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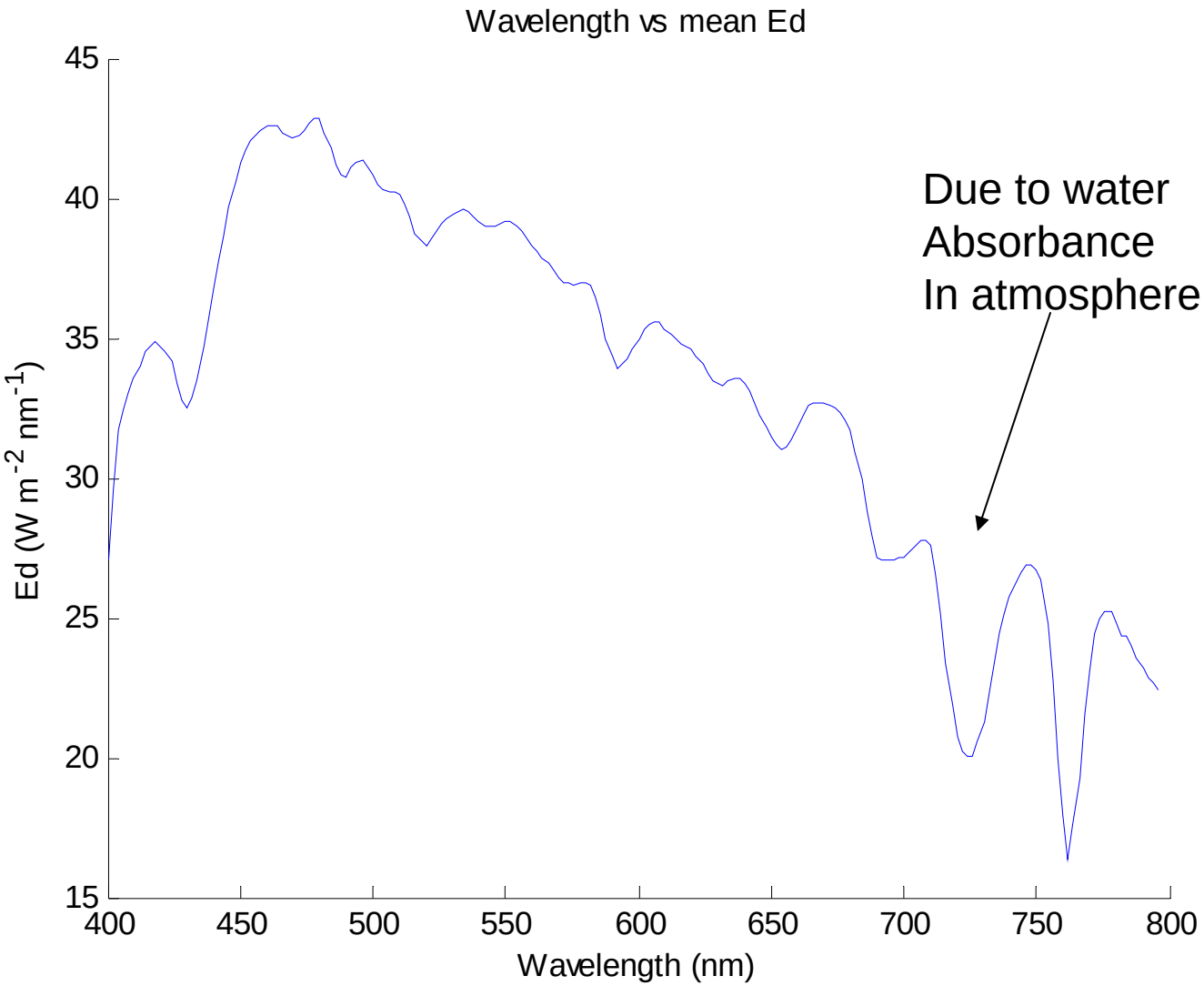
What was measured

- The HTSRB measures Ed (Downwelling Irradiance, above water sensor) and Lu (Upwelling radiance, below water sensor).
- Terms defined.
- Ed = downwelling irradiance
- Kd = diffuse attenuation coefficent
- Lu = upwelling radiance
- Lw = water leaving radiance

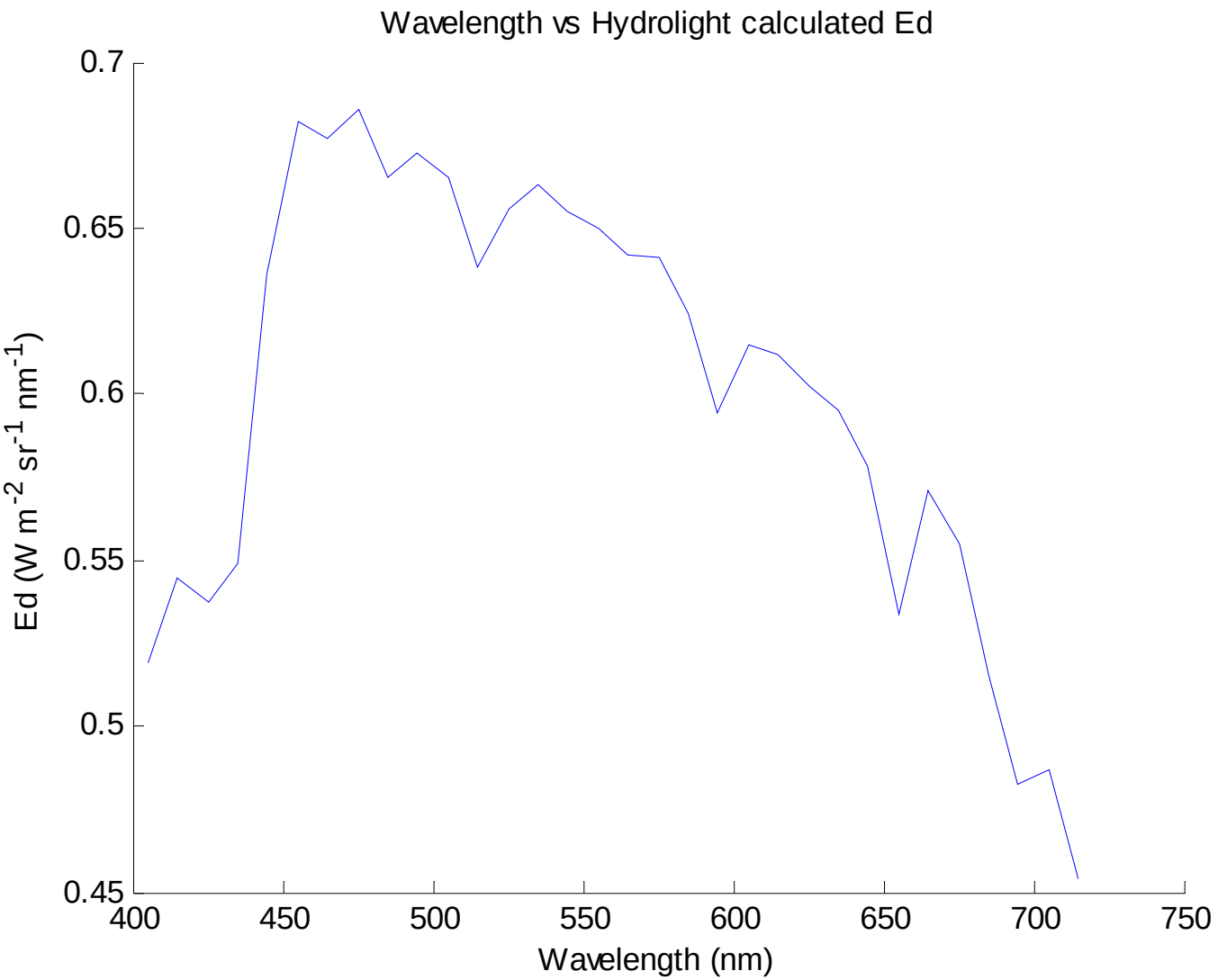
What have I done?

- Measured Ed and Lu values were used to calculate Lw.
- Lw was then used to calculate RRS.
- RRS was then used to derive chlorophyll-a concentration using the oc2 algorithm.
- This was done 3 times. Once with Lu measured at 0.63 meters, once with Lu measure at the surface, and once with a Hydrolight simulation.

Mean Ed


Wavelength vs mean Ed
Ed (W m-2 nm-1)
Wavelength (nm)
45
40
35
30
25
20
15
400
450
500
550
600
650
700
750
800
Due to water
Absorbance
In atmosphere

Ed from Hydrolight



Converting Lu to Lw

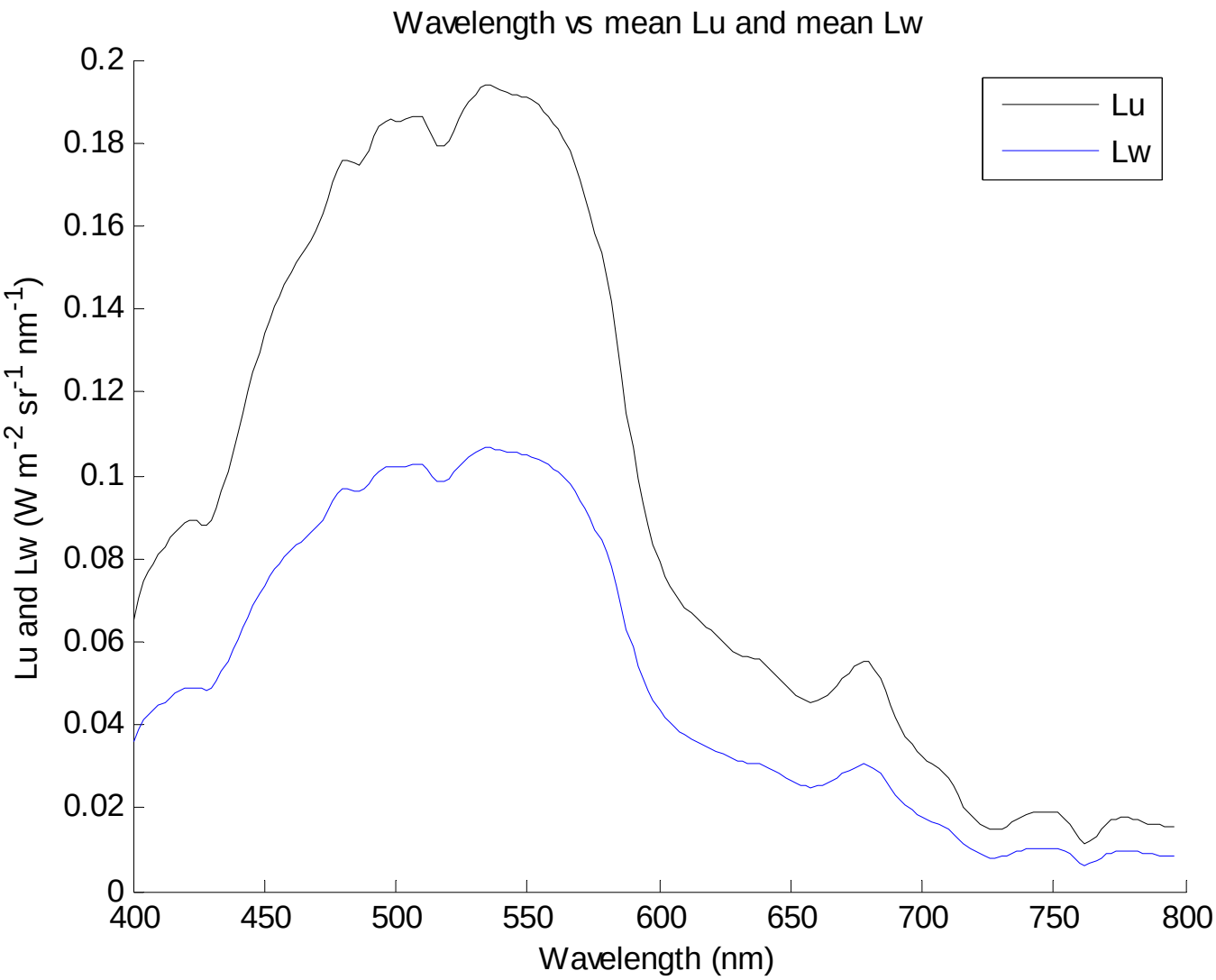
- RRS is defined by:

$$RRS=Lw/Ed$$

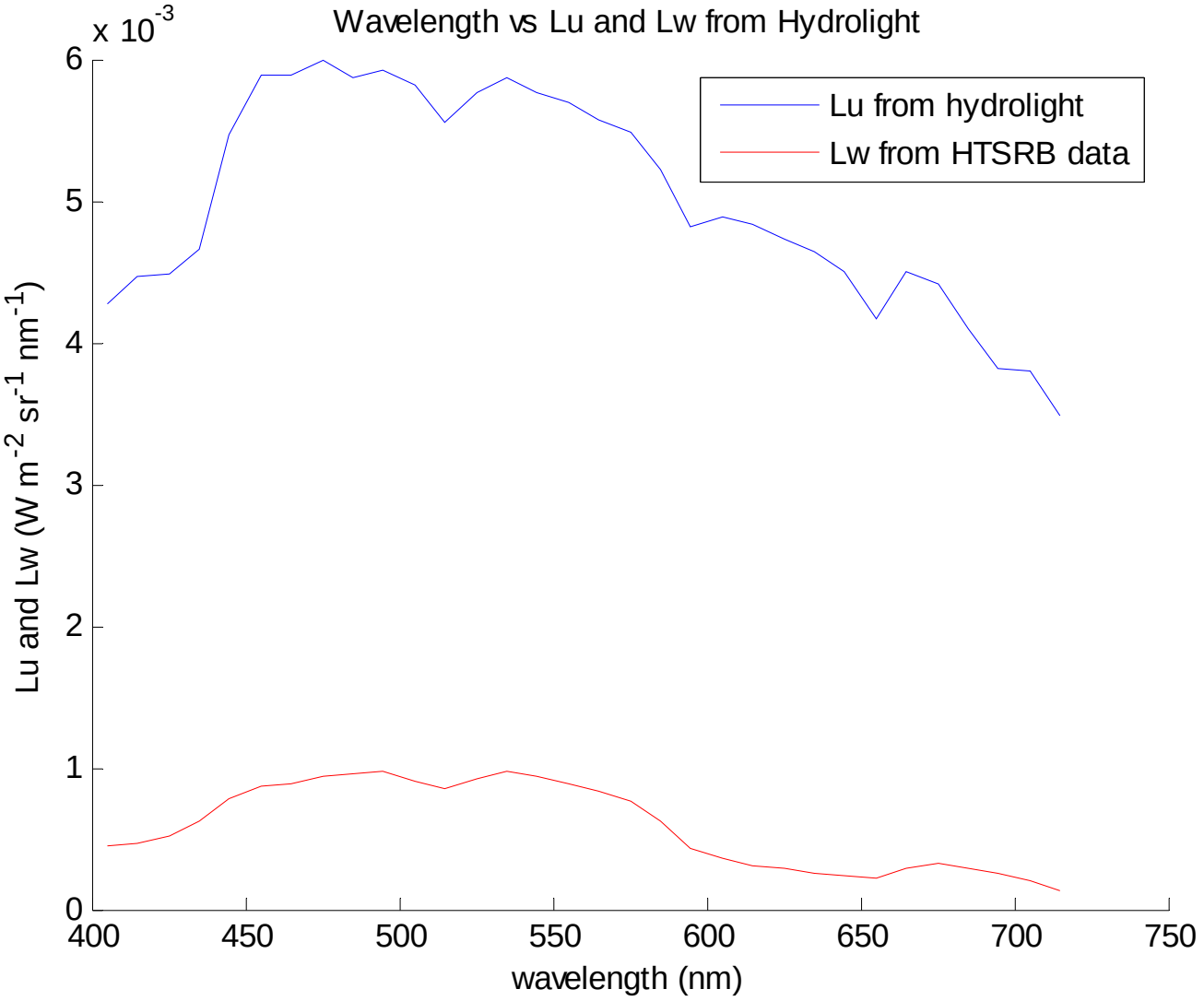
So we have to convert Lu into Lw (water leaving radiance).

- Lw = Lu * (t/n^2)
- Where t is the Fresnel Transmittance Coefficient (0.98) and n is the refractive index of water (1.33).
- Lw = Lu * (0.55)
- RRS = (0.55*Lu)/Ed
- So Lw is 55% of Lu.

Lu and Lw at 63 cm



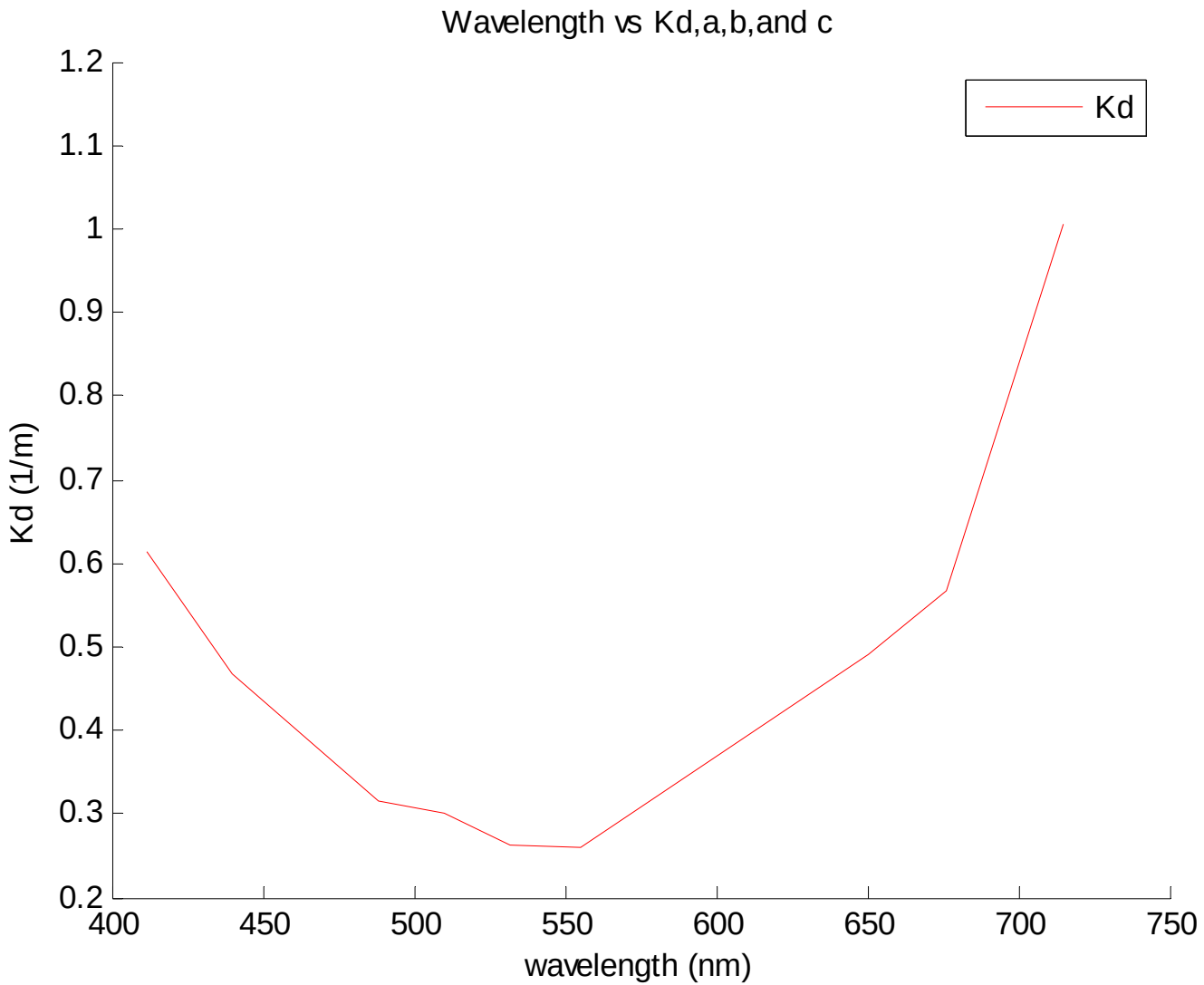
Lu and Lw from Hydrolight



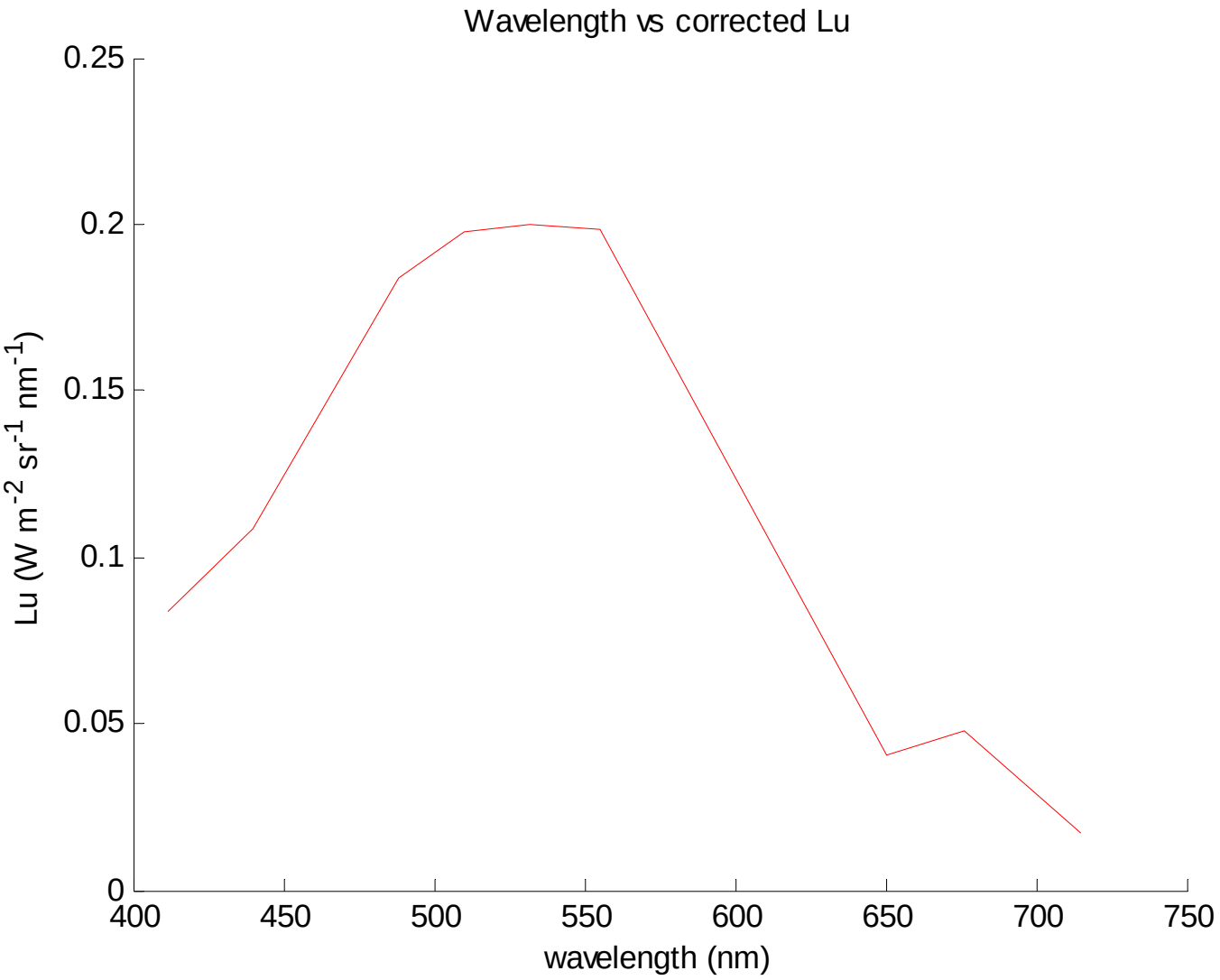
Correction for measuring Lu at 63 cm, but wanting Lu at the surface.

- To get Lu at the surface from Lu at .63 meters we must calculate Kd.
- Kd = sqrt(a^2 + G*a*b)
- Where G is a constant of 0.256
- Lu(surface) = Lu(63 cm)*e^(Kd*0.63)
- Lw and RRS were then calculated the same way as previously discussed.

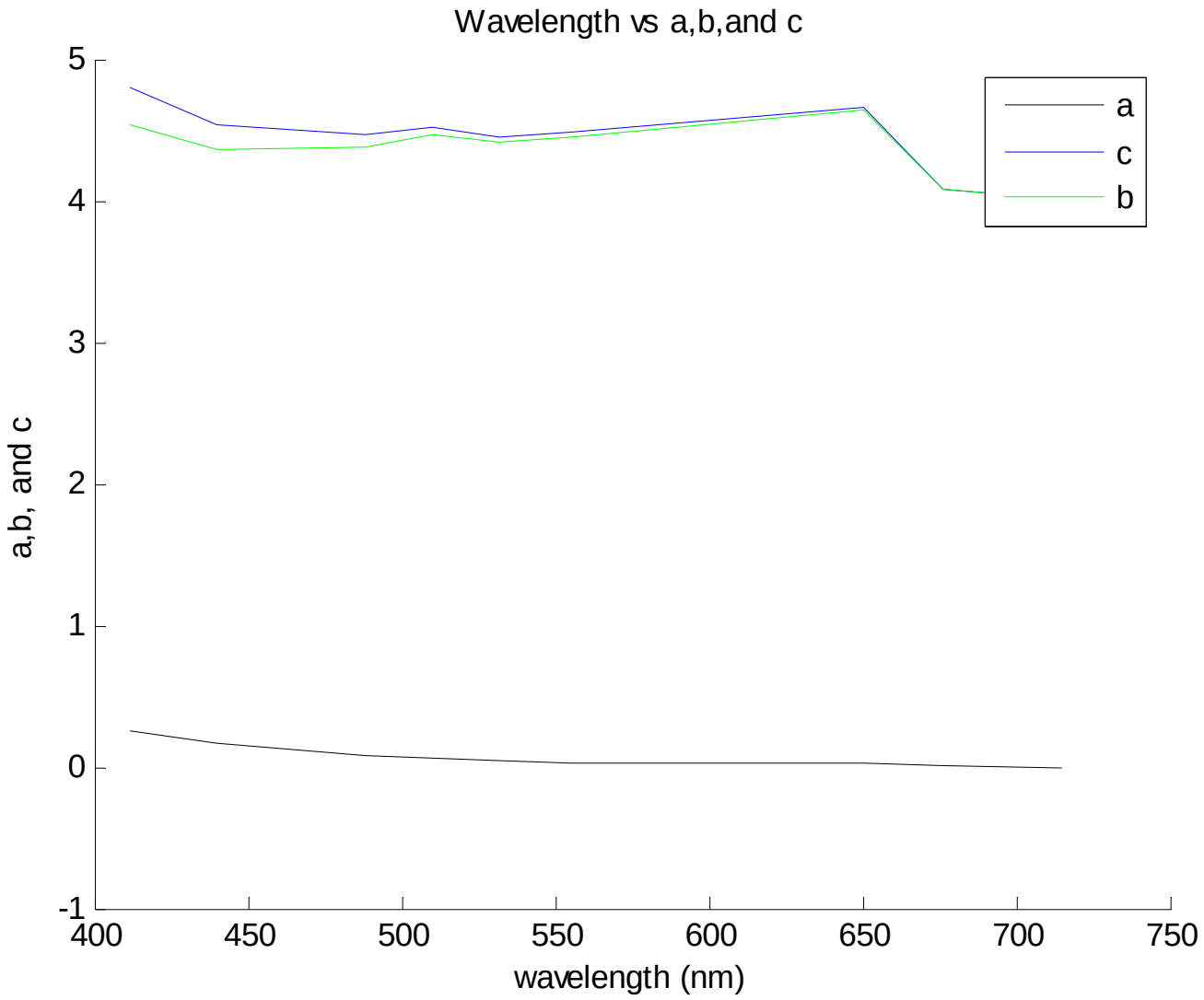
Kd


Wavelength vs Kd,a,b,and c
Kd
Kd (1/m)
wavelength (nm)
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
400
450
500
550
600
650
700
750

Lu at the surface



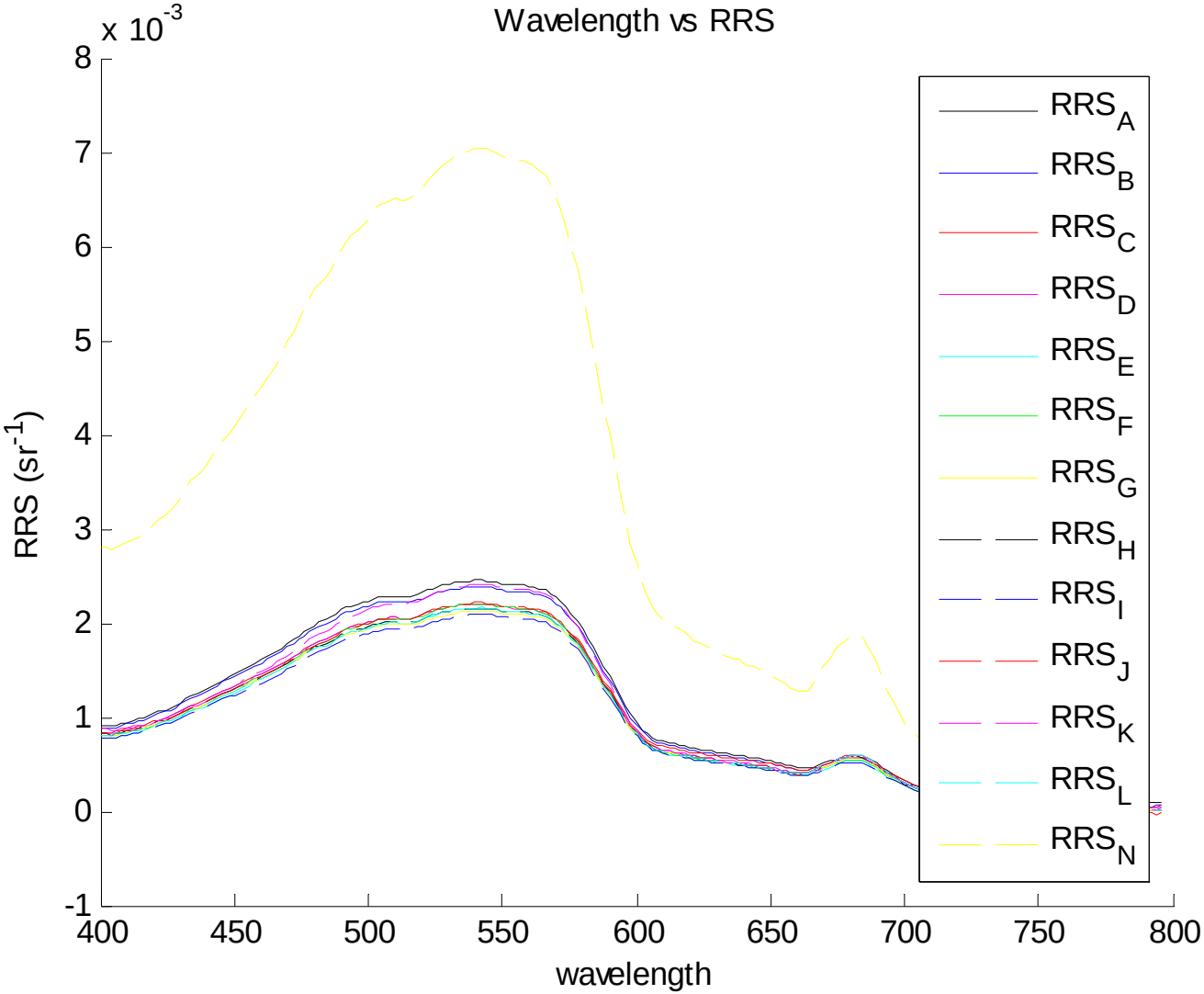
a b and c


Wavelength vs a,b,and c
a,b, and c
wavelength (nm)
a
c
b
5
4
3
2
1
0
-1
400
450
500
550
600
650
700
750

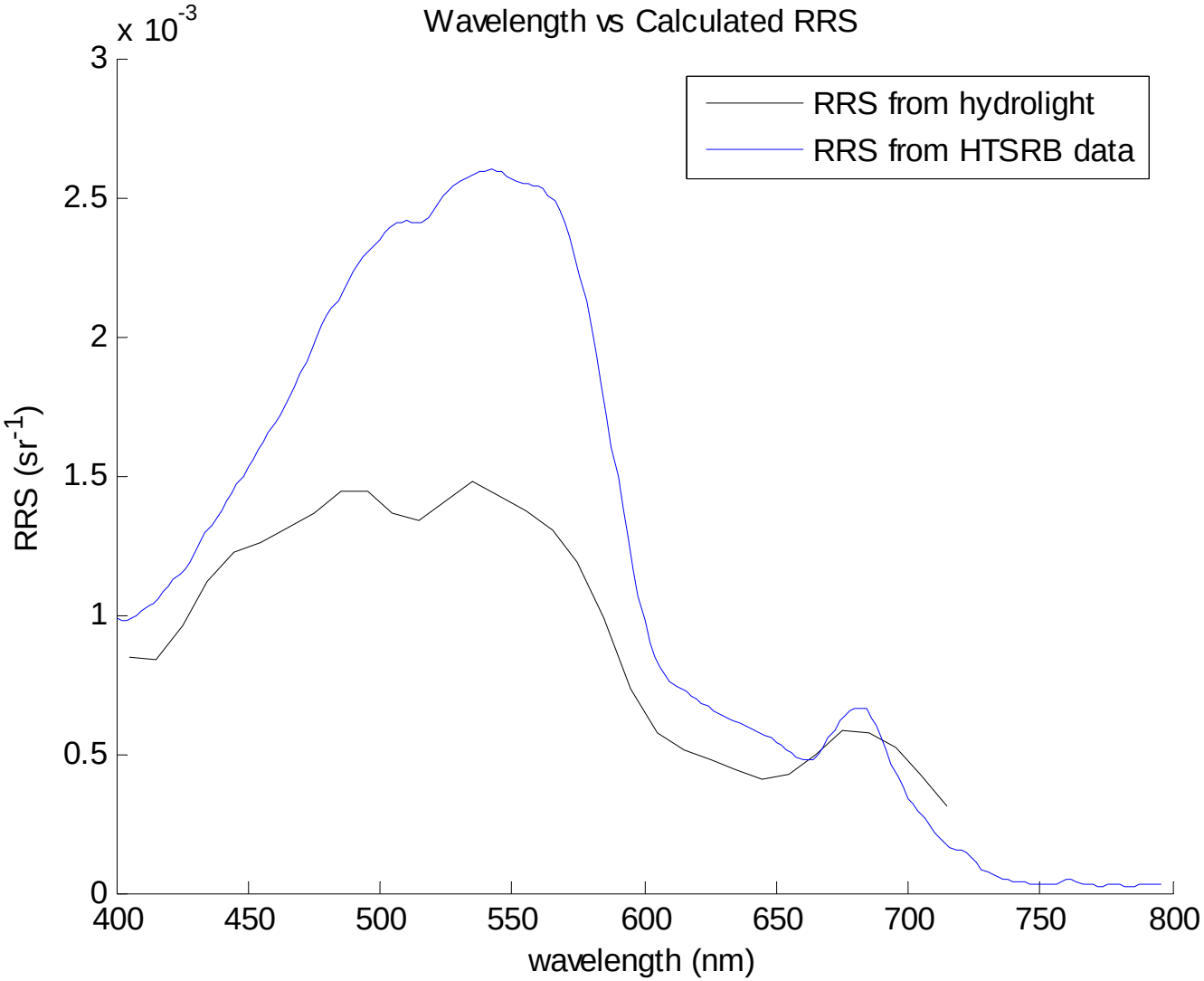
So onto RRS.

- Recall.
- RRS = Lw/Ed

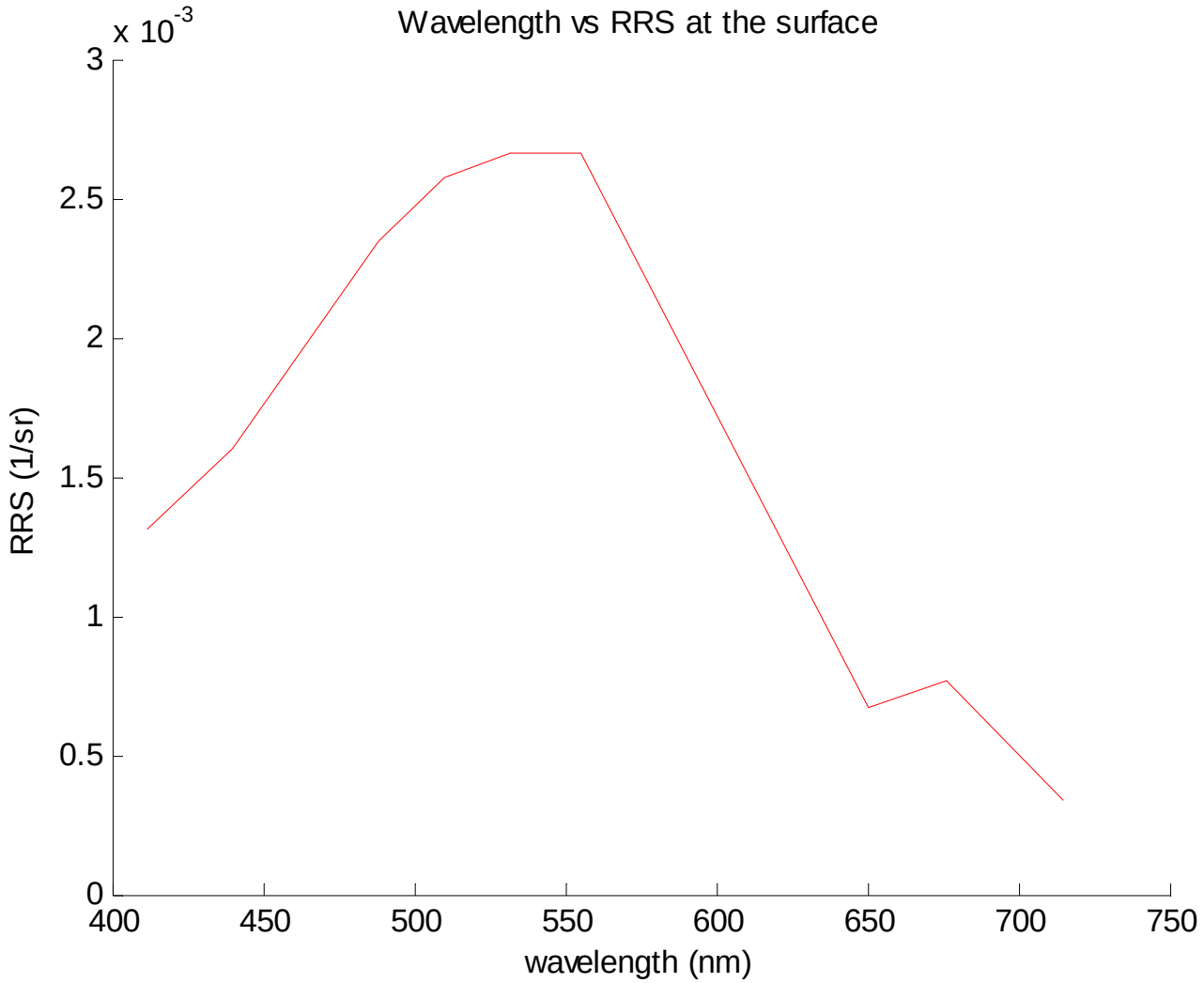
RRS calculated from 63 cm



Mean RRS from TSRB (63 cm) and Hydrolight



RRS corrected at the surface



The oc2 and oc4 algorithms

- Chl-a (ug/l) = 10.0^(a(0) + a(1)*R + a(2)*R^2 + a(3)*R^3) +a(4)

- Where R = log(RRS490/RRS555), a(0)=0.319, a(1)=-2.336, a(2)=0.879, a(3)=-0.135, and a(4)=-0.071
- Similarly the oc4 is a messy equation you probably don’t care about.

Chlorophyll results

HTSRB uncorrected oc2 = 2.4487
HTSRB uncorrected oc4 = 3.51

HTSRB corrected oc2 = 2.4377
HTSRB corrected oc4 = 3.4757

Hydrolight oc2 = 1.8786
Hydrolight oc4 = 2.042

Fluorometer = 2.48

Conclusions.

- Negligible difference between corrected and uncorrected HTSRB data.
- Overall the chlorophyll estimates seemed very successful.
- oc2 algorithm did a much better job than the oc4 algorithm.
- I need a nap.