Opportunity Title: Remote Sensing and Analyses of Coastal and Inland Waters: Biodiversity, Water Quality, and Ecosystems Research
Opportunity Reference Code: 0127-NPP-MAR24-ARC-EarthSci

Organization National Aeronautics and Space Administration (NASA)

Reference Code 0127-NPP-MAR24-ARC-EarthSci

How to Apply All applications must be submitted in Zintellect

Application Deadline 3/1/2024 6:00:59 PM Eastern Time Zone

Description **Description:**

Worldwide, coastal marine and inland water ecosystems are exposed to land-based sources of pollution and sedimentation from anthropogenic activities including agriculture and coastal development and experiencing impacts from extreme events and changing climate. Ocean color products from satellite sensors provide information on chlorophyll (phytoplankton pigment), sediments, and colored dissolved organic material. Further, ship/field-based in-water measurements and emerging airborne measurements (e.g., hyperspectral and radiometry) provide in situ data for the vicarious calibration of current and next-generation satellite ocean color sensors (Plankton, Cloud, Aerosol, ocean Ecosystem [PACE] Ocean Color Instrument), including simulation of the Decadal Survey Surface Biology and Geology (SBG) hyperspectral and thermal infrared Designated Observable (DO) of the Earth System Observatory (ESO). Further, these observations support validation and testing of existing and new algorithms for coastal and inland waters and for the study of inland and coastal aquatic ecosystems physiology, functional traits, and health.

Relevant NASA airborne campaigns include 1) C-HARRIER: Monterey Bay and Elkhorn Slough, CA, San Pablo and Grizzly Bays, and inland water bodies (Pinto Lake and San Luis Reservoir), 2) BioSCape: inland waters of South Africa (Zeekoevlei, Rietvlei, Theewaterskloof Reservoir, and Klein River Lagoon), and 3) upcoming 2024 AirSHARP: Monterey Bay. All campaigns are in concert with ship/field-based measurements (e.g., radiometry, hyperspectral, water samples for pigments and nutrients) and have demonstrated novel above- and in-water measurement capabilities supporting a combined airborne sensor approach (imaging spectrometer, microradiometers, and have included a sun photometer for some of the CA flights), focused flights with the radiometers for calibration and validation of high-altitude airborne flights and satellite ocean color data. The results characterize coastal atmospheric and aquatic properties through an end-to-end assessment of image acquisition, atmospheric correction, algorithm application, plus sea-truth observations from state-of-the-art instrument systems.

There are many properties of biological interest in the coastal ocean, e.g., coral reefs, kelp beds, river plumes, and phytoplankton including harmful algal blooms (HABs), and similar targets at the land/sea interface (e.g. estuaries/lagoons, coastal lakes). Measurements of these features are important for understanding coastal ecosystems dynamics, biodiversity, water quality, the linkages with land-based sources of pollution, and impacts (e.g., climate change) in coastal regions. However, there are

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remote sensing challenges in coastal areas and inland waters particularly regarding accurate retrieval of “ocean color” (or aquatic “color”) and benthic ecosystem reflectance as well as atmospheric correction. In coastal areas, there are highly variable radiance signals (deep water to the coastal edge) and there are higher signal (SNR) requirement over water than for land targets. For atmospheric correction, aerosol and trace gas plumes from continental sources complicate the task of atmospheric correction and there are challenges using current algorithms for coastal regions.

We seek candidates with expertise in the following topic areas and with applicable expertise in radiometry and optics (e.g., field spectroscopy, ship-based bio-optical measurements and sampling), atmospheric correction (e.g., satellite and airborne data, imaging spectrometer), coastal and inland waters algorithms, satellite (and airborne) remote sensing data processing, coding expertise (e.g., IDL, MATLAB, Python, etc.) and interest in pursuing research and open science in:

1. Aligned work with the NASA PACE Mission and SBG ESO DO and relevant airborne simulations for SBG - Use of existing and developing algorithms for coastal aquatics research (e.g., water quality and ecosystems) that utilize existing and new satellite and airborne data as well as synthetic datasets for the study of inland and/or coastal aquatic ecosystems physiology, functional traits, and health.

2. Atmospheric correction in inland and/or coastal areas – Design a research project for exploring existing atmospheric correction approaches using airborne data and in-situ measurements.

3. Airborne remote sensing of coastal waters and ecosystems – Develop research topics (inland and coastal water quality and ecosystems) utilizing existing airborne data in coastal California and planning new airborne missions.

4. Airborne instrument radiometry (including sun photometry) and hyperspectral data algorithm development for inland and/or coastal aquatic ecosystems physiology, functional traits, and health. Work includes the design of airborne mission flight plans/concepts, data acquisition, data output, and data analyses and algorithms supporting coastal remote sensing research including water quality (water-leaving radiance), deriving aerosol optical depth, and ecosystems (e.g., kelp, coral reefs)

Note: Excellent proficiency in communication and writing in English is required.

Field of Science: Earth Science

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Eligibility Requirements	• **Citizenship:** LPR or U.S. Citizen • **Degree:** Doctoral Degree.