

Using Satellite Telemetry to Track the Movement of Plastic

A case study conducted in Indonesia

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The Indonesian archipelago is rated globally the second contributor to marine plastic litter pollution. This has driven the government to increase its efforts to combat plastic pollution. Lack of systematic collection means that it often ends up in rivers and ultimately into the seas. With funding from the World Bank, the government of Indonesia set up an initiative to track the movement of plastic through a hybrid observation & model approach to determine the location of accumulation areas.

Introduction

Around 200,000 metric tons of plastic waste is discharged from Indonesia rivers mainly from Java and Sumatra Islands every year. It is very important to study the seasonal pattern of marine debris and monitor the dispersion within Indonesian waters in order to maximize the effectiveness of clean up operations and minimize environmental damage.

Marine debris is influenced by winds and current which change depending on time. For this reason, it is important to take all 3 of these factors into consideration. The simulation will forecast the time and location where the marine debris is expected to traverse and become stranded in each season.

The study hopes to improve the mitigation, better coordinative action plans and encouraging further marine debris research in Indonesia and Australia.

Materials and Methods

Monitoring and simulation of marine debris movement in this study is conducted using a web-platform which combines data acquired from Argos satellite drifters and CLS modelling tool, called Mobidrift. The combined use of predictive models and satellite drifting beacons is designed to optimise the accuracy of results and improve the model for future reference.

The MDC web portal has provided a comprehensive and integrated platform for macro-plastics drift studies at national scale in Indonesia. This platform is able to visualize not only In-situ data acquired from MAR-GE/T drifters, but to overlay the tracks onto a drift model that predicts the movement of plastic debris according to meteorological and oceanographic forces.



Figure 1: MARGET-II Argos drifter tracks displayed on the MDC web portal.

Materials and Methods cont...

Argos satellite-based drifters are used to generate near real time data of marine litter movements at sea (Figure 1). The movement of these drifters can be monitored without any coverage limitation, or threat of communication disruption.



Figure 2: The next generation of Argos drifting beacons. Made to be biodegradable and compatible with the Kineis satellite constellation

A goniometer can be used to pick up on the satellite signal and locate the beacons after it had been deployed. This allows for re-use of the beacons.

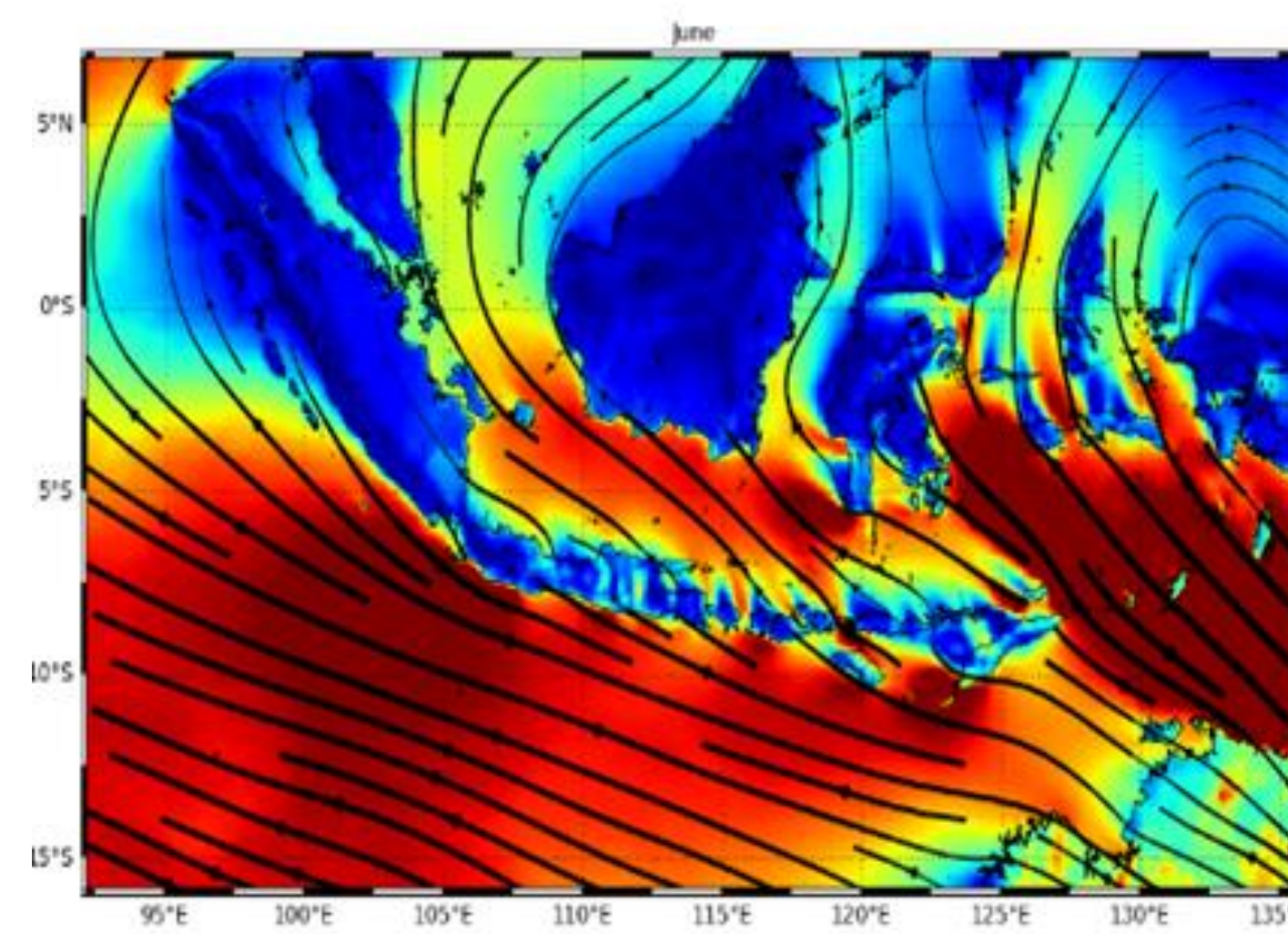


Figure 3: Windfields Models: GFS NCEP.

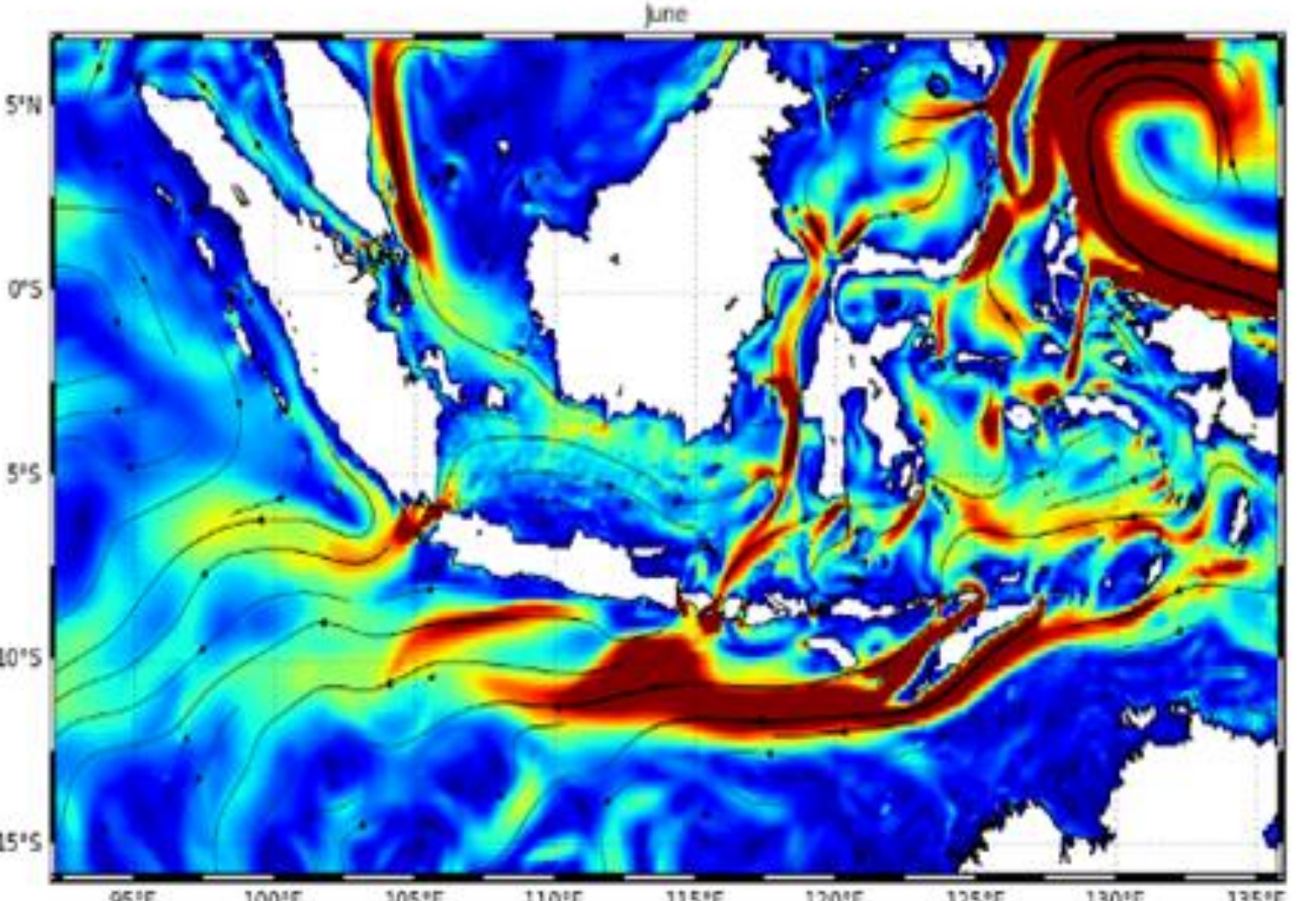


Figure 4: Surface current fields Models: CMEMS, HYCOM Satellite derived CMEMS

Conclusion

This study enables Indonesian researchers and authorities to gain a better understanding of plastic litter movement pattern on the ocean and provide indicative areas which are mostly affected by plastic litter. This information can be used to optimize clean-up efforts and select ideal locations for litter traps.

This project is very much applicable to Australian conditions and can be utilized to capture valuable data relating to all kinds of marine pollution such as macroplastic, ghost nets, oil slicks and seaweed.