RESEARCH SPOTLIGHT

Highlighting exciting new research from AGU journals

PAGE 124

Drifters help forecast Gulf of Mexico surface circulation

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 toward 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 into the ocean and tracked as each moved along surface currents for the next 6 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.

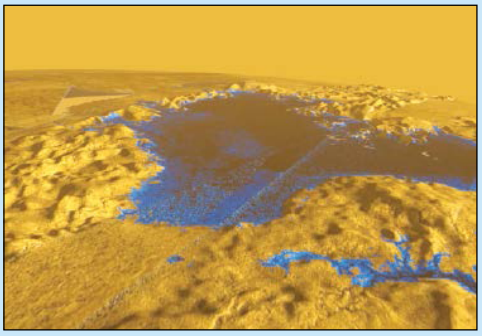
The authors found not only that the simulations made by the Lagrangian model aligned with the surface circulations revealed by the GLAD drifters but also that the model's identification of Lagrangian coherent structures could actually be used to forecast surface circulation patterns that had yet to develop. (*Geophysical Research Letters,* doi:10.1002/2013GL058624, 2013) —CS

Cassini sheds light on Titan's second largest lake, Ligeia Mare

Saturn's largest moon, Titan, is known for its dense, planet-like atmosphere and large lakes most likely made of methane and ethane. It has been suggested that Titan's atmosphere and surface are a model of early Earth. Since the early 2000s, NASA's Cassini space probe has been unlocking secrets of the distant moon.

The most recent Cassini flyby of Titan on 23 May 2013 offers new observations of Ligeia Mare, Titan's second largest lake, and offers insight into weather patterns and the chemical makeup of the surrounding terrain. *Zebker et al.* used radar data to determine that the surface of the lake is flat, ruling out the presence of waves or wind in the region. Other measurements, consistent with previous observations, suggest that Ligeia Mare is most likely composed of liquid methane.

The researchers also found that the surrounding solid terrain is most likely made of solid organic material and not water ice. The authors suggest that these findings not only help scientists better understand Titan's surface dynamics but also reveal best practices for how to infer features from remotely sensed data. (*Geophysical Research Letters,* doi:10.1002/2013GL058877, 2014) —JW



D. Ellison, R. Kirk, USGS

Perspective view of Titan's Ligeia Mare derived from data acquired by the radar instrument of the NASA/European Space Agency/Agenzia Spaziale Italiana Cassini-Huygens Mission. This image has been colorized to better distinguish liquid from solid surfaces.

Extreme weather events may not be tied to loss of Arctic sea ice

One of the most tangible effects of global climate change has been the unprecedented loss of Arctic sea ice in the latter half of the twentieth century. Since the late 1970s, Arctic sea ice has decreased by more than 7.5% per decade. Recent studies suggest that the loss of sea ice can increase the frequency of "blocking," i.e., weather patterns that can lead to prolonged extreme weather events such as drought or flooding.

New research presented by *Barnes et al.* contradicts this notion and suggests that the loss of sea ice has had little effect on the frequency of blocking in the Northern Hemisphere. The authors used three different detection methods and four different reanalyses to track blocking frequencies over the past 15–30 years and observed no robust link between blocking events and the continuing decline of Arctic sea ice.

The authors note that the presence of sea ice is not the only phenomenon that affects weather patterns and that blocking has shown large variability in the historical period they looked at. In addition, the authors stress that blocking frequencies in the recent past do not appear unusual compared to their historical variability. (*Geophysical Research Letters,* doi:10.1002/2013GL058745) —JW

—Colin Schultz, Writer, and JoAnna Wendel, Staff Writer