

## Hurricanes, typhoons and monsoons

16 Oct 2003



*Izzy puts US in a Tizzy* was a *Geography in the News* article in autumn 2003. Another headline, in the Guardian editorial, *Working up a storm* around the same time and about the same event, Hurricane Isabel, gave some food for thought. The comment "Hurricane Isabel was undoubtedly a nasty business" was certainly true but the editor argued that "America can certainly have dangerous weather. But so can other parts of the planet." The piece went on to talk about the massive impact of flooding in Bangladesh in early September that affected almost half a million people. It then made the point that perhaps the British media had spent more time on Isabel than it really deserved. An easy way to check this out is to explore what major natural events are happening in another part of the globe, for example, go into the Asian Disaster Reduction Centre (ADRC)

website at [www.adrc.or.jp](http://www.adrc.or.jp) or Reuters news website at [www.alertnet.org](http://www.alertnet.org). Both web sites make interesting reading.

Let's take the month of September 2003, ADRC reported the world grabbing headlines of the US's Hurricane Isabel and the massive 8.0 [Hokkaido earthquake](#) but several other events on a similar scale, with potential global impacts, hardly figured in the western media. There was some reporting of typhoon Maemi that battered Japan and South Korea in early September but minimal reporting of typhoon Djuan that battered the south China city of Shenzhen in the country's vital showcase economic development zone on 3<sup>rd</sup> September. Whilst the effects of the Padma (Ganges) bursting its banks in September in Bangladesh merited only a few lines on the [BBC News website](#).

### **Why is it important to know and understand the effects of such major natural events?**

Firstly, because extreme weather events seem to be getting more frequent and worse, whilst secondly, whether we like it or not what happens in one part of the global village impacts on the rest of us. As a case study, let's compare the effects of hurricane Isabel in the USA and typhoon Maemi in South Korea.

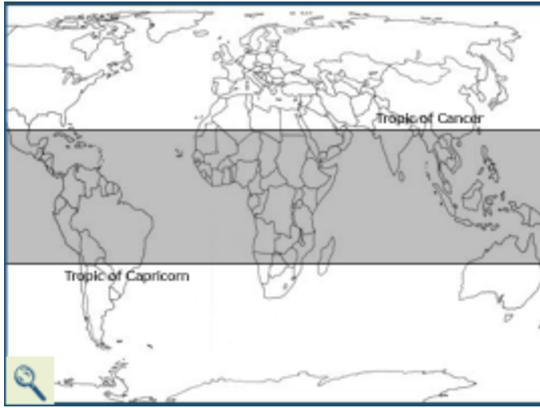
### ***But before we look at these case studies, are you clear about the difference between hurricanes, typhoons and monsoons?***

Basically there isn't a difference between a hurricane and a typhoon they are regional names for an intense **tropical cyclone** with a well-defined circulation and maximum sustained surface winds in excess of 74mph which develops over tropical waters. So in the Atlantic Ocean, the Pacific Ocean east of the International Dateline they are hurricanes, west of it they are typhoons. However east and west of the Indian subcontinent they are called cyclones. All a little confusing.

### ***So what about monsoons the major cause of devastating floods on the Indian subcontinent?***

In contrast they are very different. A monsoon low-pressure system develops over the landmass of southern Asia, not water, and they are strongly influenced by changes in the direction of the upper air jet stream. In early summer this directional change is the major cause of the high rainfall which continues until the westerly jet stream re-establishes itself. This situation then allows the Trade winds to blow towards India over the warm waters of the Bay of Bengal thus creating cyclones.

### **What environmental conditions are needed for tropical cyclones to develop?**



Map showing the zone between the two Tropics shaded in grey. This is the location of the main tropical storm tracks.

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Crucial to **tropical cyclone** development is a sea surface temperature of 27°C, the dominant wind direction must be east to west with some deflection due to the influence of the Coriolus\* force producing rotation or spin. Given these conditions tropical disturbances or **waves** develop with about 100 or so detectable each year.

As the waves move westwards the wind speed increases to 38mph, once the circulation becomes closed a **tropical depression** develops. Then gradually shower and thunderstorm activity increases as the gusting winds stir up the warm ocean waters causing moisture to rise and condense as wind speeds increase up to 73 mph. It has now become a **tropical storm**. The accompanying heavy downpours release heat and energy and with increased wind speed to over 74mph a more definite eye (check out the satellite photo below) is formed. Gradually more and more air is forced to rise upwards and outwards with a significant barometric pressure drop at the ocean surface thus a **tropical cyclone** is born.

Annually about 10 tropical storms develop of which about 5 or 6 develop into full-blown hurricanes measured on the **Saffir-Simpson (S-S)** scale. The categories of 1 to 5 measures wind speed, barometric pressure and possible damage. So category 1 has wind speeds of 74-95mph, > 28.94 inches of mercury and minimal damage whereas category 5 has winds >155mph, <27.17 inches of mercury and catastrophic damage.

So now lets consider the two September tropical cyclones on either side of the world. Izzy in spite of the hype just about made it into category 2 on the S-S scale on the North Carolina coast and it was soon downgraded. The Guardian on 20<sup>th</sup> September reported that The Potomac River (which runs through Washington) burst its banks, and branches were torn from trees on the White House lawns. But, wait a minute, the river was bankful and ready to flood in June 2003 as the photograph below illustrates.



This view taken below Grand Falls shows the high level of the Potomac River before the hurricane Isabel event .

It was already high before the storm struck.

©Pat Wilson 2003

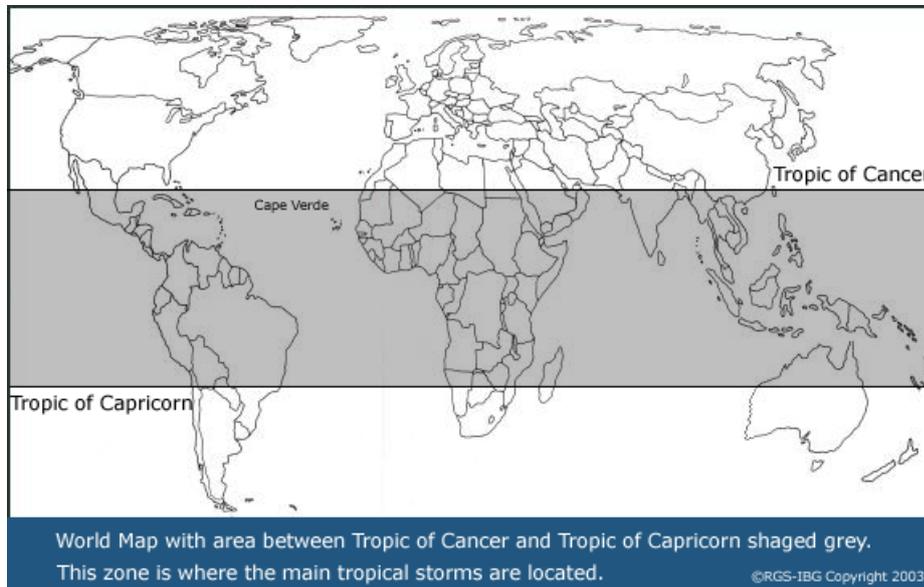
This view taken just below Grand Falls shows the high level of the river before the hurricane event so it was the very wet spring and summer aggravated by higher than usual winds, which caused all the flooding not the hurricane *per se*.

A friend emailing from Virginia living under the track of Isabel reported a tree came down in the yard and we lost power for a day. On the coast there were significant evacuations and damage to mostly wooden buildings coupled with power and communication disruptions and a reported death toll of 17. This could hardly be called catastrophic for the most prosperous country in the world.

In contrast, just five days before the USA event South Korea, on 13<sup>th</sup> September, had its worst typhoon since records began in 1904. Typhoon Maemi was a category 4 hurricane with winds gusting to 134mph and damage classed as extreme. In its wake it left well over 100 people dead, paralysed road, rail and air transport. Busan, its largest port, handling 80% of its exports had its container port badly damaged and surrounding industrial plants suffered badly too. The estimated cost of property damage was around 1.58 billion US\$. The effects on a small country like South Korea contrast markedly with such natural events in the major economies of the world. It will be interesting to see in the coming months whether there are significant drops in South Korea's growth targets and GDP as predicted because of the continuing impact of Maemi.

So the Guardian editor certainly had a point worth remembering when hearing news of disastrous natural events that perhaps British broadcasters have given more time and prominence to Isabel than it deserved.

## Hurricanes, Typhoons and Monsoons



Using the map and the information in the 'Geography in the News' feature 'Hurricanes, Typhoons and Monsoon' answer the following questions.

**1. Explain why hurricanes are often referred to as Cape-Verde type.**

**2. Explain why the zone shaded grey on the map is where most tropical storms originate.**



Isabel about 400 miles south-south east of Cape Hatteras in North Carolina.

©NASA

**3. Explain why the British Isles will never experience a true Hurricane? Are the hurricane force winds we do experience from a tropical storm?**