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

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Using remote sensing for understanding the effects of environmental changes and anthropogenic activities on estuarine and coastal waters requires the capability to measure and track complex biogeophysical and biogeochemical processes in water. A key sensor design consideration is the minimum spatial resolution required to optically resolve estuarine and coastal features and processes that are of interest. Quantitative information on spatial scales of bio-optical variation in near-shore waters and the expected ability to capture this variation at various spatial resolutions would provide a valuable and essential guideline while deciding on the spatial characteristics of a future remote sensor. We have analyzed continuous, along-track measurements of temperature and salinity of water and absorption and scattering properties of particulates and dissolved organic matter collected using flow-through instruments (AC-9, AC-s) deployed from a ship and airborne lidar from Long Island Sound, Gulf of Maine, and the North Pacific Ocean. We analyzed the ratio of sub-pixel variability to between-pixel variability and autocorrelation as a function of spatial sampling interval to understand the trade-off between the spatial resolution of a sensor and the spatial information contained within an image. For example, within coastal waters, we found a clear break in the spatial information content for particulate backscattering and attenuation at a spatial resolution of approximately 200 m. Decreasing the resolution to less than 200 m offered significant gains in spatial information, whereas increasing the spatial resolution beyond 200 m resulted in only moderate loss of spatial information.