Remote Sensing of Inland and Coastal Waters: Current Status, Challenges, Research Priorities, and End-User Engagement

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Session Description

Remote sensing of inland and coastal waters has unique challenges due to factors such as the high temporal and spatial variability of in-water optical conditions, continentality and optical heterogeneity of the atmosphere above water, complexity of shorelines, and contamination of reflected light by adjacent land. The widely variable and complex optical conditions encountered in these waters often invalidate some basic assumptions in typical atmospheric correction schemes and make it very challenging to develop bio-optical algorithms that can perform consistently well in retrieving biophysical parameters. The smaller spatial extent, optical complexity, and temporal dynamism of inland and coastal waters often make the spatial, spectral, and temporal resolutions of current sensors inadequate for monitoring water quality. At the global scale, these challenges are compounded further by inconsistencies in the acquisition, processing, and quality control of in situ and satellite data. Nevertheless, in spite of these and other challenges, there is an urgent need for reliable remote sensing techniques to operationally monitor these important aquatic resources – a need that is well understood and agreed upon by the research community and operational environmental monitoring agencies worldwide. A number of projects have now made significant progress in this area. This breakout workshop provides an opportunity to review this progress and identify the research priorities going forward. The focus of this session will be on highlighting existing gaps in instrumentation, technology, and algorithm development for operational inland and coastal remote sensing and providing recommendations for bridging the gaps.

This session will consist of presentations and discussions addressing the following questions related to remote sensing of inland and coastal waters:

Q1. Atmospheric Correction: Given that the atmospheric, environmental, and water quality conditions in and around inland and coastal waters often invalidate some basic assumptions in typical atmospheric correction schemes, what advances are needed in algorithm development/validation and instrumentation to ensure reliable atmospheric correction of inland and coastal water remote sensing data?

Q2. Bio-optical modeling: Given that inland and coastal waters often contain extreme and widely ranging constituent concentrations, what is the best approach for developing operational algorithms?

Q3. Sensor Characteristics and Product Consistency/Continuity: What are the minimum/optimum spatial, spectral, and temporal resolutions needed for remote monitoring of inland and coastal waters? Can a synergistic approach involving multiple sensors, taking advantage of desirable spatial, spectral, or temporal characteristics of each sensor, be adopted for effective monitoring of inland and coastal waters? How important is it to maintain consistency in and continuity of specific water quality products and what measures are needed to achieve it using data from multiple sensors?

Q4. Operational Monitoring: From the standpoint of operational monitoring of critical inland and coastal aquatic resources, what are the most important challenges from a user/application perspective, and what are the gaps in existing technology/algorithms for operational product generation, validation, data dissemination, capacity building, citizen education, and user engagement?

Agenda:

14:00 – 14:05: Introduction and Outline of the Session - Paul DiGiacomo

Q1. Atmospheric Correction (Moderator: Wes Moses):

14:05 – 14:25: Atmospheric Correction for Coastal and Inland Waters – Current Capabilities and Challenges Nima Pahlevan)
14:25 – 14:45: Discussion on the challenges in atmospheric correction

Q2. Bio-optical Modeling (Moderator: Andrew Tyler):

14:45 – 15:00: Do You Really Need Optical Water Types? (Timothy Moore)
15:00 – 15:15: Optical Water Type Guided Selection of Algorithms for Global Remote Sensing of Lake Biogeochemical Properties (Evangelos Spyrakos)
15:15 – 15:35: Discussion on the challenges in bio-optical modeling

Q3: Sensor Characteristics and Product Consistency/Continuity (Moderator: Nima Pahlevan):

15:35 – 15:45: Desired Sensor Characteristics for Coastal and Inland Water Monitoring (Wes Moses)
15:45 – 16:00: Discussion on sensor characteristics and product consistency/continuity

Q4: Operational Monitoring (Moderator: Carsten Brockmann):

16:00 – 16:15: The Copernicus Inland Water Service of the European Union (Carsten Brockmann)
16:15 – 16:30: GEO AquaWatch: The Development of a Global Water Quality Monitoring Service (Steve Greb)
16:30 – 16:45: Discussion on operational monitoring and session adjournment