Modeling surface circulation patterns in the Gulf of Mexico

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During the 2010 Deepwater Horizon oil spill, scientists' understanding of the mesoscale surface circulation patterns of the Gulf of Mexico became a topic of great importance. With the oil slick growing, disaster response teams needed to know where to deploy. Many were concerned with the oil's ultimate destination—whether it would travel towards the Florida Keys and into the Atlantic Ocean, or remain in the Gulf. The drivers of surface circulation patterns are varied, ranging from wind to internal waves to pressure and salinity gradients, and the task of forecasting the oil's motion was a challenge.

In the wake of the oil spill, researchers devised a plan to deploy 300 drifters in the Gulf of Mexico, a project intended to greatly improve their understanding of surface circulation in the Gulf. Known as the Grand Lagrangian Deployment (GLAD), the project was implemented in July 2012 when the fleet of drifters was dropped in the ocean and tracked as they moved along surface currents for the next six months.

Using observations of the drifters' motion, Olascoaga et al. tested the skill of a Lagrangian model in representing surface circulation in the Gulf. The authors' model used satellite observations of the geostrophic velocity (the balance of the pressure gradient and the Coriolis current) to calculate surface circulation patterns. The authors were concerned with modeling the behavior of "Lagrangian coherent structures"—hidden lines in the surface ocean that guide fluid parcel dynamics.

The authors find not only that the simulations made by the Lagrangian

model aligned with the surface circulations revealed by the GLAD drifters, but also that the model's identification of Lagrangian coherent structures could actually be used to forecast surface circulation patterns that had yet to develop.

More information: Drifter motion in the Gulf of Mexico constrained by altimetric Lagrangian coherent structures, *Geophysical Research Letters*, DOI: 10.1002/2013GL058624, 2013 onlinelibrary.wiley.com/doi/10 … 013GL058624/abstract

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