NOAA 2019 update: in situ validation activities for satellite ocean color products and related ocean science research

Abstract

The National Oceanic and Atmospheric Administration (NOAA), Center for Satellite Applications and Research, Ocean Color team takes an "end-to-end" approach to the production of near real time and delayed mode high quality satellite ocean color products that support research and applications by all NOAA Line Offices, as well as external users in the government, academic, commercial and general public sectors. In situ validation of satellite data is essential to the process. In May 2019, the fifth annual NOAA research cruise dedicated to the primary objective of ocean color calibration and validation (Cal/Val) for the Visible Infrared Radiometer Suite (VIIRS) onboard the Suomi National Polar-orbiting Partnership (SNPP) and the NOAA-20 satellites will be conducted with ship board support by the NOAA Office of Marine and Aviation Operations. On these cruises, in situ radiometric observations are made of apparent optical properties (e.g., remote sensing reflectance) and inherent optical properties (e.g., absorption and backscattering coefficients) along with other optical, biological and biogeochemical parameters. Cruise activities are documented in NOAA Technical Reports: November 2014 (Report #146, https://dx.doi.org/10.7289/V52B8WQZ); December 2015 (Report #148, https://dx.doi.org/10.7289/V5/TR-NESDIS-148); October 2016 (Report #151, https://doi.org/10.7289/V5/TR-NESDIS-151). The technical report for the May 2018 cruise is currently in progress. NOAA CoastWatch/OceanWatch is developing a database for in situ observations in support of satellite validation. Datasets from NOAA Cal/Val cruises are in the process of being archived and will be publicly accessible through NOAA National Centers for Environmental Information. The NOAA Ocean Color Cal/Val team, composed of NOAA and external academic principal investigators, also collaborates with other investigators and field programs to leverage in situ observations for satellite validation and for algorithm development. The NOAA optical sensor calibration laboratory with NIST traceable materials is operated in College Park. NOAA also supports the operation of four AERONET-OC sites in US coastal and inland waters.

1) Four NOAA Dedicated VIIRS Cal/Val Cruises to date.

- In water profiling, surface floating and above water ocean radiometry
- Apparent Optical Properties (AOPs)
- Inherent Optical Properties (IOPs)
- Aerosol optical thickness
- Flow-through continuous measurements
- IOPs
- Phytoplankton characterization
- Discrete water sampling and analyses

Fig. 2. Report covers (from left to right) first cruise November 2014, second cruise December 2015, third cruise October 2016.

2) Collaborations and cruises of opportunity

- External/International
  - South Korea (KORUS)
  - Australia
    - CSIRO So. Pacific
    - CORAL PRISM Great Barrier Reef
    - AIMS (Planning)
  - Indian Ocean (upcoming)

3) NOAA Optical Instrument Calibration Lab

Fig. 4. Mike Ondrusek and Eric Stegeli in the NOAA optical lab performing instrument calibrations

4) NOAA supports:

- Marine Optical Buoy (MOBY)

Fig. 5. MOBY

5) Data Distribution, Repository and Archiving

NOAA CoastWatch/OceanWatch will serve as a repository and support an in situ data portal. NCEI formally stewards and archives the cruise data collections.

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Fig. 6. Lake Erie AERONET-OC platform USCG Light #2 operated by NOAA Great Lakes Environmental Research Laboratory and University of New Hampshire.

Fig. 7. Early layout for the beta GUI interface for the in situ ocean color database.

Fig. 8. NOAA VIIRS Cal/Val Cruise will be May 2019. Charleston to Key West. Aboard the NOAA Ship Nancy Foster.