

ID: W2959012558

TITLE: Toward the Integrated Marine Debris Observing System

AUTHOR: ['Nikolai Maximenko', 'Paolo Corradi', 'Kara Lavender Law', 'Erik van Sebille', 'Shungudzemwoyo P. Garaba', 'Richard S. Lampitt', 'François Galgani', 'Victor Martinez-Vicente', 'Lonneke Goddijn-Murphy', 'Joana Mira Veiga', 'Richard C. Thompson', 'Christophe Maes', 'Delwyn Moller', 'Carolyn R. Löscher', 'Anna Maria Addamo', 'Megan Lamson', 'Luca Centurioni', 'Nicole R. Posth', 'Rick Lumpkin', 'Matteo Vinci', 'Ana Martins', 'Catharina Pieper', 'Atsuhiko Isobe', 'Georg Hanke', 'Margo H. Edwards', 'Irina Chubarenko', 'Ernesto Rodríguez', 'Stefano Aliani', 'Manuel Arias', 'Gregory P. Asner', 'Alberto Brosich', 'James T. Carlton', 'Yi Chao', 'Anna-Marie Cook', 'Andrew B. Cundy', 'Tamara S. Galloway', 'Alessandra Giorgetti', 'Gustavo Goñi', 'Yann Guichoux', 'Linsey E. Haram', 'Britta Denise Hardesty', 'Neil Holdsworth', 'Laurent Lebreton', 'H.A. Leslie', 'Ilan Macadam-Somer', 'Thomas H. Mace', 'Mark Manuel', 'Robert Marsh', 'Élodie Martinez', 'Daniel J. Mayor', 'Morgan Le Moigne', 'Maria Eugenia Molina Jack', 'Matthew C. Mowlem', 'R. W. Obbard', 'Katsiaryna Pabortsava', 'Bill Robberson', 'Aurelian Rotaru', 'Gregory M. Ruiz', 'María Teresa Spedicato', 'Martín Thiel', 'Alexander Turra', 'Chris Wilcox']

ABSTRACT:

Plastics and other artificial materials pose new risks to health of the ocean. Anthropogenic debris travels across large distances and is ubiquitous in the water and on the shorelines, yet, observations of its sources, composition, pathways and distributions in the ocean are very sparse and inaccurate. Total amounts of plastics and other man-made debris in the ocean and on the shore, temporal trends in these amounts under exponentially increasing production, as well as degradation processes, vertical fluxes and time scales are largely unknown. Present ocean circulation models are not able to accurately simulate drift of debris because of its complex hydrodynamics. In this paper we discuss the structure of the future integrated marine debris observing system (IMDOS) that is required to provide long-term monitoring of the state of the anthropogenic pollution and support operational activities to mitigate impacts on the ecosystem and safety of maritime activity. The proposed observing system integrates remote sensing and in situ observations. Also, models are used to optimize the design of the system and, in turn, they will be gradually improved using the products of the system. Remote sensing technologies will provide spatially coherent coverage and consistent surveying time series at local to global scale. Optical sensors, including high-resolution imaging, multi- and hyperspectral, fluorescence, and Raman technologies, as well as SAR will be used to measure different types of debris. They will be implemented in a variety of platforms, from hand-held tools to ship-, buoy-, aircraft-, and satellite-based sensors. A network of in situ observations, including reports from volunteers, citizen scientists and ships of opportunity, will be developed to provide data for calibration/validation of remote sensors and to monitor the spread of plastic pollution and other marine debris. IMDOS will interact with other observing systems monitoring physical, chemical, and biological processes in the ocean and on shorelines as well as state of the ecosystem, maritime activities and safety, drift of sea ice, etc. The synthesized data will support innovative multi-disciplinary research and serve diverse community of users.

SOURCE: Frontiers in marine science

PDF URL: <https://www.frontiersin.org/articles/10.3389/fmars.2019.00447/pdf>

CITED BY COUNT: 194

PUBLICATION YEAR: 2019

TYPE: article

CONCEPTS: ['Environmental science', 'Remote sensing', 'Buoy', 'Debris', 'Temporal scales', 'Shore', 'Marine debris', 'Computer science', 'Geology', 'Oceanography', 'Ecology', 'Biology']