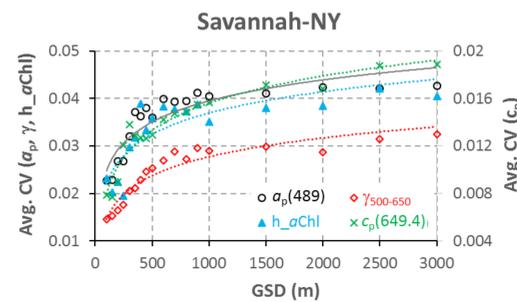
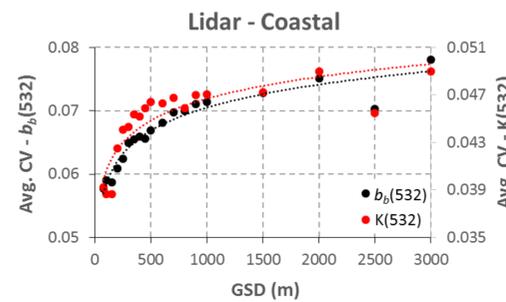
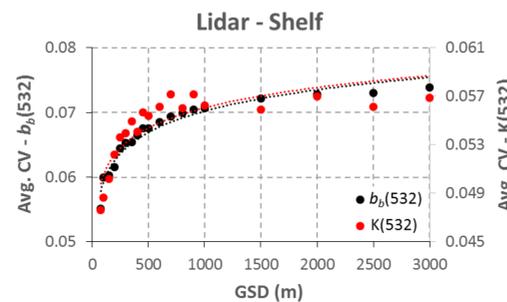
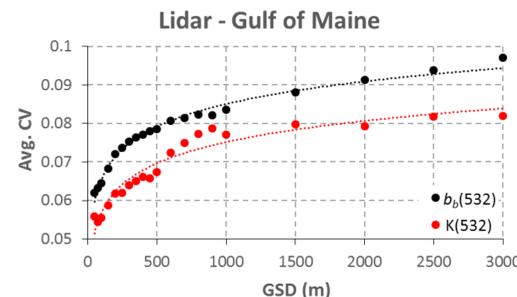
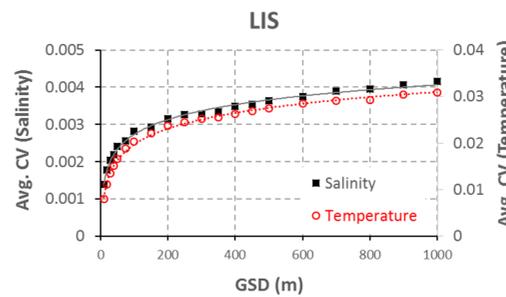
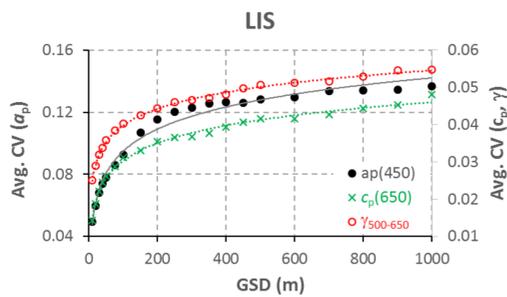
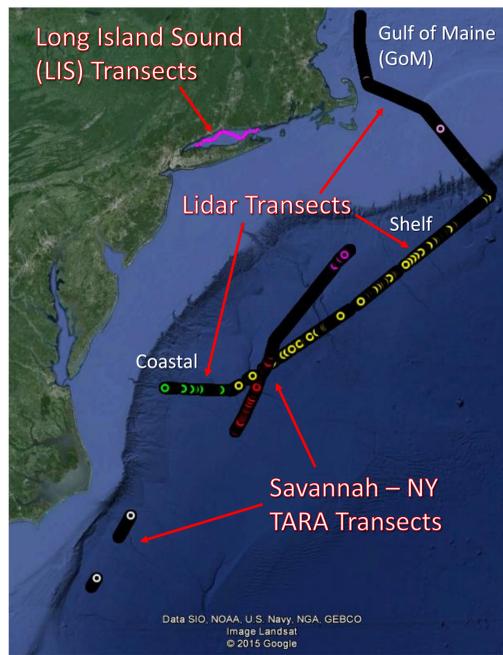


A Remote Sensing Perspective on Spatial Scales of Variation in Biogeophysical Properties of Water

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Objective: Express spatial variability in biogeophysical and bio-optical parameters as a function of Ground Sampling Distance (GSD) and investigate the effect of spatial resolution on spatial variability in data.



Methods/Parameters Considered:

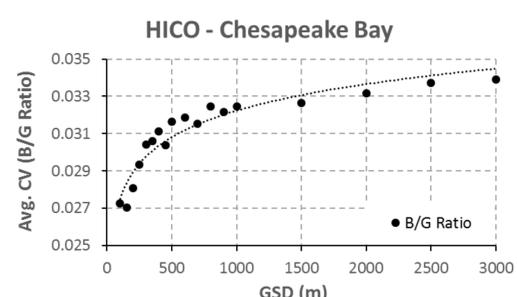
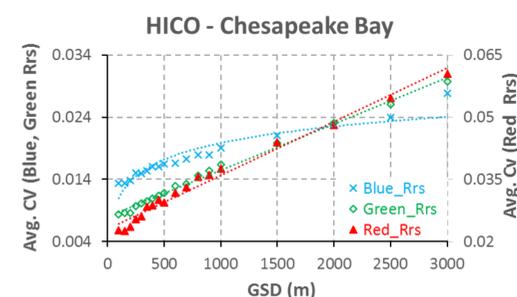
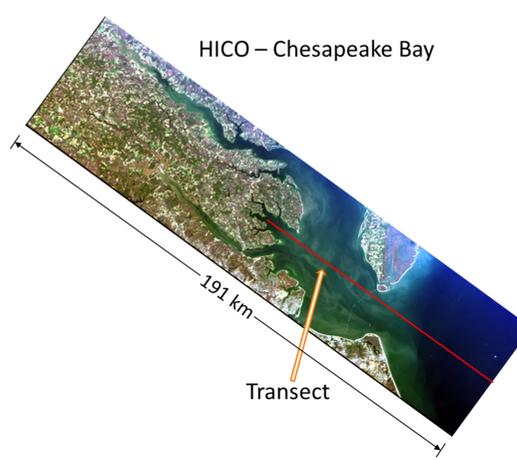
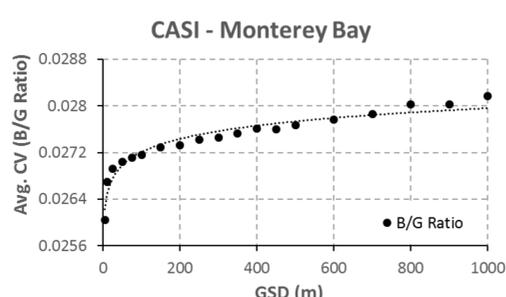
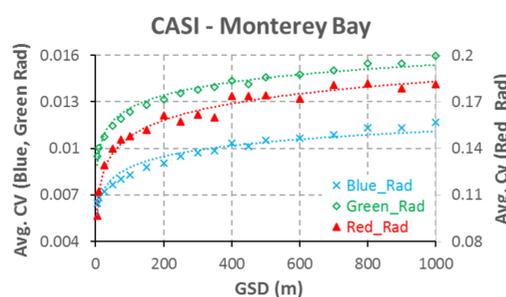
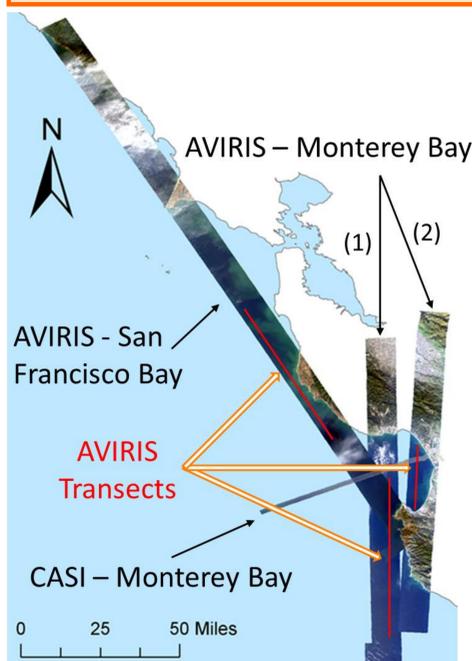
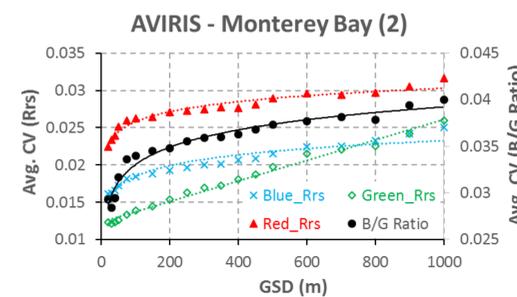
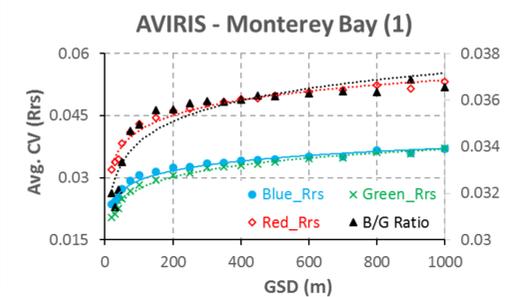
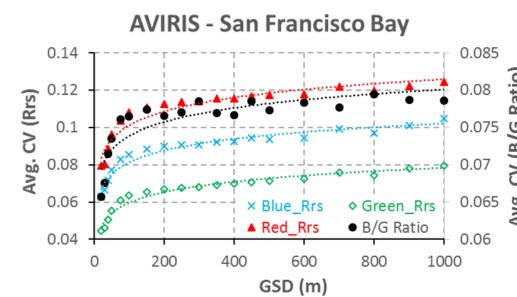
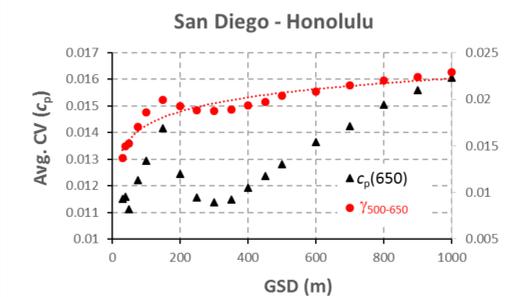
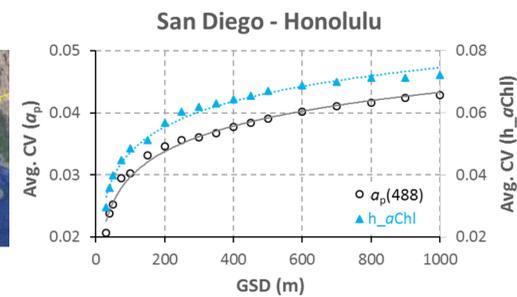
Within-pixel spatial variability is expressed as the Average Coefficient of Variation (Avg. CV) of all data points within a segment (corresponding to the GSD) along a transect.

$$\text{Avg. CV} = \frac{1}{n} \sum_{i=1}^n \left(\frac{\sqrt{\frac{\sum_{j=1}^k (x_{j,i} - \bar{x}_i)^2}{k-1}}}{\bar{x}_i} \right), \text{ where } n \text{ is the number of segments}$$

along a transect, k is the number of data points within a segment, and \bar{x}_i is the average data value within the i^{th} segment

- $\sigma_p(x)$: particulate absorption coefficient at x nm
- $c_p(x)$: particulate beam attenuation coefficient at x nm
- γ_{x-y} : slope of the beam attenuation coefficient between x and y nm
- $b_b(x)$: back-scattering coefficient at x nm
- $k(x)$: diffuse attenuation coefficient at x nm
- $h_{\sigma Chl}$: height of the chlorophyll absorption feature near 675 nm above a baseline between 650 and 700 nm.

Salinity, Temperature, Reflectance (Rrs), Blue(443 nm)/Green(553) Rrs Ratio, and Radiance



Discussion/Conclusions

- Natural breaks in the relationship between the average within-pixel variation and the spatial resolution indicate threshold points beyond which decreasing the spatial resolution would yield a significant increase in spatial information.
- Flat portions of the plots indicate regions where changing the spatial resolution results in only marginal change in spatial information
- For near-coast waters, a clear natural break at a GSD of about 200 m suggests a significant increase in spatial information at spatial resolutions smaller than 200 m, with only marginal gain/loss in information for spatial resolutions between 200 m and 1 km.
- For off-shore waters, the break occurs at a higher GSD, at about 500 m.