# How unusual were the 2005 hurricanes?

**Professor Mark Saunders**, lead scientist for Tropical Storm Risk and head of seasonal forecasting and meteorological hazards at Benfield Hazard Research Centre, questions how unusual this year's hurricane season has been.

THE 2004 and 2005 hurricane seasons have underlined the vulnerability of the offshore energy sector to major hurricane losses and raised the question of how the sector can better prepare itself to deal with such issues going forward.

The major difficulties facing the offshore energy industry may be minor compared to the overwhelming problems affecting residents of New Orleans and the Gulf Coast following the truly catastrophic landfall damage afflicted by Katrina.

But there is no doubt that, following several years of relatively low hurricane activity in the Gulf of Mexico, Hurricanes Ivan, Katrina and Rita have provided a wake-up call to the energy and marine sectors, highlighting the substantial disruption to offshore energy production that severe storms can cause.

Given that oil and gas from the Gulf of Mexico are crucial to the US economy, providing 25% of the US's energy consumption, and given the current boom in offshore energy production, it is clearly of vital importance to quantify the frequency with which hurricanes of the intensity of Ivan, Katrina and Rita are likely to occur in the region.

Perhaps one of the factors which accounts for why so many were surprised by the ferocity of Ivan, Katrina and Rita is that prior to these hurricanes there had been a recent lack of 'damaging' events.

However, an examination of the historical records shows that hurricanes of Ivan's and Rita's intensity are not uncommon when crossing the Gulf offshore energy belt. Furthermore, Katrina is not the strongest hurricane to have affected the region.

Ivan, Katrina and Rita tore through the Gulf in September 2004, August 2005 and September 2005 respectively, causing immense disruption.

Ivan destroyed, one rig and caused extensive damage to four others, casting a further five aside. Ivan also destroyed seven production platforms, damaged 102 pipelines – an issue which proved most problematic taking several months to diagnose and repair – and, at its peak, shut down 83% of the Gulf's total oil production.

## Windspeeds

Katrina and Rita together destroyed 111 mainly older 'end of life' and 'low producing' facilities not constructed to the upgraded 1988 design standards. Another 52 platforms suffered significant damage. The major new deepwater facilities withstood the storms better with only one platform destroyed and four receiving significant damage. To date, damage to 44 pipelines has been reported from Katrina and Rita and 10 refineries remain shutdown.

Ivan, Katrina and Rita had one-minute sustained winds of about 130 mph, 150 mph and 130 mph respectively when they caused their extensive damage to the Gulf's energy installations – intensities which over the last decade have only been approached, let alone reached, by two other hurricanes as they crossed the Gulf offshore energy-production belt. Opal in 1995 had sustained winds of 120 mph and Lili in 2002 achieved sustained winds of 110–120 mph.

However, since 1900, 12 hurricanes with a higher intensity than that of Ivan have made landfall between Pensacola (Florida) and Brownsville (Texas), the coastal extent which encompasses where the Gulf's offshore oil and gas production is situated.

The strongest landfalling hurricane was Camille which struck southeast Louisiana in August 1969 packing sustained winds of 190 mph (gusts in the range 210-220 mph) and causing a storm surge of 22–25 ft above mean sea level.

Given, that Camille's 190 mph winds were approximately 25% higher than Katrina's peak wind and 45% higher than Ivan's and Rita's peak wind, clearly the damage such a hurricane would inflict if it happened today could be far worse than that caused by Ivan, Katrina or Rita.

From these statistics alone it is possible to conclude that a hurricane of Katrina's strength or stronger will happen again and that hurricanes of at least Ivan's and Rita's strength will affect Gulf offshore energy production at least once a decade.

What is more, an intense hurricane – ie one with sustained winds of at least 111 mph – is

likely to affect the region every three years.

Nor does recent activity do anything to contradict such analysis. This year in addition to Katrina and Rita we have already seen hurricanes Dennis and Emily and tropical storms Arlene and Cindy cause disruption to Gulf offshore energy production – indeed, Dennis is believed to have caused BP's new US$5bn Thunder Horse platform southeast of New Orleans to list by 20%.

Similarly, 2004 was also a very active hurricane season. In the US alone, albeit as a result of damage on land, Hurricanes Charley, Frances, Ivan and Jeanne caused an estimated insured damage of $23bn – a total which is nine times the annual average for US hurricane insured loss between 1950 and 2003.

But losses aside, perhaps one of the most critical factors about the both 2005 and 2004 seasons is that the usually high levels of activity were forecast well in advance.

For example, as far back as 5 December 2003, the Tropical Storm Risk (TSR) consortium was forecasting that for 2004 there was a 68% chance of an above average US landfalling storm season (as measured by landfalling storm wind energy), only a 26% chance of a normal year and a 6% chance of a below average year.

Again, on 10 December 2004, for the 2005 US landfalling storm season, TSR forecast a 65% chance of an above average activity season with a 22% chance of a normal year and only a 13% chance of a below average year.

By 5 August 2005, TSR was warning that due to further strengthening of key climate signals the 2005 hurricane season was now expected to deliver record breaking levels of activity in the Atlantic basin of some 150% above average and US landfalling tropical cyclone activity of 90% above average.

The question, as ever with such forecasts, however, is how they can be applied in such a way that they enable people to make better informed decisions on their risk management and insurance purchasing strategies, especially given that the marine, energy and power sectors could have reduced their losses in 2004 and 2005 by acting on the TSR hurricane forecasts.

New 'wind speed probability' graphical products should help the industry to be better prepared for such events as they will enable the offshore industry to tell at a glance what the current chance is that a given platform or rig will be hit by damaging winds.

If current predictions from the scientific community prove correct as to the expected impact on the peak intensity of Atlantic hurricanes, the use of such tools will become more important as the return periods between high category hurricanes become shorter.

A detailed global climate modelling study produced last year by leading academics Knutson and Tuleya, forecast that, in line with theoretical estimates by Emanuel, an 80% increase in CO2 levels will lead to a 6% increase in hurricane maximum intensity. The model also predicted that there would be an 18% increase in the mean precipitation rate within 100 km of the storm centre.

While the model stated that these changes may not be detectable for a few decades, in the last three months there have also been two studies published in leading academic journals which warned that a significant increase in hurricane intensities has already occurred.

A paper published by Emanuel in *Nature* in August presented results that demonstrated that the annual 'power' of Atlantic hurricane activity has doubled during the past 30 years.

Separately, in a mid-September issue of *Science*, a paper presented by Webster et al showed that the number of category 4 and 5 strength hurricanes worldwide has risen from around 11 a year in the 1970s to 18 a year today – an increase of some 50%.

Whether these increases are being driven by global warming or not is unclear. However, such studies should at least encourage greater reflection on some of the core assumptions that are being made by the energy, marine and insurance sectors.

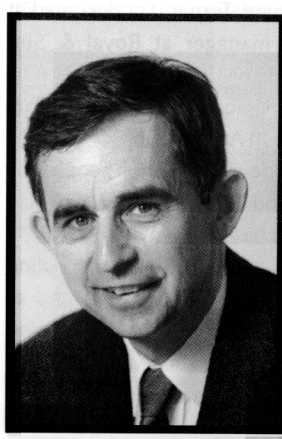
The upswing in intense hurricane activity draws attention to whether the mooring systems for the offshore mobile drilling units are adequate. During hurricanes Katrina and Rita 19 such facilities were torn from their anchor moorings and set adrift.

Similarly, at the very least, the catastrophe models used by the energy and marine sectors should take in to account that Ivan, Katrina and Rita are not unusual occurrences.

Either way, the industry can no longer afford to assume that such events are to be dismissed as unusual, especially as any repeat events are only likely to become more of a concern as the Gulf offshore energy production grows and moves into deeper waters where hurricane wind speeds are even higher. ■

**On 5 August 2005 TSR's hurricane prediction included warnings of:**

- 22 tropical storms for the Atlantic basin as a whole of which 11 would be hurricanes and seven intense hurricanes;
- seven tropical storm strikes on the US of which three would be hurricanes; and
- three tropical storm hits, including two hurricanes, on the Caribbean Lesser Antilles.



Professor Mark Saunders