# Estimating Phytoplankton Absorption Spectra with the Bricaud and Stramski Model:

# How Robust is the Model?

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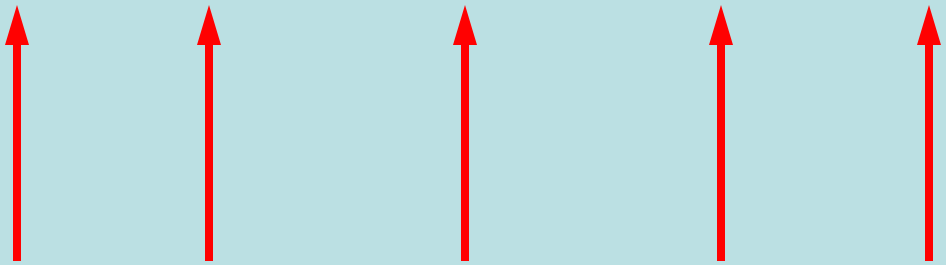
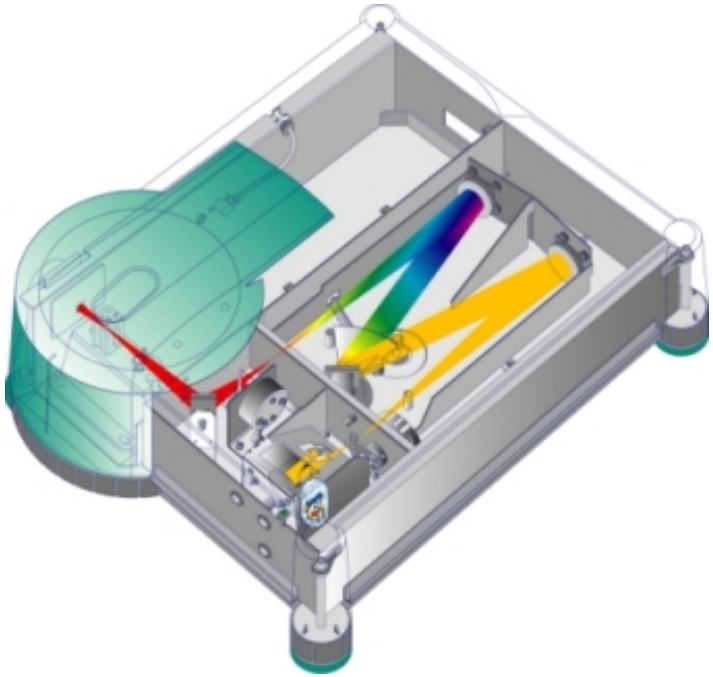
## Spectral Decomposition

$$a_{tot} = a_w + a_{CDOM} + a_\Phi + a_{NAP}$$



These can all be determined with Spectrophotometry

# Spectrophotometry



-Cary 50 Spectrophotometer

-Single Beam

-Measures in Optical Density (OD) not absorption coefficient (a(m^-1))

-Corrections:

Null, Blank, OD conversion, β

$$a(\lambda) = \frac{2.303*100}{pathlengh*\beta} [OD_{filter} - OD_{blank} - OD_{null}]$$

## Spectral Decomposition

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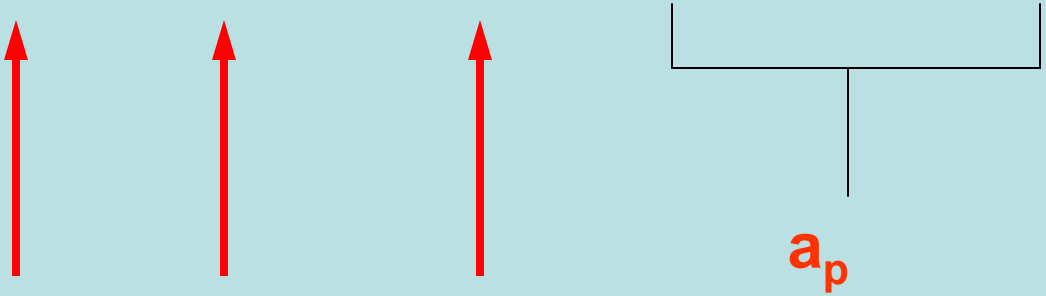
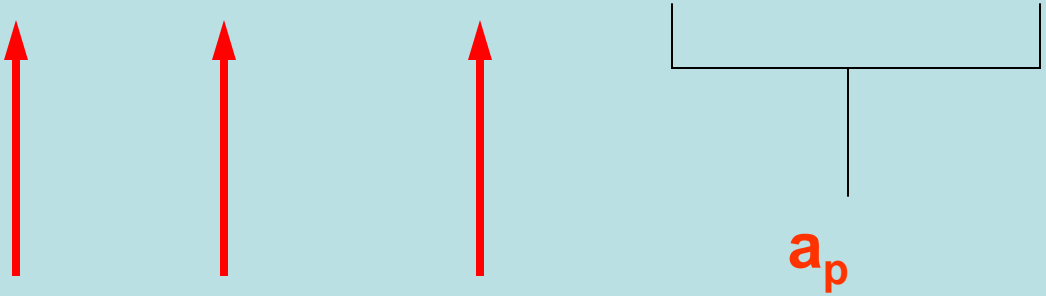



Only These Can Be determined with an AC9

How do we decompose particulate absorption?

## Spectral Decomposition

$$a_{tot} = a_w + a_{CDOM} + a_\Phi + a_{NAP}$$

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How do we decompose particulate absorption?

Modeling!

# Model From Bricaud and Stramski (1990)

$$aNAP(\lambda) = ap(\lambda) - a\Phi(\lambda)$$

$$aNAP(\lambda) = Ae(-S\lambda)$$

1) $0.99Ae(-380\ S) - A(-505\ S) = 0.99ap(380) - ap(505)$

2) $Ae(-580\ S) - 0.92Ae(-692.5\ S) = ap(580) - 0.92ap(692.5)$

-Two Equations with two unknowns

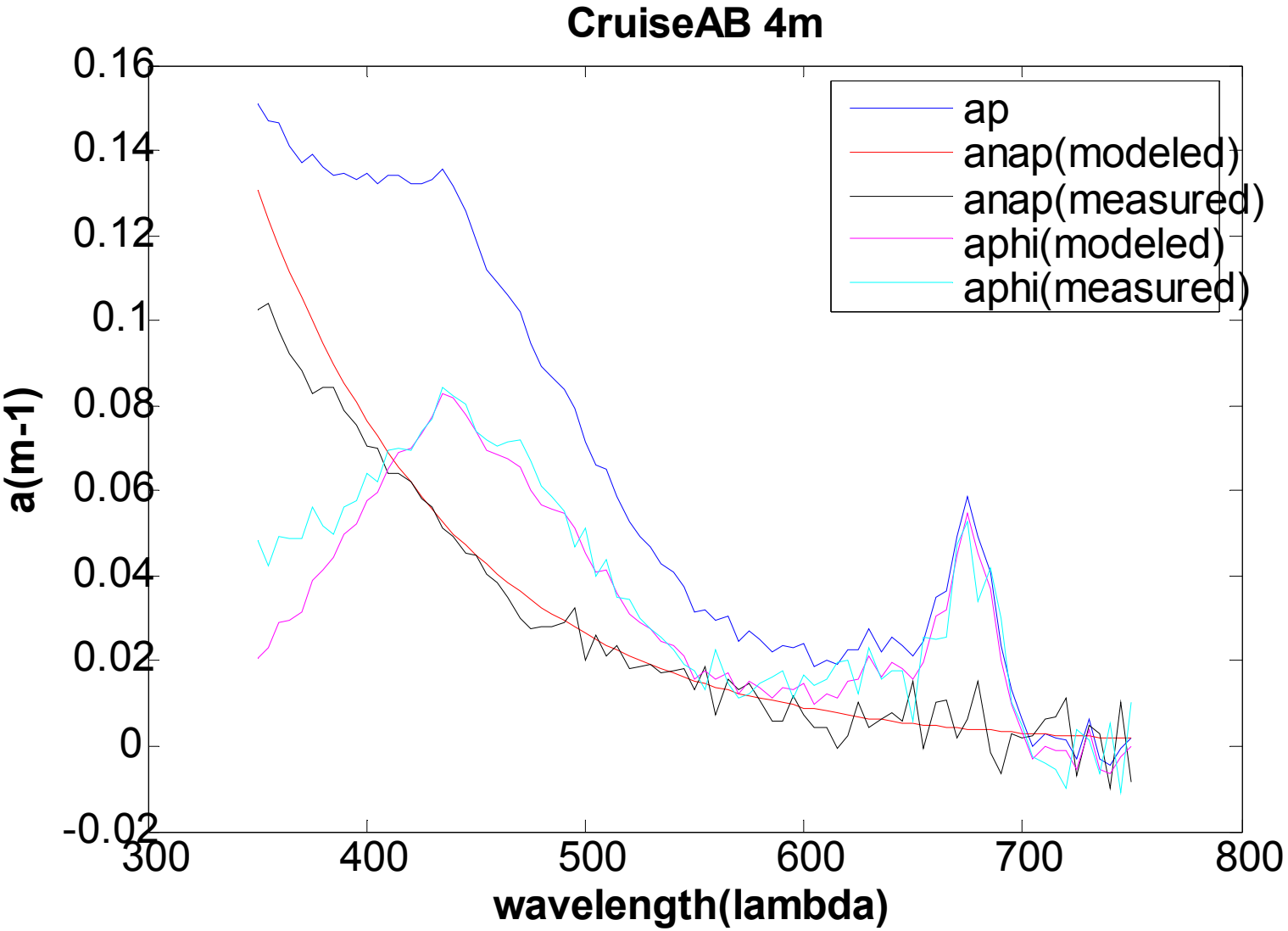
-You only need the particulate absorption spectrum

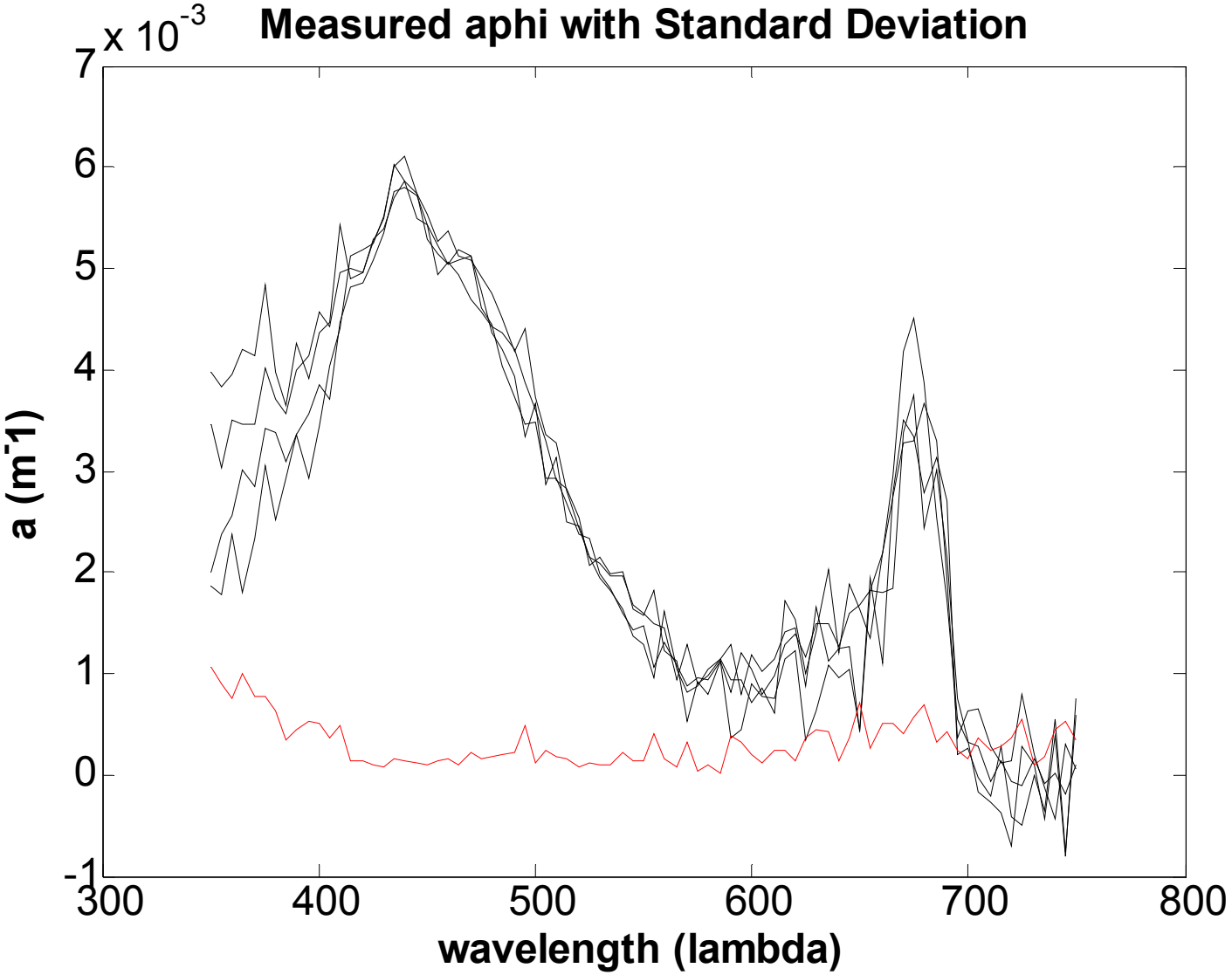
## My Approach:

The variability in phytoplankton absorption spectra measured in the spectrophotometer using the Kishino methanol extraction method

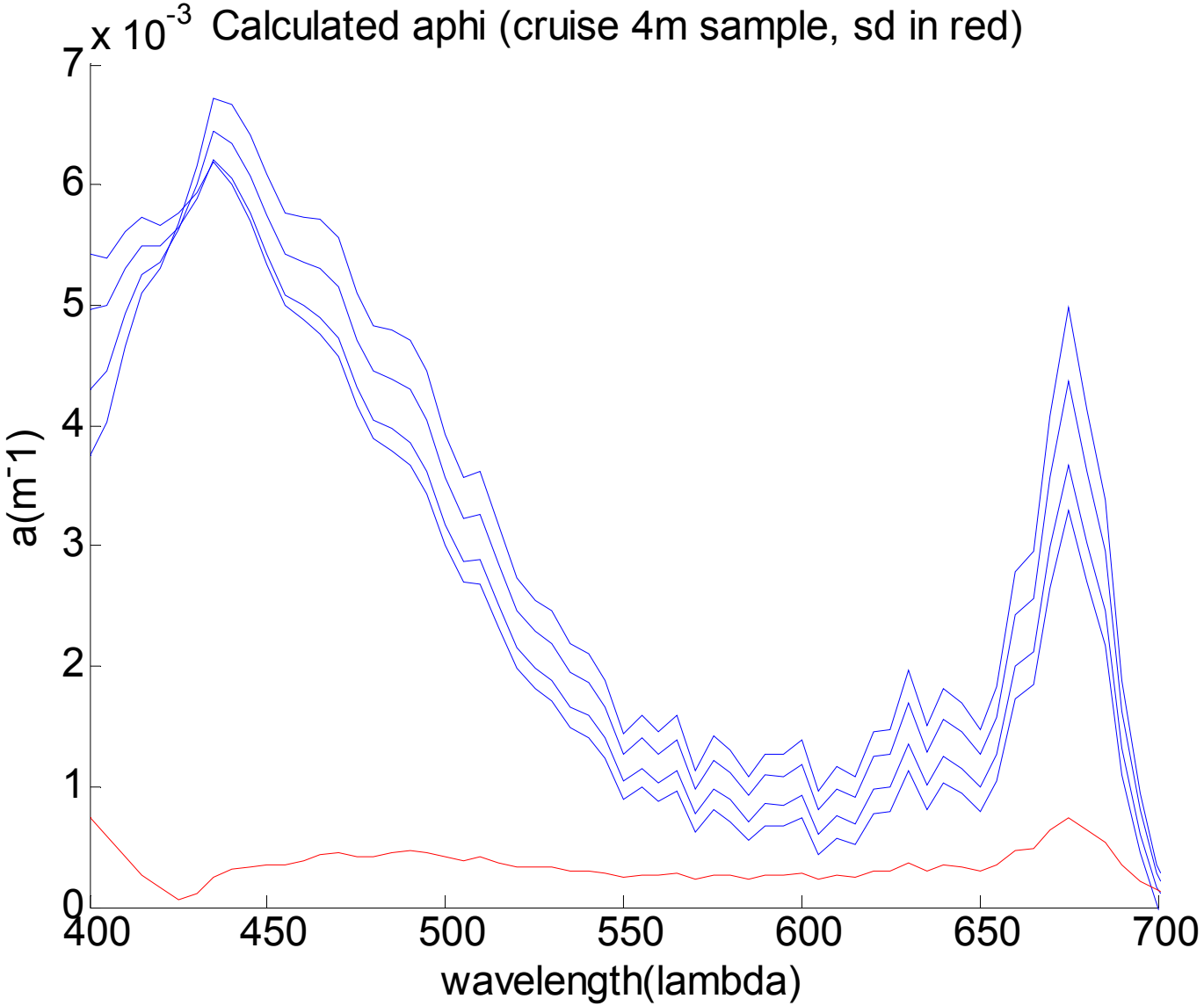
VS.

The variability for calculated phytoplankton absorption spectra using different slopes for the non-algal particle spectrum (S= 0.012, 0.011, 0.009, 0.007)


CruiseAB 4m
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
-0.02
a(m-1)
300
400
500
600
700
800
wavelength(lambda)
ap
anap(modeled)
anap(measured)
aphi(modeled)
aphi(measured)

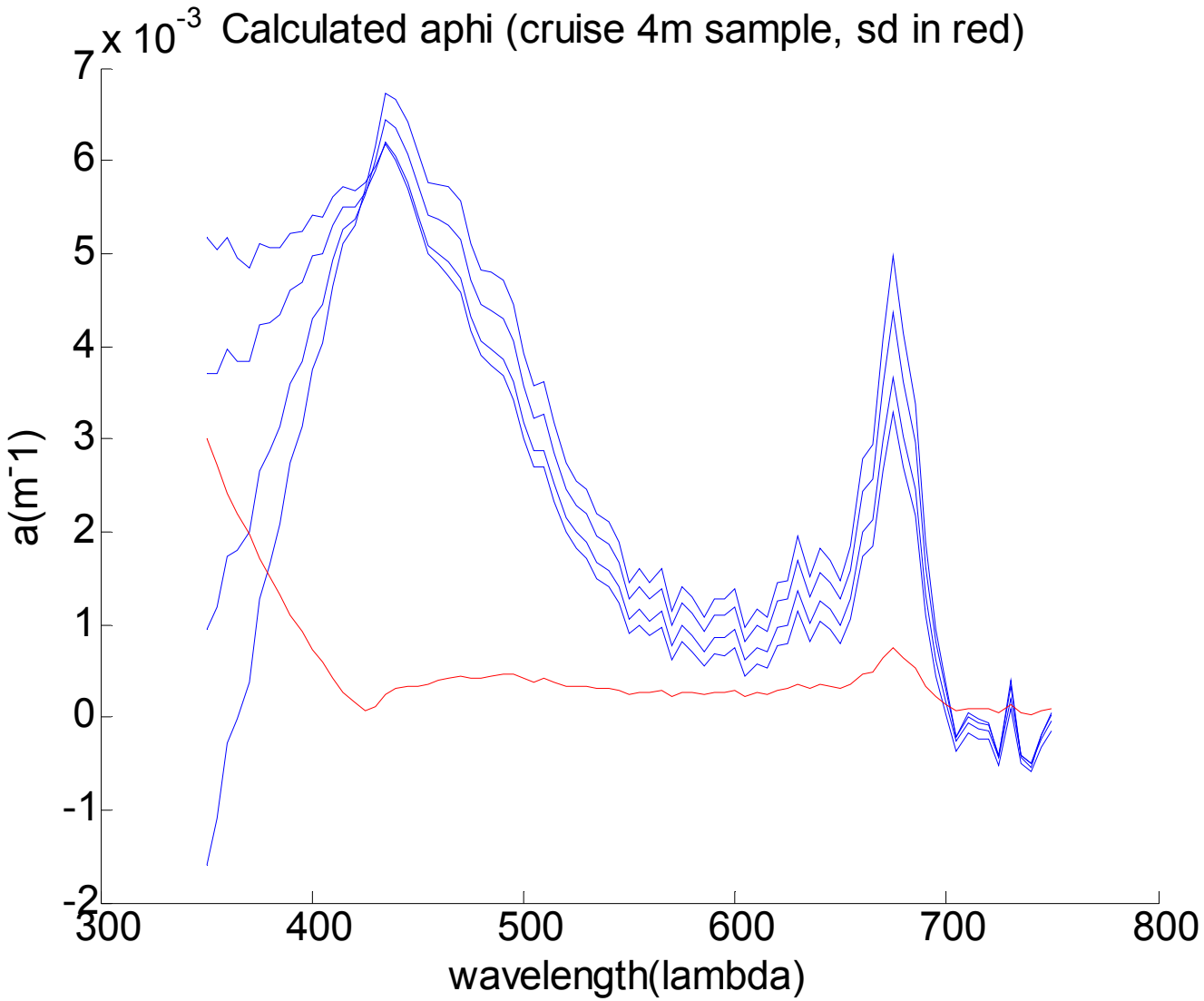



**Measured aΦ spectra (normalized to total aΦ) with Standard Deviation (red).**
**Standard Deviation ~3.16X10$^{-4}$**

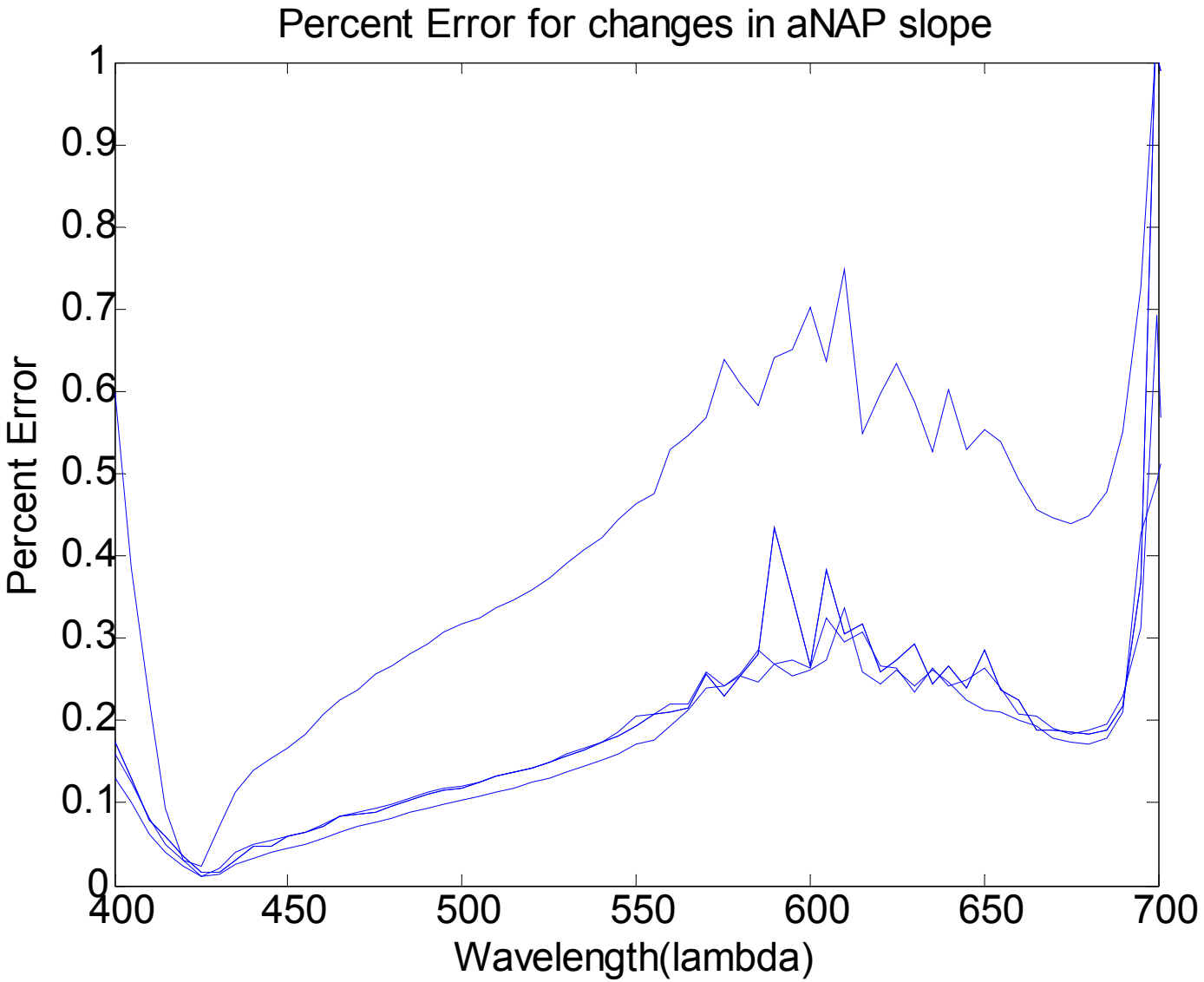



**Calculated aΦ spectra using different values of aNAP slope with Standard Deviation (red).**

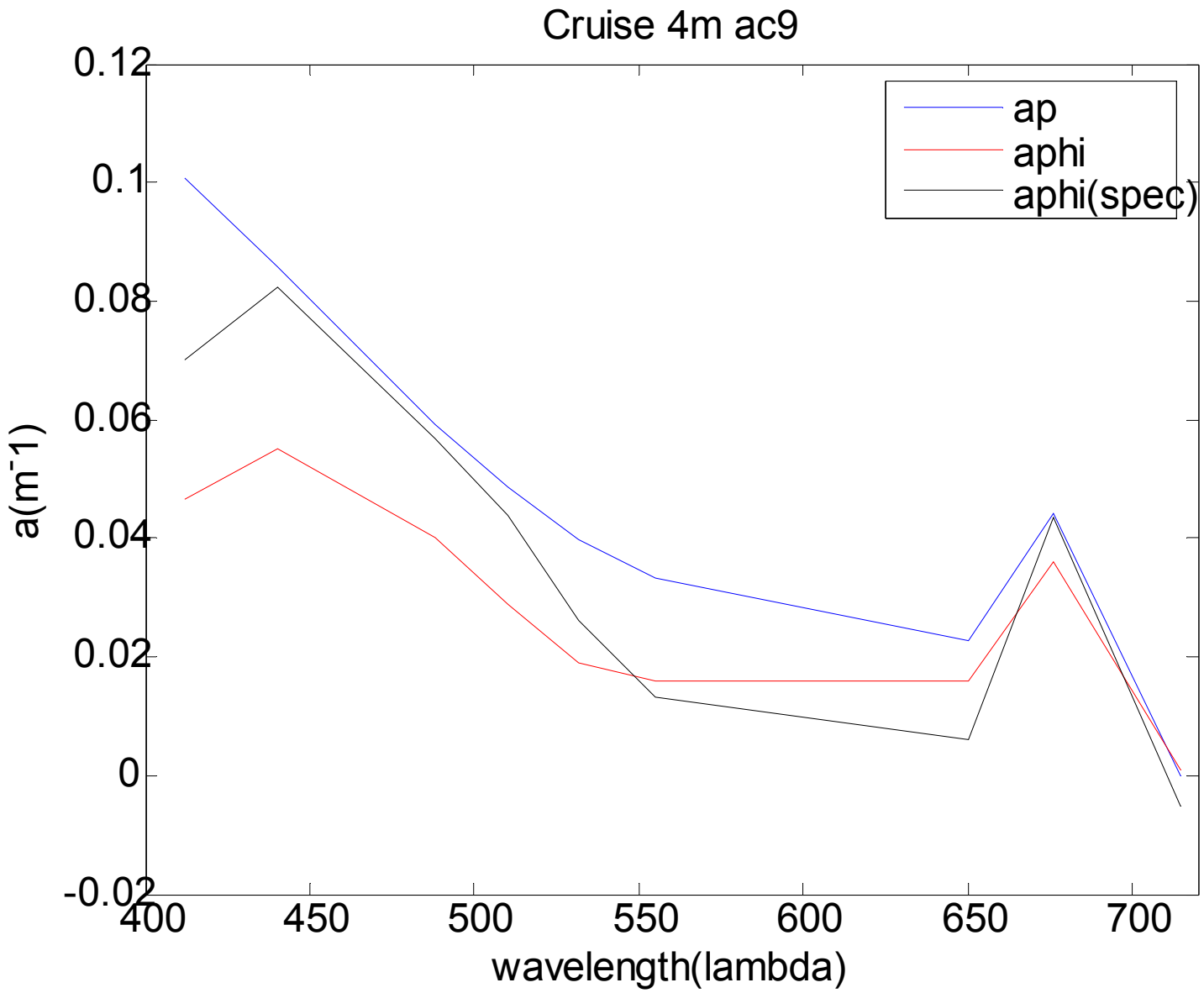
**Standard Deviation ~5.05X10$^{-4}$**



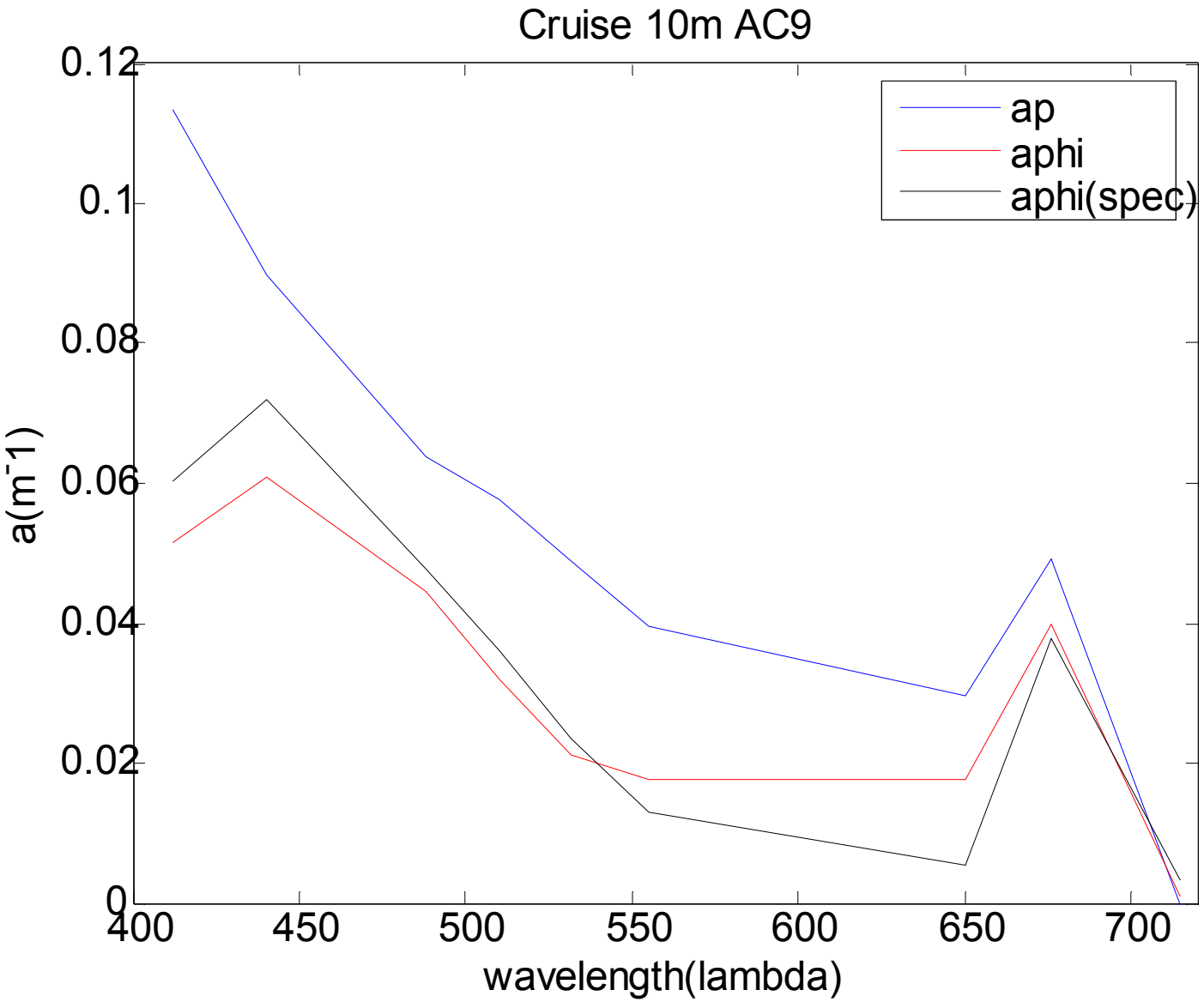

**-What the previous graph actually looks like-**




**Percent Error for Changes in aNap slope**
**Highest curve is dock sample A**




**Calculated aphi from ac9 cruise data compared to spectrophotometer**




**Calculated aphi from ac9 cruise data compared to spectrophotometer**

# Conclusions

-Problems with AC9 Cruise Data are likely the cause of big differences in aΦ

-Model is robust for spectrophotometer data

-Assumptions of the Model:

Minimal absorption by accessory pigments at 380nm, 505nm, 580nm, 692nm

380:505 ratio and 580:692 ratio are both ~1 for aΦ

Wavelength pairs are far enough apart to estimate slope of $a_p$ accurately

How could these be broken?

-Even though this model was developed for the open ocean, it still works in a tidal estuary.

# A Pretty Picture for Curt