Remote Sensing of Water Quality: Bridging Operational and Applications Communities

How Can Remote Sensing Address Information Needs and Gaps in Water Quality and Quantity Management?; Cincinnati, Ohio, 28 April–2 May 2014

PAGE 354

One of the highest priorities of the NASA Applied Sciences Program (ASP) is to benefit society by supporting the development of tools, services, and applications that leverage Earth observations (EO) and satellite assets, and their transfer to operations. Toward this goal, the Water Resources Application Area of ASP has been exploring how satellite remote sensing could contribute to water quality monitoring decisions and practices and organized a workshop at the biennial National Water Quality Monitoring Conference 2014 in Cincinnati, Ohio.

This meeting provided an overview of satellite remote sensing for water quality, discussed case studies, and strengthened communications between water quality managers and the applied remote sensing research community. By cultivating a better understanding of water quality information needs and data gaps, ASP can facilitate a mechanism for applying satellite remote sensing to help address identified gaps.

Workshop attendees identified themselves as primarily researchers who can inform water quality monitoring goals or practices at federal, state, and local water agencies; a small subset of attendees were from academia. Discussions focused on the pros and cons of using satellite-based information for water quality monitoring. Benefits include the availability of satellite data from U.S. federal agencies, which are free for stakeholder use. EO could also complement existing monitoring efforts by improving both spatial and temporal coverage.

Specifically, attendees were interested in how EO satellites could be used to obtain information about remote sites or locations that could not be easily accessed. One stated priority is monitoring the timing and extent of algal blooms and pollution events such as thermal spills. Identified limitations of satellitebased EO included monitoring inland streams, rivers, and water bodies smaller than the pixel resolution of platforms such as Landsat, the Moderate Resolution Imaging Spectroradiometer (MODIS), and the upcoming Sentinel-3. Water clarity, trophic status, harmful algal blooms, chlorophyll-a, sediment, temperature, nutrients, dissolved oxygen, and microorganisms/pathogens were all identified as priority water quality constituents by workshop attendees. However, workshop

discussions clarified that certain variables cannot be directly measured by satellites, including nutrients, dissolved oxygen, and microorganisms/pathogens. Future research challenges include addressing land adjacency effects and the lack of atmospheric correction algorithms for smaller, inland water bodies or coastal zones, which are otherwise welldeveloped for open ocean environments.

Finally, attendees identified potential pilot projects to provide examples of how remote sensing could be used for water quality monitoring. Several pilot project ideas were proposed, including the use of remote sensing to characterize the extent of algal blooms in North Carolina estuaries, a review of the current utility of hyperspectral remote sensing data for water quality applications, and the use of satellite remote sensing to monitor the impacts of drought on vegetation and perennial streams in the Los Angeles River Watershed. NASA ASP will work to identify science experts to act as advisors for each pilot project.

Additional resources can be found by visiting http://appliedsciences.nasa.gov and http://develop.larc.nasa.gov.

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