An initial assessment of the impact of system spectral response parameters on driving ocean color applications for the GeoXO ocean color instrument (OCX)

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NOAA's Geostationary Extended Observations (GeoXO) program is planning to include a hyperspectral ocean color instrument (OCX) in geostationary orbit slated for operations by the early 2030s. Shared international focus has led to a diverse legacy of space-based remote sensing ocean color missions that have and will continue to provide ocean color products into the future at a variety of spatial, temporal, and spectral resolutions. This work reports on an investigation of the impacts of system spectral response parameters on spectral shape and algal bloom detection for the planned OCX instrument. A dataset of high resolution (1 nm spectral sampling) in-situ spectra of red tide collected with an above water spectrometer, and associated K. brevis cell concentrations, were used to simulate OCX observations of varying system spectral response parameters. The OCX Performance Operational Requirements Document (PORD) level spectral resolution and sampling are varied concurrently and the location of band centers is varied independently. The impacts to the spectral shape using hyperspectral signature analysis, as well as the impacts to two heritage multispectral algal bloom detection algorithms – red band difference (RBD) and Karenia brevis bloom index (KBBI) – are assessed considering both changes in resolution/sampling and band center location. This work provides a quantitative assessment of the impacts of system spectral response requirements on both the spectral shape of observations as well as the algal bloom detection to provide insight on how various instrument performance parameters influence science and operational utility of OCX. Future work will seek to expand this analysis to include a larger dataset that considers additional water cases.

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