



Review

Aquatic color radiometry remote sensing of coastal and inland waters: Challenges and recommendations for future satellite missions



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ABSTRACT

Aquatic color radiometry remote sensing of coastal and inland water bodies is of great interest to a wide variety of research, management, and commercial entities as well as the general public. However, most current satellite radiometers were primarily designed for observing the global ocean and not necessarily for observing coastal and inland waters. Therefore, deriving coastal and inland aquatic applications from existing sensors is challenging. We describe the current and desired state of the science and highlight unresolved issues in four fundamental elements of aquatic satellite remote sensing namely, mission capability, in situ observations, algorithm development, and operational capacity. We discuss solutions, future plans, and recommendations that directly affect the science and societal impact of future missions with capability for observing coastal and inland aquatic systems.

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1. Introduction and background

Coastal and inland water bodies have a direct interface with society, providing value for recreation, food supply, commerce, transportation, and human health. Coastal waters are defined here as those within close enough proximity to land for terrestrial processes to impact water constituents. Inland waters refer to fresh or brackish water bodies of sufficient size to have several observable pixels from current and future spaceborne sensors. Due to the close proximity of human population to these waters, they are under pressure from direct human activities as well as climate change (Allan et al., 2013; Halpern et al., 2008). Understanding the issues of water quality and the impact of

environmental change on the ecological and biogeochemical function of these water bodies is of interest to a broad range of communities. Remote sensing offers one of the most spatially and temporally comprehensive tools for observing these waters (NRC (National Research Council), 2011), yet for a variety of reasons, researchers and managers today still face many similar challenges as four decades ago (Bukata, 2013; Palmer, Kutser, & Hunter, 2015b). Drawing from discussions at a recent workshop on remote sensing of coastal and inland waters (Mouw & Greb, 2012), we provide here a comprehensive review of the current status of and challenges in remote sensing of coastal and inland waters, with recommendations for future satellite missions. The review is focused on aquatic color radiometry covering the spectral range

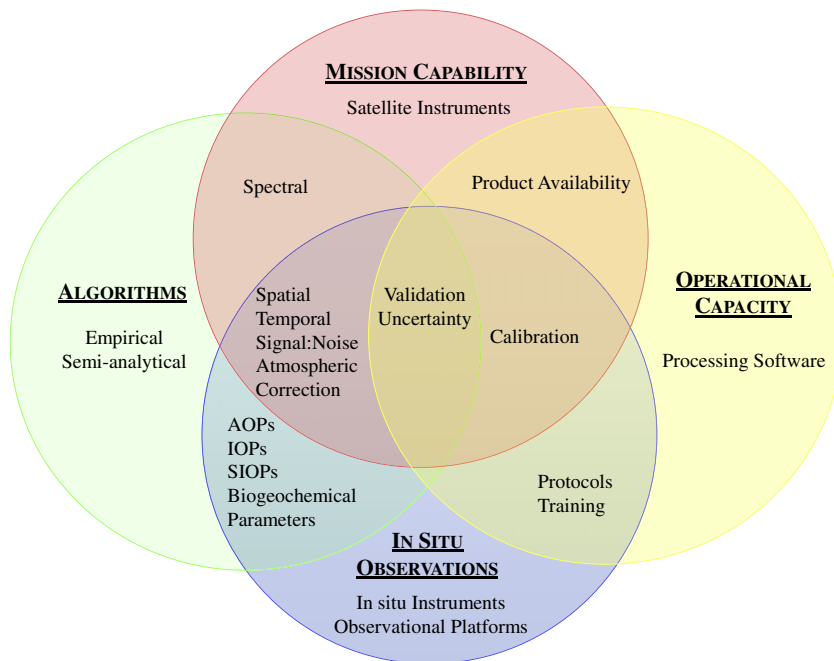


Fig. 1. Integration schematic of the fundamental elements of aquatic color satellite remote sensing.

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