# Undersea forces from hurricanes may threaten Gulf pipelines

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Hurricanes could snap offshore oil pipelines in the Gulf of Mexico and other hurricane-prone areas, since the storms whip up strong underwater currents, a new study suggests.

These pipelines could crack or rupture unless they are buried or their supporting foundations are built to withstand these hurricane-induced currents. "Major oil leaks from damaged pipelines could have irreversible impacts on the ocean environment," the researchers warn in their study, to be published on 10 June in Geophysical Research Letters, a journal of the American Geophysical Union (AGU).

With the official start of hurricane season approaching on June 1, news reports about the Deep Horizon oil spill that began fouling the Gulf last month have raised questions about how a hurricane might complicate the unfolding disaster.

A hurricane might also create its own spills, the new research indicates. The storms' powerful winds can raise waves 20 meters (66 feet) or more above the ocean surface. But their effects underwater are little known, although signs of seafloor damage have showed up after some hurricanes.

Based on unique measurements taken directly under a powerful hurricane, the new study's calculations are the first to show that hurricanes propel underwater currents with enough oomph to dig up the seabed, potentially creating underwater mudslides and damaging pipes or

other equipment resting on the bottom.

At least 50,000 kilometers (31,000 miles) of pipelines reportedly snake across the seafloor of the Gulf of Mexico. Damage to these pipelines can be difficult to detect if it causes only smaller leaks, rather than a catastrophic break, the researchers say. Repairing underwater pipes can cost more than fixing the offshore oil drilling platforms themselves, making it all the more important to prevent damage to pipelines in the first place.

The researchers, at the U.S. Naval Research Laboratory at Stennis Space Center, Mississippi, got an unprecedented view of a hurricane when Hurricane Ivan, a category-4 storm, crossed the Gulf of Mexico in 2004. The eye of the storm passed over a network of sensors on the ocean floor, put in place to monitor currents along the continental shelf in the Gulf.

The research team found that strong currents along the sea floor pushed and pulled on the seabed, scouring its surface. "Usually you only see this in very shallow water, where waves break on the beach, stirring up sand," says David Wang, co-author of the study. "In hurricanes, the much bigger waves can stir up the seafloor all the way down to 90 meters [300 feet]."

Ivan's waves on the surface created powerful currents that dug up the seafloor. Acoustic measurements using sound waves showed that these currents lofted a lot of sediments, which clouded the water up to 25 meters (82 feet) above the seafloor. The team's seafloor sensors tracking the pressure underwater experienced a big increase, as well. This showed that the ground was washed away beneath the sensors, causing them to sink into a lower, higher-pressure zone.

Using a computer model of wave-induced current stresses, the team

estimated how powerful currents would need to be for forces they exert at the sea floor to exceed a "critical force" that triggers sediment suspensions and could lead to underwater mudslides.

According to these estimates, hurricanes considerably weaker than Ivan, which was category-4, could still tear up the seafloor, causing significant damage as deep as 90 meters.

The researchers were surprised by how long the destructive currents persisted after Hurricane Ivan passed by. "The stress on the sea floor lasted nearly a week," says Hemantha Wijesekera, lead author of the study. "It doesn't go away, even after the hurricane passes."

The researchers say they're not sure what strengths of forces underwater oil pipelines are built to withstand. However, "hurricane stress is quite large, so the oil industry better pay attention," Wijesekera says.

**More information:** As of the date of this article, this study "High Sea-Floor Stress Induced by Extreme Hurricane Waves" by Wijesekera et al. is still "in press" (i.e. not yet published). It will be available on 10 June at dx.doi.org/10.1029/2010GL043124

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