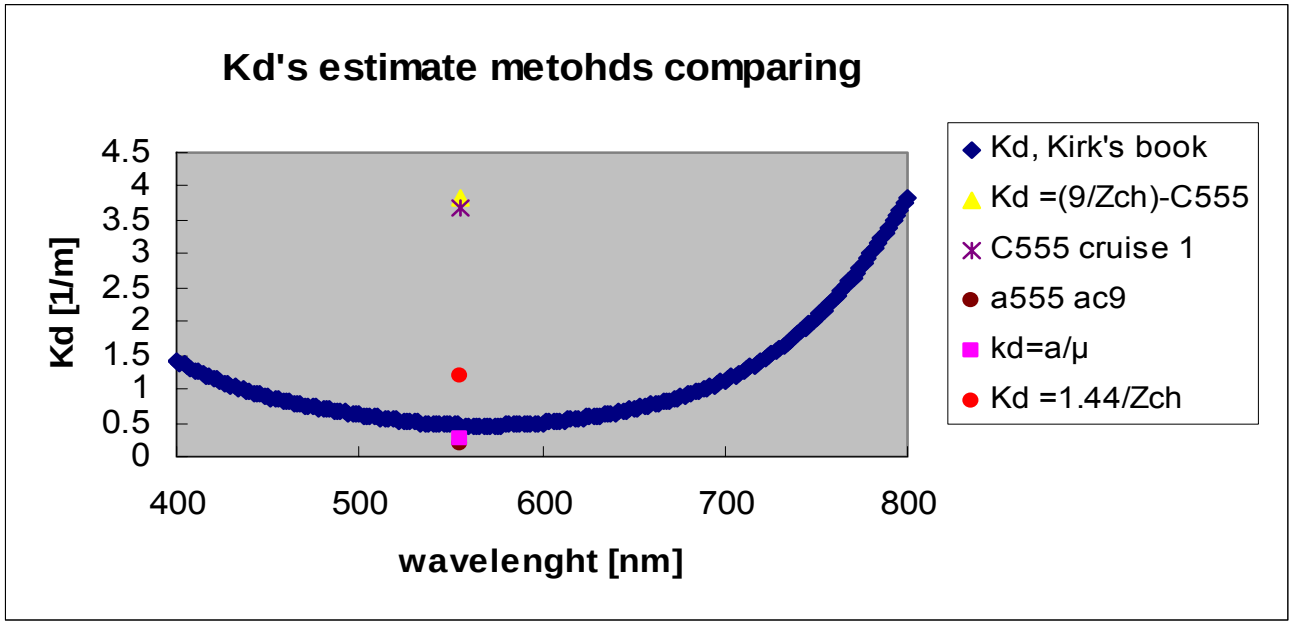
- Kd = a/μ
- Kd =$[a^2+Gab]^{0.5}$
- Hydrolight model

AC9 data used

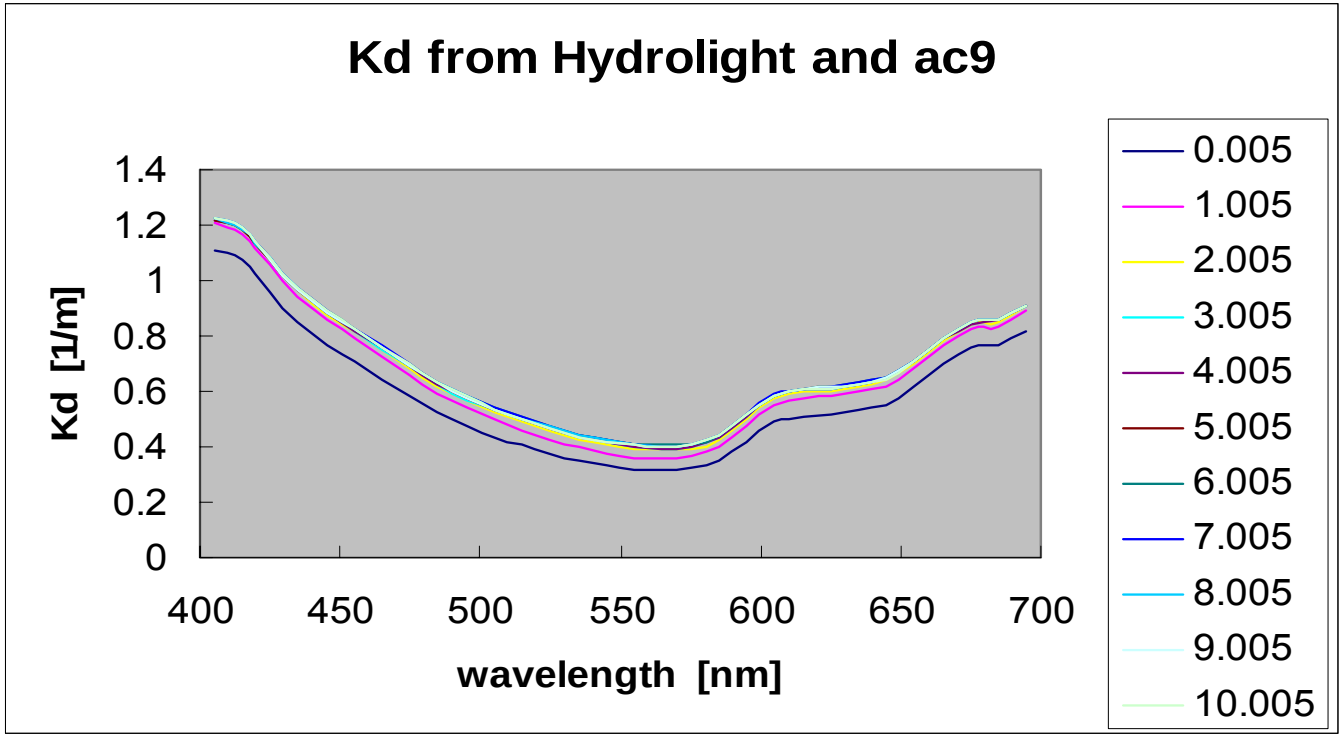


Cruise 1

Secchi depth ~1- 1.25



Cruise 1

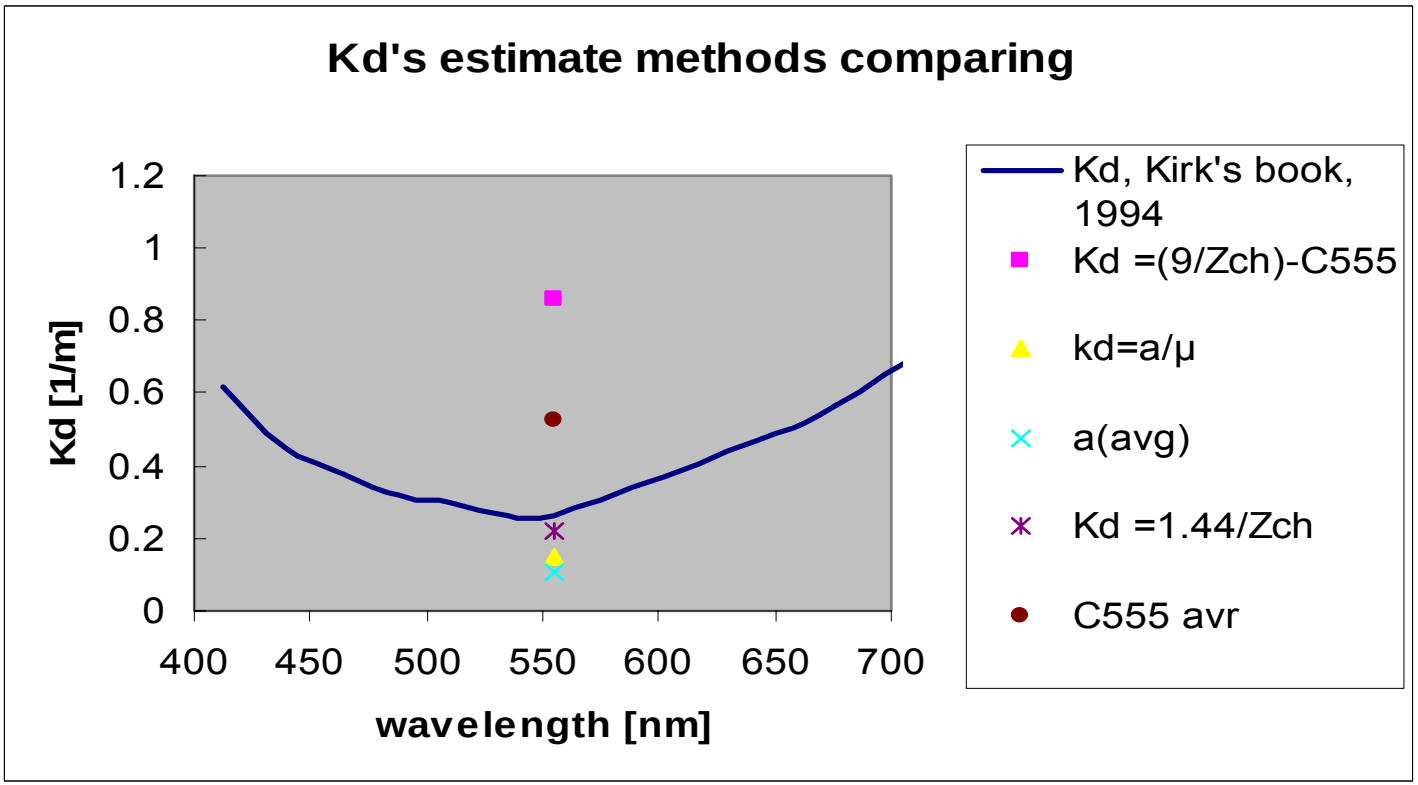

Kd from Hydrolight and ac9
Kd [1/m]
1.4
1.2
1
0.8
0.6
0.4
0.2
0
400
450
500
550
600
650
700
wavelength [nm]
0.005
1.005
2.005
3.005
4.005
5.005
6.005
7.005
8.005
9.005
10.005

Kd's estimations- Cruise 1

- Kd = a/μ= 0.27
- Hydrolight model = 0.391
  Kd =$[a^2+Gab]^{0.5}$=0.465
- Kd= 1.44/Zsh = 1.152
- Kd ~ 9/Zsh-c = 3.82

Cruise 2

Secchi depth ~6.5



Kd's estimations - Cruise 2

- $Kd = a/\mu = 0.15$
- $Kd = [a^2+Gab]^{0.5} = 0.26$
- $Kd = 1.44/Zsh = 0.22$
- $Kd \sim 9/Zsh\text{-}c = 0.86$

Inverse estimations of Kd

Morel and Maritorena, 2001

- Kd = Kw + K bio
- Kw (λ) = a_w (λ) + (1/2)b_w(λ)
- Kbio = X(λ)(Chl) $^{e(\lambda)}$
  for X , e and Kw table data are used

Cruise 1

Kd(555) = 0.1483 for chl a 3.3 [mg m3]

Cruise 2

Kd(555) = 0.1343 for chl a 2.65 [mg m3]

Inverse estimations of Secchi depth

- **Using (Kd+c) ~ 9/Zsh**

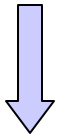
Cruise 1:
For Kd =0.4 ; c= 3.7; Zch ~ 2.2 m
Cruise 2:
For Kd = 0.2 ; c = 0.52; Zch ~ 12.3 m

- **Using Kd ~ 1.44/Zsh**

Cruise 1:
For Kd =0.4 ; Zch ~ 7.2 m
Cruise 2:
For Kd = 0.2 ; Zch ~ 3.6 m

just to remind, in BEGINNIG Secchi depth were : cruise1 – ~1.25
cruise 2 ~ 6.5

SO WE ARE GO DOWN



Conclusions

- Secchi disk use can lead to measurement uncertainty

- Secchi disk value should be considered as a simple visual index of the clarity of a body of water
- Secchi disc can be used correlated with AOP
- Kd' s value were consistent for the methods used IOP parameters (absorption coefficient)
- (Kd+c) ~ 9/Zsh relationships give overestimates by fold 2 at least
- AOP estimates from Secchi should be approved by another methods.

THANKS FOR ACKNOWLEDGMENT !