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A 6TH GYRE: REMOTE TRACKING OF ARCTIC OCEAN PLASTICS

Abstract

There is a growing concern over the ubiquitous distribution of plastic pollution that is evolving in the Beaufort Gyre in the Arctic Ocean, prompting international collaboration and new environmental measures. Despite an exponential increase in the amount of data on plastic in the five ocean gyres using space technologies (i.e. satellites) and applications, trends in the Arctic Ocean remain scarce, requiring innovative solutions to monitor the growing situation. The geophysical characteristics and presence of sea ice make it difficult for current technologies, specifically Earth observation (EO), to detect and track microplastic. Marine pollution is recognized as an immediate threat to both land and marine ecosystems. Satellites have proven useful in identifying ocean plastic patches and current movements in other oceans but little research has been applied to the Arctic, a region that impacts eight countries making up the Arctic Circle. This is in part because plastics are less observed compared to melting ice caps. Nonetheless, as noted by environmentalists and academics, waiting until an ecological problem becomes a disaster only exacerbates the situation. Moreover, as sea ice melts, new economic opportunities for marine activities including new trade routes (i.e. Transpolar Sea Route), fishing locations, and resource exploitation will lead to increased pollution. Due to the expanse of the Arctic Ocean, its frozen characteristics, and developing plastics problem, adapting current space technologies and applications to monitor and track plastics on the surface, in the ice, and below the surface could be a solution for tackling the problem before it meets the level of the existing five Gyres. This interdisciplinary team project paper investigates the use of Sentinel-2, Sentinel-6, Fourier Transform Spectroscopy, stratospheric balloons, and autonomous

underwater vehicles to provide an integrated strategy, including communication and outreach, to tackling marine plastic pollution while recognizing that it is necessary to also prevent plastics from entering the ocean in the first place. The general cost of the operations was considered in tandem with an overview of the financial loss and societal burden of ocean plastic. Included in the paper is a proposal for the enhancement of the Arctic Council using scientific diplomacy and best practices for marine debris management and recommendations for future research.