# AIR Brief:
# Implications of the Gulf Oil Spill for the Upcoming Hurricane Season

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AIR WORLDWIDE

## Background

The current oil spill in the Gulf of Mexico followed soon after a large explosion on the Deepwater Horizon oil drilling platform, 50 miles off the Louisiana Coast, on April 20. The rig, which in AIR's offshore exposure database has a replacement value of $560 million, was a fifth generation semi-submersible, self propelled and equipped with dynamic positioning system. Eleven workers lost their lives in the blast, but it was initially thought that no oil was spilling. Four days after the explosion, spotters noticed signs of an oil leak, and it was soon estimated that as much as 5,000 barrels of crude oil a day were escaping into the Gulf. Subsequent underwater videos and ship-based studies called into question the estimated flow rate of the leak, however, suggesting it may be many times higher.[1] Initial capping efforts were not successful, and while subsequent procedures were able to siphon off some of the flow, little real progress has been made. That may change with BP's latest effort, which began on May 26, to plug and seal the well using heavy mud and cement in a procedure called "top kill".[2]

The timing of this spill means that a potentially important, additional complicating factor may come into play. North Atlantic hurricane season officially begins on June 1, and with seas 2 to 3 degrees Fahrenheit warmer than normal in the northern Gulf of Mexico[3], the possibility of a tropical storm or hurricane on top of this oil spill becomes very real. Here we address the possible interactions between oil at sea and hurricanes, as well as indications of what this might mean to wildlife, ecosystems, business, and insurance interests.

## Oil's Effect on Hurricanes—A Case of the Tail Wagging the Dog?

Hurricanes are born over warm ocean waters. This warmth provides the fuel required to initiate and maintain a hurricane's wind circulation, and a hurricane will begin dissipating as soon as it is cut off from warm waters. In turn, the effects of a hurricane are also felt by the ocean: winds whip up huge waves that make for dangerous marine and coastal conditions. These contribute to storm surge and flooding at the coast. Indeed, they stir the ocean so much that cooler water from below rises to the surface leaving behind the relatively cool traces of hurricane tracks, which remain visible for days afterwards in thermal satellite imagery. Given all of these factors, a change to the ocean's surface as significant as the Deepwater Horizon oil spill in the Gulf of Mexico raises a variety of questions about hurricanes. Will the hurricane season in the Gulf of Mexico be different now that oil has surfaced and begun spreading? In particular, will the oil on the surface affect individual storms as they approach the area?

There are two possible ways that an oil slick might directly affect hurricanes: through changes to the initial hurricane formation or through changes to a hurricane that has already formed. Both processes result from the tendency that oil would have to cut the atmosphere off from the underlying ocean. Crude oil is light and floats

[1] MSNBC, Spill estimate under review after criticism, May 20, 2010.
[2] CNN, How BP's 'top kill' procedure will work, May 24, 2010
[3] NOAA, Current Operational SST Anomaly Charts for the Year 2010.

in water, then tends to spread out. A surface covered with oil would prevent water from evaporating. In addition, because oil is more viscous than water, it does not easily form ripples when the wind blows. Ripples represent the first stage in the development of high seas, which later contribute to storm surge, ocean swell, and high surf.

What are the chances that the Gulf oil spill will form a blanket over the ocean surface, cutting off evaporation and preventing hurricane formation? In reality, the effect is likely to be minimal. The current spill, while historic in extent, covers just a small portion (indeed about 3%) of the Gulf.[4] If a group of thunderstorms that might otherwise grow into a hurricane did happen to pass directly over the spill, development could theoretically stall as storm cells are cut off from the water surface. But even much of the spill area remains patchy.[5]

A possible opposite effect to the one described above relies on the possibility that the oil slick will actually further heat the already warm waters in the area, since the black oil will absorb sunlight and will also serve to prevent evaporative cooling to balance the solar heating.[6] Under this scenario, the warmer surface could actually encourage hurricane formation once the oil disperses and evaporation begins again, although the total additional warming is likely to be quite small.

The oil, which is gushing out of the well a mile below the surface, is mixing with chemical dispersants and water on its way up. What arrives at the surface is fundamentally different from crude oil spilled from a tanker. This warm dilute mixture could still contribute to evaporation—and storm development. Any retarding effect would be only on weak thunderstorms; a storm that has already developed gale force winds would churn the ocean so much that the oil would have little effect.

Similarly, if an already-developed storm passed over the spill, the effects of the oil would likely be minimal. The winds even at the edge of the storm would easily whip the seas into such a frenzy that the oil would mix with the ocean below, exposing enough water to the surface that evaporation could take place and continue supplying fuel to the storm.

Thus, in the end, while possible effects of this oil spill on a tropical storm or on the hurricane season overall is an interesting question, the implications are in fact small. Far more important are the effects that a hurricane would have on the spilled oil and surrounding region.

## Storm over Oily Waters

The ongoing effects of the oil spill on Gulf of Mexico wildlife, habitats, fishing, tourism, and other uses could be taken to a new level if a tropical storm developed or moved into the area. All rescue, spill control, coordination, and other activities would be halted if a major storm were to threaten. Crews laying out booms

[4] Interactive map from Google Crisis Response
[5] NOAA Emergency Response, Deepwater Horizon Incident—maps and commentary updated daily.
[6] National Public Radio, Hurricane, Oil Spill Could Be Troubling Mix, May 21, 2010

or trying to cap the spill itself rely on relatively calm seas and safe conditions in order to do their work. Any nearby storm would put workers in danger, requiring evacuations and halting efforts to deal with the spill. The barriers that are currently designed to keep oil away from the coast would not only be left unmanned, they would be completely overwhelmed by tropical storm winds and high seas, washing oil over the booms and well inland when the storm makes landfall.

The northern Gulf of Mexico is one of the world's major sources of shrimp, oysters, and crabs, with fishery production valued at over half a billion dollars annually.[7] Already, NOAA has closed slightly more than 22 percent of Gulf of Mexico federal waters to fishing.[8] The inland reach of the oil with the arrival of a tropical storm surge, coupled with oil mixing thoroughly into the coastal waters due to winds and surf, could destroy this year's harvests and also threaten future production by harming underwater habitats.

A similar risk is posed to birds in the area's marshes, where there are already possible signs of oil. A single strong wind or storm surge event could completely breach the barriers in place and expose the animals' habitats to the spill. What ultimately washes or gets blown ashore may or may not be less toxic than that straight out of a tanker, but it also adds to the scientific unknowns regarding the impact. The U.S. Environmental Protection Agency has asked BP to reduce the amount of dispersants it is using in the face of these unknowns.[9] There is also likely to be a large amount of oil under water, with possibly long-lasting effects on marine life.

The impact of the contamination that could result from storm surge brought by a hurricane could also be detrimental for tourism. As images enter the public consciousness of once-pristine beaches being sullied by tar balls or covered in oil, the region's reputation as a tourist destination is likely to suffer. Already, hotels near the spill—even where the oil has not come ashore or affected nearshore fishing—are reporting occupancy rates at less than 25% of the season's normal levels, and Florida is following Louisiana's lead[10] in filing a claim for $35 million from BP to cover public relations and advertising designed to reassure potential Gulf Coast visitors that they are still open for business. The coming weeks should be very revealing about tourist activity in spill-affected areas in terms of claims for lost business.

Along with the serious dangers, the scenario of a hurricane making a glancing blow with the oil spill has some potential upsides. Since oil, once it is dispersed to sufficiently low concentrations, is generally less harmful than in higher doses, a hurricane whose winds, waves, and rain encounter a small portion of the oil slick at sea could have the beneficial result of making the oil more dilute and innocuous by mixing it vertically and horizontally with ocean water. The more oil encountered, the more work the hurricane would have to do to

[7] LSU Center for Natural Resource Economics & Policy, Economic Impacts to Fisheries and Coastal Habitat, April 30, 2010
[8] NOAA, NOAA Expands Fishing Closed Area in Gulf of Mexico, May 25, 2010
[9] Business Week, BP Told to 'Scale Back' Dispersants in Gulf, EPA Says, May 26, 2010
[10] Business Week, Crist asks BP to pay for oil-spill tourism ads, May 12, 2010

disperse it to safe levels—and given the potential size of the Deepwater Horizon spill, it is not clear that it is practical to disperse this much oil, or how this would affect the deeper ocean[11] the oil would mix into.

Furthermore, there is some chance that a precisely located hurricane landfall could serve to ameliorate the contamination were the storm to wash oil off of sensitive beach or wetland areas and back out to sea. For instance, consider what might happen if the bulk of the spill drifts northward and makes landfall on the Alabama and Florida Gulf Coasts over the next few weeks. If an early-season tropical storm then crosses from Florida Keys toward the panhandle, and its Western portion impacts the oiled beaches, the winds would be pushing the oil back offshore—perhaps with enough rain and wind to actually move most of the harmful oil off the sand and back out to sea. This is reminiscent of what happened with Hurricane Henri and a small portion of the Ixtoc spill in 1979.[12] This hypothetical scenario is quite specific – and since it is based on the oil making landfall, followed by a landfalling hurricane, it involves a large amount of destruction, even though the storm flushing the beach of oil might in itself have positive or mitigating effects.

## The Costs: A Developing Story

No one doubts that the costs associated with this oil spill will be high. But because there is still so much uncertainty about the spill, and response actions are still under way, estimates of the total costs are themselves highly uncertain. As the responsible party, BP has already begun accepting claims[13] of losses for property damage and business interruption. While the last count showed 19,000 claims filed and 8,000 paid, the totals will clearly rise as long as the spill is impacting the area, and if there are any large tropical storm-induced damages.

Will the oil from the Deepwater Horizon well still be actively threatening the Gulf of Mexico and Atlantic coasts this summer, and vulnerable to a hurricane strike? Beyond ocean currents and weather, a great deal depends on ongoing efforts to cap and contain the spill. Until that is done, it will be extremely hard to calculate the damages due to the spill. Some reports have proposed a figure of $1.5 to $3.5 billion in insurance losses[14], but that may be an underestimate given the additional information that has come to light in the two weeks since the figure was floated, and of course the indefinite timeline and possibility of storm-exacerbated oil damages involved.

The incident has served as a wake-up call to the oil and insurance industries, and both sectors will be watching closely to see what the implications are for the future of deep-water drilling given the ultimate costs. BP is self-insured in the US,[15] an option that is realistic only for the largest oil companies. The terms of the national Oil Pollution Act (OPA) of 1990 imply that a firm should have stockholder equity equal to 10 times the insured

[11] New York Times, Giant Plumes of Oil Forming Under the Gulf, May 15, 2010
[12] Gundlach et al., Impact and Persistence of Ixtoc I Oil on the South Texas Coast, Proceedings: 1981 Oil Spill Conference
[13] Gulf of Mexico Sea Grant Program If You Suffer Damages Because of an Oil Spill, May 14, 2010
[14] Advisen, Gulf Spill May Force Long-Term Rise In Insurance Cost, May 20, 2010
[15] Reuters, Fitch acknowledges error in BP's post-spill report, May 5, 2010

amount of potential damages in order to self-insure.[16] Industry sources indicate that it might simply not be possible for companies to purchase the insurance necessary to cover the expected liability associated with drilling. While the OPA limits an oil company's liability to an amount equal to the cost of oil removal plus $75 million—except in the case that gross negligence, willful misconduct, or flouted safety codes caused the spill—both BP and the Department of the Interior have indicated that BP has accepted responsibility and its costs for this spill will not be limited to this amount. Furthermore, momentum is building for legislation to change this limit,[17] with the liability ceiling being raised or even eliminated by new laws in response to the Deepwater Horizon incident.

Another consideration is the role that federal funds may play in compensating affected parties for the current incident and its aftermath. The OPA, which was passed into law before the Exxon Valdez spill but which was only fully funded afterward, established a federal fund known as the Oil Spill Liability Trust Fund (OSLTF) to compensate those impacted by oil spills. Setting aside the individual-plaintiff and class-action lawsuits that many private law firms have already begun developing, the proper steps to recover losses, according to government web sites, are to submit claims to BP before seeking other compensation. Should those claims be denied, the law allows for claims then to be submitted to the OSLTF.[18] Even though the OSLTF is legally capped at $2.7 billion—and therefore might be insufficient to cover all of the Deepwater Horizon expenses, if that entire amount were available—it still could act to provide a cushion for privately-insured and self-insured oil companies, who in turn originally supplied the fund via a federal tax on every barrel of oil imported into the US. How the OSLTF is used now will therefore affect insurance rates for deepwater drilling, and by extension the viability of such enterprises in the future. If the fund is used to lessen the cost to BP and other private parties, this may keep the estimated risk associated with deepwater drilling within insurable bounds. But, if official enforcement, judicial decisions, or legislation actions require BP to foot almost all of the bill or to repay most of the funds tapped from the OSLTF, then this cost would likely further increase the modified risk estimates for any future deepwater drilling activities.

It is no wonder, then, that even though the situation in the Gulf is still rapidly evolving, industry observers agree that insurance rates related to every aspect of deepwater drilling will rise as a result and many are wondering whether deepwater drilling has a future at all.[19]

The present deepwater break is the first of its kind and magnitude, and threatens to reach a new scale of costs associated with long-term pollution cleanup, business interruption, and response costs. Legal decisions or legislative actions may also establish laws attaching additional liabilities to future drilling in deep water, and these in turn will be incorporated into insurance costs. Even if the worst-case scenario —a powerful hurricane halting cleanup efforts and then driving toxic oil far into sensitive areas—does not come to pass, the

[16] Business Insurance, Spill triggers effort to up liability cap, May 24, 2010
[17] CBS News, Obama Seeks Greater Liability from BP on Spill, May 12, 2010
[18] U.S. Government Printing Office, Oil Pollution Liability and Compensation: Claims Procedure
[19] Blooomberg, Oil-Rig Disaster Threatens Future of Offshore Drilling, May 14, 2010

widespread realization of the double-barreled peril made possible by deepwater drilling in the Gulf of Mexico is bound to drive up coverage costs for such activities.

Even if this is not necessarily a death knell for deep-water drilling, it is a critical moment. About the only certain thing is that no matter how long it takes to quell the flow of oil from beneath the Gulf of Mexico, the impacts—socioeconomic, political, financial, and legal—will be felt for a long time to come.

# About AIR Worldwide

AIR Worldwide (AIR) is the scientific leader and most respected provider of risk modeling software and consulting services. AIR founded the catastrophe modeling industry in 1987 and today models the risk from natural catastrophes and terrorism in more than 50 countries. More than 400 insurance, reinsurance, financial, corporate and government clients rely on AIR software and services for catastrophe risk management, insurance-linked securities, site-specific seismic engineering analysis, agricultural risk management and property replacement cost valuation. AIR is a member of the ISO family of companies and is headquartered in Boston with additional offices throughout North America, Europe and Asia. For more information, please visit www. air-worldwide.com.

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