Hyperspectral Application of Derivative Spectroscopy

NASA HSI2 (Hyperspectral Imager 2)
North of Maumee Bay State Park
June 21, 2016, Swath 13

Initial SNR 1000:1

SNR improvement

SNR Gain

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<th>VPCA Component Rank</th>
<th>SNR Gain</th>
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After: Ortiz et al. JGLR, 2019; [https://doi.org/10.1016/j.jglr.2019.03.005](https://doi.org/10.1016/j.jglr.2019.03.005); Email: jortiz@kent.edu
VPCA 1 Simulated L8 bands, 30m

VPCA 1 Simulated L8 bands, 3m, Smooth 9x9

VPCA -1 HSI2 10nm, 30 m

VPCA1 HSI2 10nm, 3 m, Smooth 9x9

**Composition:**
Illite, diatoms and phycoerythrin (R=0.94)

Ortiz et al., (HyspIRI 2017; jortiz@kent.edu)
061916 L8 (surface reflectance product), swath15 subset: VPCA decomposition

Actual L8 Image Decomposition

Composition:
- Diatoms (R=0.996)
- Phycocyanin (R=0.993)
- Chl a & carotenoids (R=0.996)

Ortiz et al., (HyspIRI 2017; jortiz@kent.edu)
Indian River Lagoon Brown Tide
*A. lagunensis* from Sentinel-3A

- KSU VPCA spectral decomposition identifies Brown Tide in IRL, Florida
- Spectral signature for *A. lagunensis* in spectral library matches spectral signal extracted from Landsat 8 OLI, Sentinel-3A OLCI
- Landsat 8 OLI, Sentinel-3A OLCI spatial patterns match known Brown tide in Mosquito Creek, IRL
- Cell count concentration for Ochrophyta match pixels values extracted from Sentinel-3A OLCI ($R^2 = 0.92$)

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