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A VIEW FROM ABOVE: HARNESSING EARTH OBSERVATION, HUMAN MOBILITY, AND ANIMAL ECOLOGY DATA TO MONITOR MARINE CHANGE IN THE ANTHROPOCENE

Abstract

To monitor the changing Earth system in the Anthropocene there is a clear need to harness existing, and leverage new technologies. Decision makers need targeted information to enable them to implement appropriate and effective mitigation strategies. However, to achieve the Sustainable Development Goals (SDGs) as laid out by the United Nations, and to enable sustainable positive change using satellite-based products, there needs to be increased collaboration between Science, Industry and Policy. The increasing pressures from human activity on the ocean have resulted in measurable impacts on 66% of the ocean, including rapid declines in marine biodiversity. As such, the ocean reveals itself as the perfect setting to further such partnerships. Here we demonstrate several high-impact use cases from the marine science industry with a wide range of environmental, societal, and economic implications from an academic perspective. By combining the fields of Earth observation, human mobility, and animal ecology, we show how satellite-based data can fuel downstream use-cases and create tangible impact at the global scale. We show (1) how the VIIRS Boat Detection data was used to track the pulses and pauses in maritime traffic during the COVID-19 pandemic; (2) how the ARGOS and AIS systems revealed areas of high shipping and endangered species conflict, and (3) how a suite of EOVs led to the first global map of future habitats under climate change for the largest fish on Earth. These diverse scenarios showcase how leveraging collective systems can support ground-breaking science, leading to sustainable growth, and ultimately, increased levels of protection for the ocean and its inhabitants. As with many initiatives in marine science and conservation, particularly change monitoring, these projects were developed to answer a specific set of questions, in which satellite derived products were sought out for scalability. However, this approach is inherently limiting. What could we achieve with greater collaboration, if the research and development pipeline was reversed, and satellite-based technologies were developed alongside research aims and outputs? While we provide several key examples of data fusion, to achieve ongoing SDGs increased collaboration and two-way communication is required between the wider space community and end-users to ensure collective goals are being realised.