A Glow from Below: **Bioluminescent Milky Seas and their Role in the Earth System**

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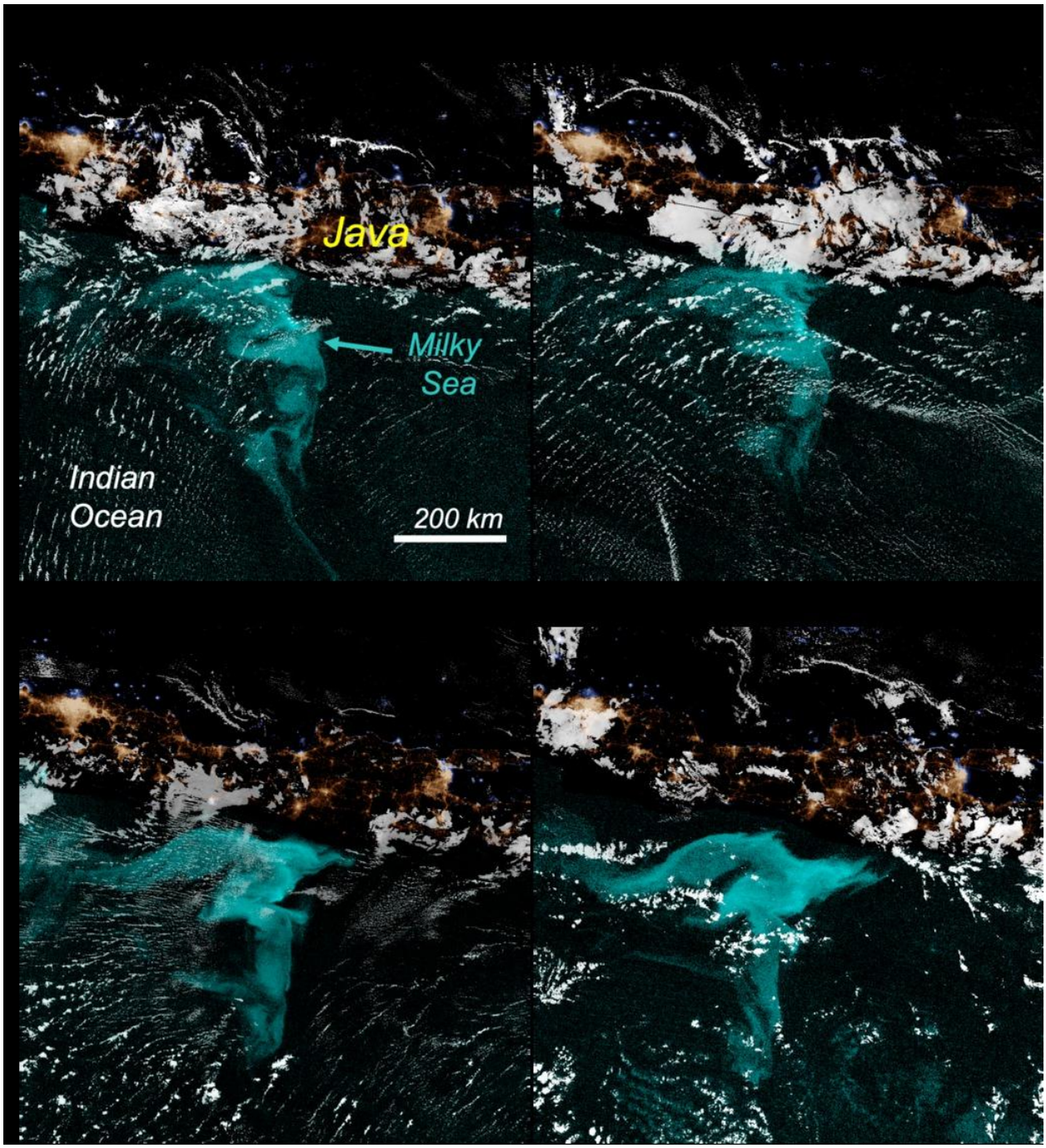
'Milky seas' describe an obscure nocturnal marine bioluminescence phenomenon in which wide swaths of ocean to glow steadily. Mariners describe them appearing as a daylit snowfield under dark, moonless skies, and extending to the horizon in all directions. Their pallid glow imparts the sensation of hovering above a the clouds, with the luminous ocean casting underlighting the clouds and causing an aurora-like glow on the horizon.. Milky seas are thought to be caused by luminous bacteria, producing light upon achieving high populations (~10^8 cells/mL) via a process called quorum sensing. However, sailor accounts paint an inconsistent picture of milky seas in terms of their composition and structure. On the macroscale, their occurrence correlates with modes of the Indian Monsoon and Indian Ocean Dipole. However, the local environmental conditions supporting milky sea formation remain unclear—making it difficult to anticipate and intercept future events. Environmental satellites, carrying low-light sensors which survey the entire earth multiple times per day, offer our best way of guiding us toward new knowledge.

A new-generation of low-light visible satellite sensors—the Day/Night Band (DNB) on NOAA's Visible Infrared Imaging Radiometer Suite (VIIRS)—reveals an ability to detect and quantify milky seas in unprecedented detail. Since its launch in 2011, the DNB has documented over 10 cases of steadily-glowing waters within the historically reported 'hot-bed zones' of the Arabian/Somali Sea and Maritime Continent. These waters drift along with the currents, adjacent to regions of higher chlorophyll-A, and last for days up to weeks. Here we highlight a prominent milky sea from mid-2019 which spanned 100,000 km^2 (the same size as Iceland) and persisted for at least 40 nights south of Java. The event yielded the first known photos from a yacht crew who sailed through a narrow section of its southern boundary. Satellite-retrieved water temperature, biomass properties, and ocean current dynamics suggest a '*Natural Flask*' mechanism that forms an isolated habitat conducive to luminous bacteria proliferation. The study of milky seas opens new doors for marine ecology and coupled air-sea-biosphere studies geared toward understanding major responses of primary production (and the global carbon sink) to a changing climate.


Java
Milky
Sea
Indian
Ocean
200 km