Review of "Physical and biogeochemical controls on light attenuation in a eutrophic, back-barrier estuary" (bgd-11-12183-2014)

Anonymous Referee

General Comments:

As indicated by the title, this manuscript describes the use of combined high-frequency, in situ optical and wave gauge measurements with an optical model to investigate the impact of boat wakes on the diffuse attenuation measured over wavelengths representing the photosynthetically active region (PAR) of the water column near seagrass beds. Overall the manuscript is well organized and the writing is clear and concise.

The strength of the manuscript lies in the main message conveyed by the authors – high-frequency measurements are necessary to expose the scale of the variability in diffuse attenuation measurements, critical in understanding seagrass community restoration success and estimating the recovery of estuaries from eutrophication.

The only disparaging comment I have about the manuscript is that the reader may be confused by discussions of backscatter, scatter and backscatter ratio measurements, which need to be better explained in the manuscript. I am not certain whether backscatter related terms are inverted from equation 2 or were directly measured. Seems as least backscatter may have been measured in situ, but not inverted from the data?

Specific Comments:

1. Use of FDOM and spectral slope of CDOM interchanges in equation 2
    a. Use of a fixed spectral slope without knowledge of at least some knowledge of CDOM spectral absorption in at least a few discrete samples from the study area.
    b. Use of in situ FDOM with respect to non-linearity effects due to particle interference or concentration related quenching effects. Some researchers have seen non-linearity effects on FDOM due to particles at turbidities as low as 20 NTU.
2. Use of backscatter ratio in the paper. Instruments used in the study are capable of obtaining backscatter, but not reported?

Other comments and questions:

- Was the bottom PAR sensor located in the fluidized sediment? What about the optical sensing volume, particle interference and likely beam attenuation along

the pathlength of the sensing volume? How was this addressed as this would certainly affect response linearity.

- K_d should be annotated as K_d (PAR).

- The calculation for K_d assumes linearity between the irradiance measurement with depth in the water column. With only two PAR sensors located at fixed depth (top and bottom) that forces linearity. The lower PAR sensor located in the fluidized sediment may not accurately represent the light field at the benthos due to particle interferences?

- "Backscattering caused by water molecules was the largest bb effect "…

  This is confusing to me. Is the intention to show the reader that as a modelling exercise, b_b of water impacts the model more as a variable or actual measured b_b? According to your methods section, a WETLabs ECO NTUSB sensor was used to measure turbidity. You do not mention that backscatter was inverted from the sensor anywhere in the manuscript. Was the sensor characterized to obtain backscatter? How did you obtain backscatter then? Ultimately how was the backscattering ratio determined, since scatter (*b*), was not measured either. This needs to be clarified in the manuscript. No?

- A time series of the backscatter would greatly add to the manuscript.