

# Hurricane Impact on Sea Floor

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**Abstract:** Hurricane-induced currents can generate strong force on the deep seabed, thus causing catastrophic failure of oil production facilities and fracture on the oil pipeline.

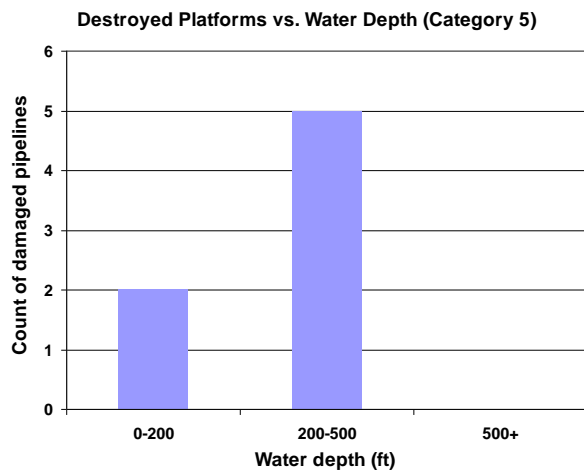
## 1. Introduction:

Hurricane can cause destroy or damage on the offshore oil production facilities depending upon the hurricane category, water depth, and other factors. The damage mechanisms include wind, waves and current, mudslide, and dragging force from rigs or anchors. (Clinton, 2008, and Goff, 2010)

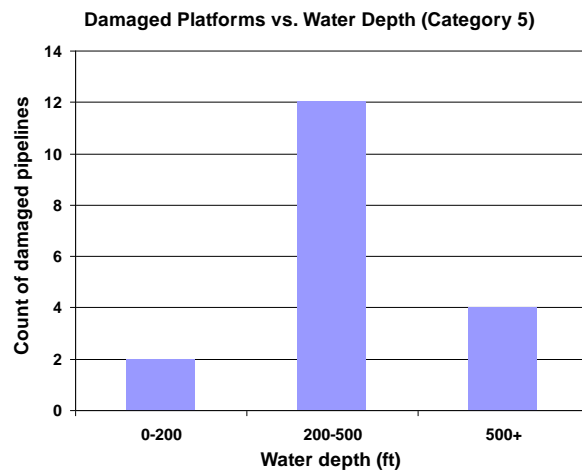
Strong surface waves can induce current at seafloor, which can generate extreme forces. Some times the massive destructive stress can persist a week even after the passage of the hurricane. When the forces reach critical point, the current at seabed can cause sediment suspension, thus leading to massive underwater mudflows. (Wijesekera 2010) When the supporting sedimentary basin starts being washed away, the oil production facilities and oil flowlines will slide down into a lower position suffering from higher pressure. Meanwhile, some facilities and pipelines are elevated by the dense turbidite current. (OTC 17738) The extent of the displacement of the oil flowlines are affected by the water depth, soil type, and geology type. Mudslides are likely to occur around the areas with heavy silt and steep slopes, such as the perimeter of the Mississippi Delta. (BLM 1980) It was reported that no pipeline movement was detected from survey data at the water depth below 500 ft. (OTC 17738)

## 2. Destroyed and Damaged Platforms vs. Water Depth after Hurricane Ivan

The correlation between the destroyed and heavily damaged platforms and water depth after hurricane Ivan of category 5 in sea in the year of 2004 is shown in Fig.1 and Fig. 2, respectively. (Moritis, 2005) The damage of the platforms is likely to occur because of most of platform piles located at the water depth ranging from 200 to 500 ft.



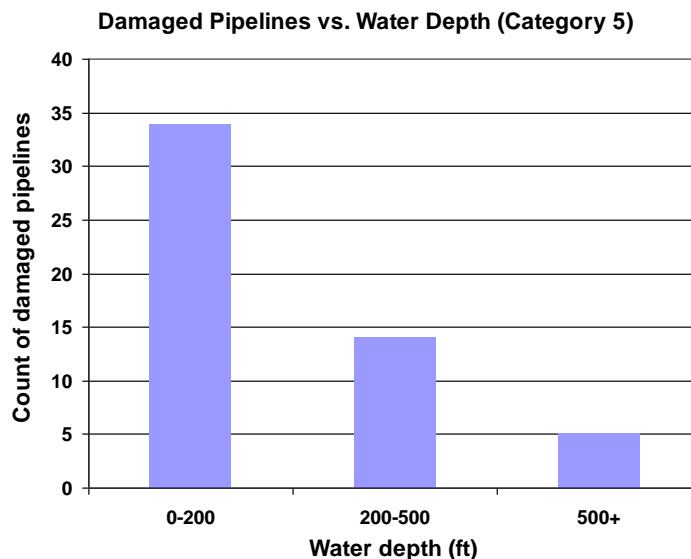
**Fig.1.** Destroyed Platforms vs. Water Depth



**Fig.2.** Damaged Platforms vs. Water Depth

### 3. Damaged Pipelines vs. Water Depth after Hurricane Ivan

The correlation between damaged oil pipelines and water depth after hurricane Ivan of category 5 in sea is shown in Fig.3. With the water depth approaches deeper, the number of the damaged pipelines decreased. (Ghoneim, 2006). It was reported by MMS that hurricane Ivan which produced a 52-ft significant wave height caused the damage of 102 pipelines, when the 10,000 miles pipelines were in the direct path. (Moritis, 2005) Some of the damages on the oil flowlines can be difficult to detect if the oil leaks is below the sensitivity of the oil leaking sensor. Repairing of deep sea pipes can be more expensive than repairing the offshore oil platform in some extent.



**Fig.3.** Damaged Pipelines vs. Water Depth after hurricane Ivan of category 5 in sea

### 4. Conclusions:

The hurricane-induced waves and underwater current can wreak havoc on the deep sea oil production facilities and pipelines.

### 5. Acknowledgments:

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### 6. References:

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