HYPER-a

HYPER-SPECTRAL ABSORPTION INSTRUMENT

First *In Situ* Measurements with Hyper-a

- Measurements with Sequoia Scientific's Hyper-a and Sea-Bird Scientific's ac-s collected in East Sound, WA on May 20, 2024, during a period of strong *Noctiluca scintillans* bioluminescence.
- The comparison is not strictly one-to-one, as the two instruments sampled slightly different water volumes.
- The ac-s remain the only mature, routinely available commercial in situ hyperspectral absorption meter.

- Sequoia's Hyper-a, commercially available since 2024 provides much higher spectral resolution, revealing narrow spectral features missed by the ac-s. And extends into the UV (300 nm – 710 nm).

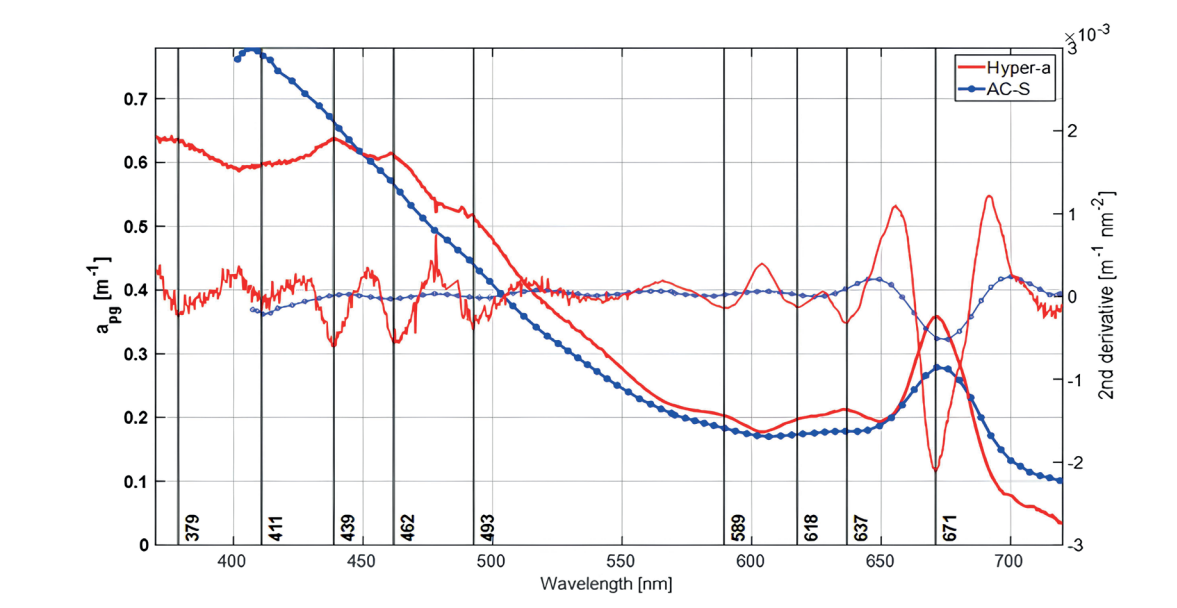

Figure 1. Comparison of hyperspectral absorption measurements (a_{pg}, left y-axis) and their second derivatives (right y-axis) collected on May 20, 2024 in East Sound, Orcas Island, WA, USA. Data from two instruments: Hyper-a (red line) and ac-s (blue line with markers). Prominent absorption features are seen at 379, 411, 439, 462, 493, 589, 618, 637, and 671 nm, corresponding to known pigment signatures in Chaetoceros socialis and Pyrocystis fusiformis populations present during the Noctiluca scintillans bloom. Second-derivative spectra are overlaid to highlight band minima.

SEQUOIA
Tools and Research for Particle Intelligence

Both instruments capture the main absorption envelope, confirming consistent total pigment absorption and show overall shape agreement. Hyper-a has a spectral resolution advantage: Its dual-spectrometer, hyperspectral system (~2 nm resolution) detects narrow pigment features that the ac-s (with ~4–10 nm spacing) does not resolve.

- The 440–460 nm maximum is diagnostic of peridinin-containing dinoflagellates, confirming Noctiluca's carotenoid signature. The broad peridinin band (440–470 nm) appears smoother and slightly stronger in Hyper-a, while ac-s underestimates the peak amplitude.
- Hyper-a resolves finer structure: Around 500–550 nm, Hyper-a shows subtle curvature and a defined minimum, while ac-s produces a flatter, featureless response.
- The valley around 550 nm represents the green window where peridinin and chlorophyll absorb weakly — this gives Noctiluca its orange-brown appearance.
- The 675 nm chlorophyll-a peak confirms the presence of photosynthetic pigments (though Noctiluca is mixotrophic, not a strong chlorophyll producer).

Data, figures, and descriptions courtesy of Alberto Tonizzo, Chris Strait, Mike Twardowski, Sunstone Scientific LLC, and Florida Atlantic University – HBOI, USA.The Hyper-a was developedwith NASA SBIR funds on contracts #80NSSC20C0472 and 80NSSC21C0491 to Sequoia Scientific, Inc. with Sunstone Scientific, LLC as subcontractor.

More information: info@sequoiasci.com • https://www.sequoiasci.com/product/hyper-a/

Figure 2. Email us for more Hyper-a information!

Figure 3. Hyper-a webpage link

Sequoia Scientific, Inc.
2700 Richards Road, Suite 107
Bellevue, WA 98005 USA
Tel +1 (855) 753-3313
email info@SequoiaSci.com
www.SequoiaSci.com

SEQUOIA
Tools and Research for Particle Intelligence

SUNSTONE SCIENTIFIC

FLORIDA ATLANTIC UNIVERSITY
Harbor Branch Oceanographic Institute