

ID: W2941857669

TITLE: Globally Consistent Quantitative Observations of Planktonic Ecosystems

AUTHOR: ['Fabien Lombard', 'Emmanuel Boss', 'Anya M. Waite', 'Meike Vogt', 'Julia Uitz', 'Lars Stemmann', 'Heidi M. Sosik', 'Jan Schulz', 'Jean-Baptiste Romagnan', 'Marc Picheral', 'Jay Pearlman', 'M D Ohman', 'Barbara Niehoff', 'Klas Ove Möller', 'Patricia Miloslavich', 'Ana Lara-Lpez', 'Raphael M. Kudela', 'Rubens M. Lopes', 'Rainer Kiko', 'Lee Karp-Boss', 'Jules S. Jaffe', 'Morten Hvitfeldt Iversen', 'Jean-Olivier Irisson', 'Katja Fennel', 'Helena Hauss', 'Lionel Guidi', 'Gaby Gorsky', 'Sarah L. C. Giering', 'Peter Gaube', 'Scott M. Gallager', 'G. B. J. Dubelaar', 'Robert K. Cowen', 'François Carlotti', 'Christian Briseño-Avena', 'Léo Berline', 'Kelly J. Benoit-Bird', 'Nicholas J. Bax', 'Sonia D. Batten', 'Sakina-Dorothee Ayata', 'Luis Felipe Artigas', 'Ward Appeltans']

ABSTRACT:

In this paper we review on the technologies available to make globally quantitative observations of particles, in general, and plankton, in particular, in the world oceans, and for sizes varying from sub-micron to centimeters. Some of these technologies have been available for years while others have only recently emerged. Use of these technologies is critical to improve understanding of the processes that control abundances, distributions and composition of plankton, provide data necessary to constrain and improve ecosystem and biogeochemical models, and forecast changes in marine ecosystems in light of climate change. In this paper we begin by providing the motivation for plankton observations, quantification and diversity qualification on a global scale. We then expand on the state-of-the-art, detailing a variety of relevant and (mostly) mature technologies and measurements, including bulk measurements of plankton, pigment composition, uses of genomic, optical, acoustical methods and analysis using particles counters, flow cytometers and quantitative imaging devices. We follow by highlighting the requirements necessary for a plankton observing system, the approach to achieve it and associated challenges. We conclude with ranked action-item recommendations for the next ten years to move towards our vision of a holistic ocean-wide plankton observing system. Particularly, we suggest to begin with a demonstration project on a GO-SHIP line and/or a long-term observation site and expand from there ensuring that issues associated with methods, observation tools, data analysis, quality assessment and curation are addressed early in the implementation. Global coordination is key for the success of this vision and will bring new insights on processes associated with nutrient regeneration, ocean production, fisheries, and carbon sequestration.

SOURCE: Frontiers in marine science

PDF URL: <https://www.frontiersin.org/articles/10.3389/fmars.2019.00196/pdf>

CITED BY COUNT: 232

PUBLICATION YEAR: 2019

TYPE: article

CONCEPTS: ['Plankton', 'Computer science', 'Marine ecosystem', 'Environmental science', 'Temporal scales', 'Ecosystem', 'Variety (cybernetics)', 'Environmental resource management', 'Data science', 'Remote sensing', 'Ecology', 'Biology', 'Geography', 'Artificial intelligence']