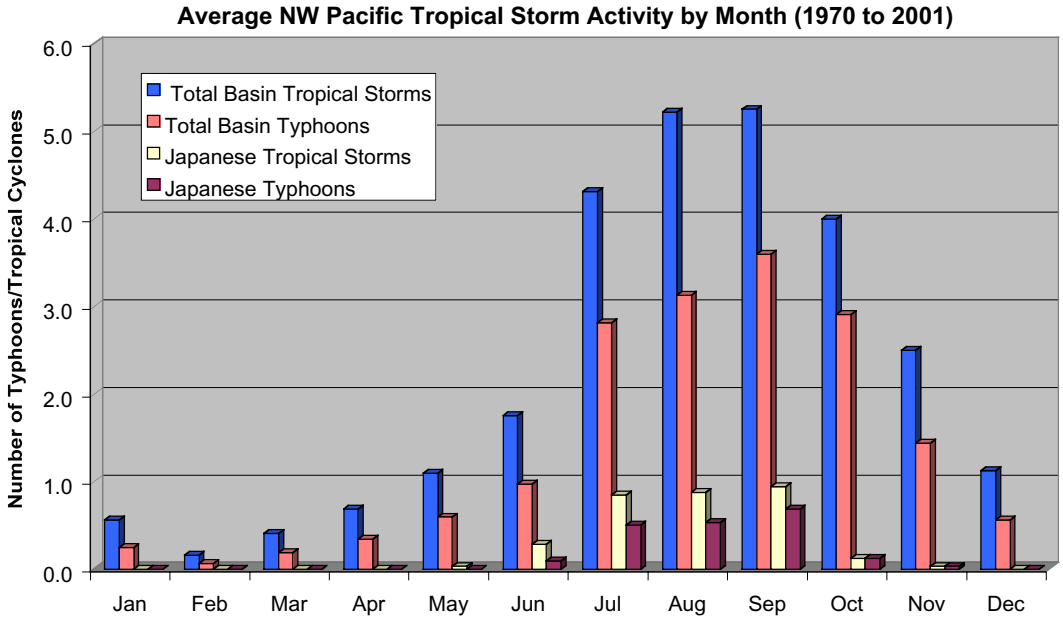
Insurance Day: 22nd May 2002

Will Beckham's England get blown away in the World Cup?

For weeks the nation has anxiously followed news of Beckham's foot. But arguably the weather England can expect in Japan and Korea could have as much an impact on the probability of England progressing out of the "Group of Death" as the state of Beck's metatarsal. As England's finest arrive in the Far East what weather awaits them? Can advances in long term forecasting help them know whether to expect typical British playing conditions (typhoon strength winds and driving rain) or balmy semi-tropical heat more suited to the skills of Argentina or Nigeria?

The chart below shows the average monthly incidence of tropical storms and typhoons in the northwest Pacific since 1970.



Clearly June, when England play their group games in Japan, is not a peak month. But there is a high probability of at least one tropical storm in the NW Pacific basin during June, with a reasonable probability of a tropical storm land-falling in Japan.

Forecasting Tropical Cyclones

The Tropical Storm Risk (TSR) consortium is a leader in the development of tropical cyclone forecasts. TSR spun-off from the UK government backed TSUNAMI initiative two years ago and is sponsored by three leading global insurance businesses: Benfield Group, Royal & SunAlliance and Crawfords.

The TSUNAMI hurricane forecasting project was launched over three years ago, lead by scientists from the Benfield Greig Hazard Research Centre at University College London and managed by the UK Met Office. The aims of the project were to:

- Improve the accuracy of seasonal tropical cyclone forecasts at all lead times using new statistical and dynamical model techniques
- Forecast land falling events in addition to overall basin activity
- Extend forecasts to new territories (eg NW Pacific and Queensland)
- Benefit business, government and society by reducing risk and uncertainty

In 2000, the TSR consortium took the process further, seeking to combine the best of the two conflicting schools of forecasting: statistical and dynamical.

Statistical forecasters, such as Professor Bill Gray's group at Colorado State University, acknowledge that the world's climate is a complex system, which is yet far from understood. However, they argue that a partial understanding does not preclude long-term forecasts being made with real skill. Historical records are examined in an attempt to find patterns that seem to be linked to tropical cyclone incidence.

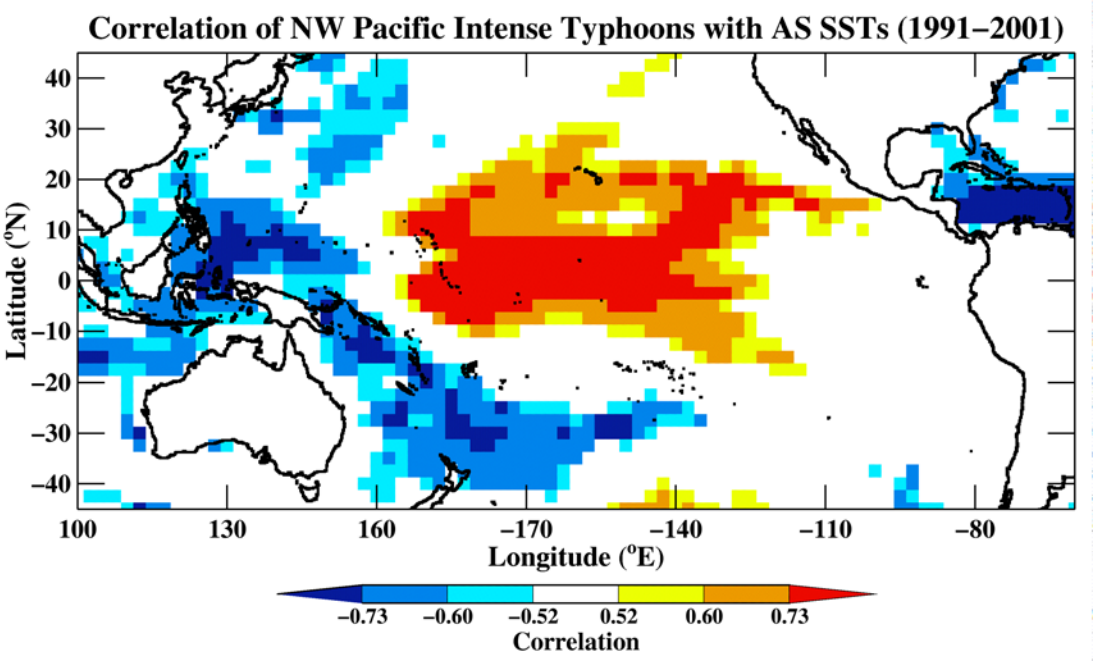
In contrast, dynamical forecasters would argue that such methods, based as they are on limited data, are unreliable. Instead, forecasters should seek to understand fully the processes that determine extreme climatic events. These are laudable sentiments, but are dynamic modellers yet in a position to forecast general climatic conditions from 9 months out? Even the best, such as that developed and run by the United Kingdom Met Office's Hadley Centre, would not claim to be able to produce seasonal forecasts more than a few months ahead.

The aim of the TropicalStormRisk (TSR) consortium is to get the best of both worlds. The team are confident that they can go "beyond Gray" by using the latest scientific and computational methods to identify new predictors of tropical cyclones. But they also plan to use the Met Office's dynamic climate models to seek to explain and justify how and why observed predictors do influence tropical cyclone activity. It is hoped that consortium members will not only gain access to better long-term forecasts, but also that the work will increase understanding of the cycles and patterns governing tropical cyclone genesis and intensity.

Forecasting NW Pacific Tropical Storms and Typhoons

A paper presented by Drs Paul Rockett and Mark Saunders of TSR at the recent American Meteorological Society conference on Hurricanes and Tropical Meteorology outlined the methods TSR use to forecast tropical cyclones in the NW Pacific. The guiding principles of TSR are to use the best science and to be open about methods used and the limits of predictability.

The prime driver of tropical storm frequency seems to be summer sea surface temperature anomalies in the Pacific Ocean. Where temperatures are warmer (El Nino conditions) the probability of typhoons in the NW Pacific is higher, when temperatures are cooler (La Nina) probabilities are lower. By contrast, Atlantic Hurricane activity tends to be lower in El Nino years and higher in La Nina conditions.



The chart above shows the degree of correlation between sea surface temperature and intense typhoon activity. TSR uses an innovative scheme to forecast sea surface temperatures in the region 160°E to 150°W, 5°N to 5°S at long leads and uses these to make its typhoon forecasts.

TSR's Forecast for 2002

TSR's latest forecast for the NW Pacific suggests that the number of tropical storms in 2002 is likely to be 16% higher than the 30 year average. There is an even greater probability of stronger storms, 27% more typhoons and over 30% more intense typhoons are forecast.

TSR NW Pacific Forecast 2002	Intense Typhoons	Typhoons	Tropical Storms
TSR forecast	10.3 (+/- 2.2)	20.8 (+/- 3.4)	30.5 (+/- 4.6)
10 year climate norm	8.4 (+/- 2.7)	16.9 (+/- 4.3)	27.4 (+/- 4.6)
30 year climate norm	7.9 (+/- 3.0)	16.4 (+/- 3.6)	26.3 (+/- 4.0)

The numbers in the brackets reflect show the estimated standard deviation of the forecast and the actual standard deviation of historical numbers. Unlike other forecasters, TSR are always careful to state how reliable the forecasts are.

However, in the two years that TSR (and TSUNAMI) have made forecasts for the NW Pacific, the forecasts have proved very accurate. 2000 was predicted with uncanny accuracy, every prediction was right on the nail. The 2001 forecast under-predicted actual numbers somewhat, put never more than around 1 standard deviation of the actual.

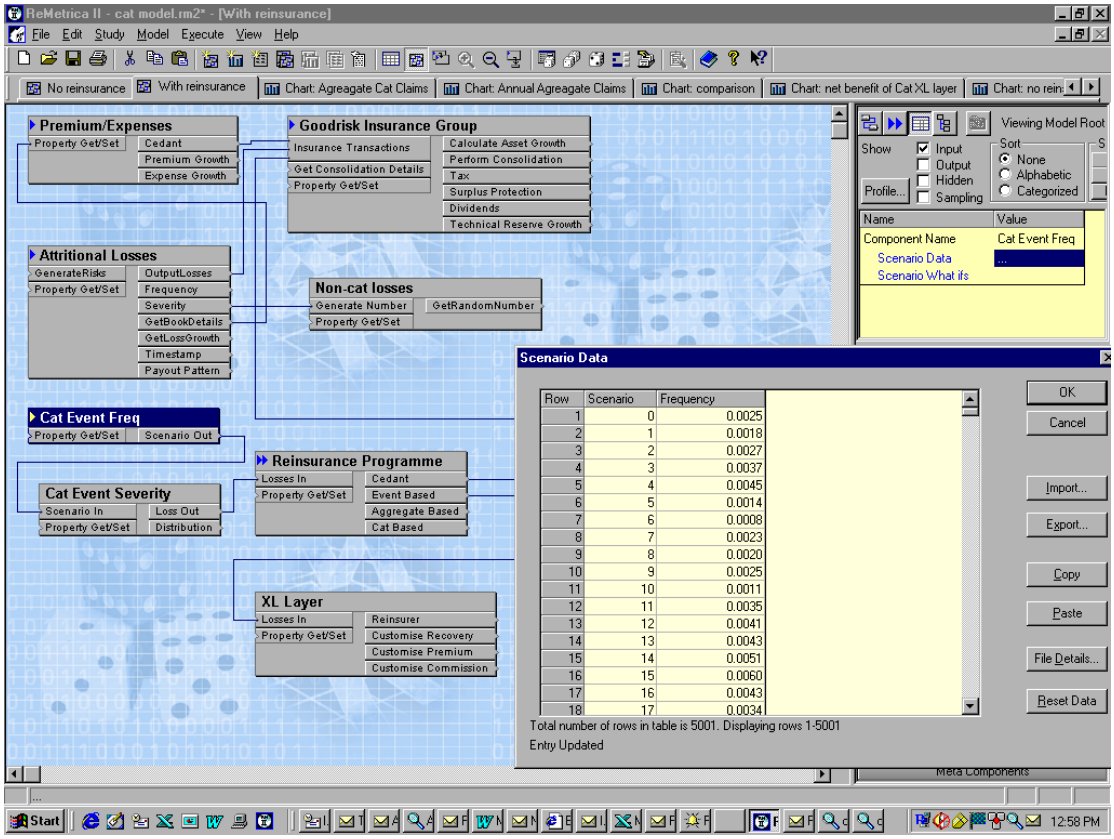
Implications for Insurers and Reinsurers

This is all very interesting, but what benefit can insurers and reinsurers gain? In reality, insurers are unlikely to want, or indeed be able to, change their underwriting and marketing strategy based upon a single forecast, however accurate. Elements of a core catastrophe reinsurance programmes are unlikely to be changed radically year by year, relationship issues and a desire for price stability act against change. Similarly, reinsurers may be unable to change their rates to meet a probable increase (or decrease) in loss probability predicted by a forecast.

But in a world where decisions about the cost benefit of different business strategies and reinsurance purchases is increasingly driven by results from dynamic financial analysis models, anything that helps increase understanding about risks faced and their inter-relation must be of benefit.

Whilst decisions about core reinsurance may not be changed by a forecast, the assessment of cost benefit of more opportunistic additional purchases (perhaps sub-layers, PML bust or sideways covers) could and should take the best estimates of loss activity into account. Peril Models are now commonly used throughout the industry, but the event set probabilities they use are not adjusted to reflect the often very large, predictable, year to year variation driven by factors such as El Nino.

Advanced DFA models, such as created using Benfield Group's ReMetrica II software, allow such effects to be modelled quickly and easily, allowing users to finesse standard peril model output.



The use of weather derivatives is increasing. Certainly, it would be unwise to buy or invest in a weather derivative product without considering the best possible information available.

As importantly, developing a forecast helps identify and quantify factors in the global climate system that influence weather across the world. The DFA models used by global insurers and reinsurance typically assume no correlation between hurricane and Japanese typhoon losses, but as we saw earlier, science shows that this may be an over pessimistic assumption. This is but one example. The work of TSR and others in the field can help insurers and reinsurers manage their exposures better, but probably can do little to help England end 36 years of hurt in the World Cup final at Yokohama on 30th June.

TSR can be contacted via their website at www.tropicalstormrisk.com.

David Simmons is Head of Risk Consultancy, Benfield ReMetrics and is the Benfield Group representative on the Tropical Storm Risk consortium.