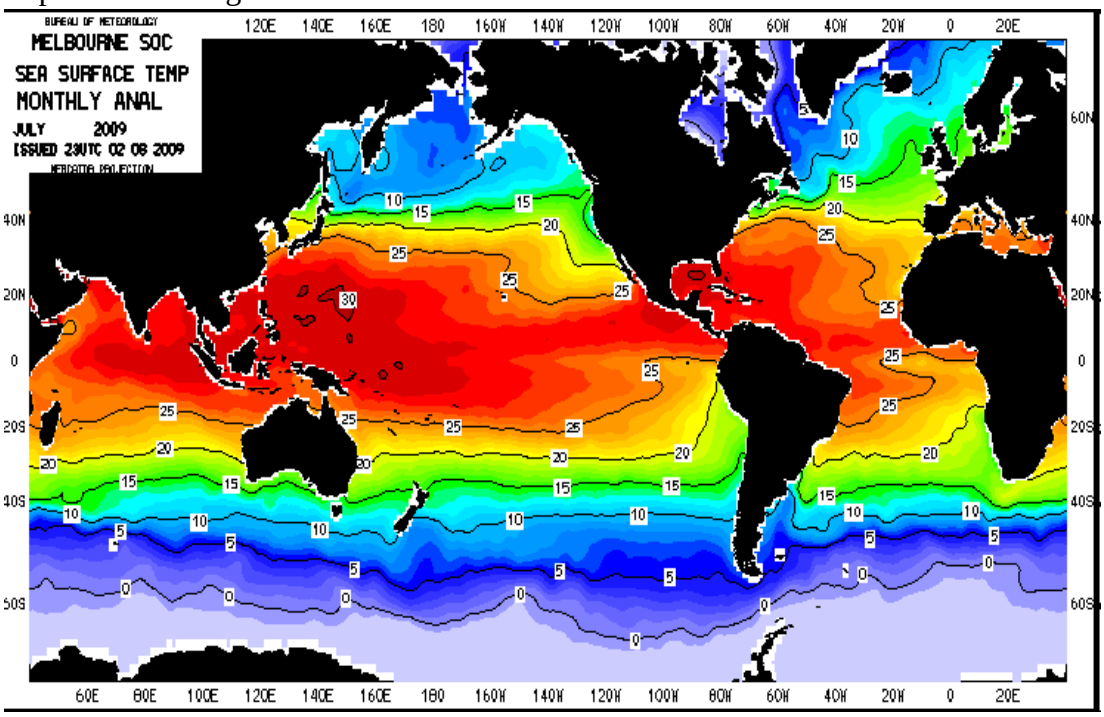
Notes from the presentation of Bob McDavitt, MetService Weather Ambassador, to the Roadmarkers Conference 2009

After a brief introduction to what is meant by El Nino, we will look at the latest state of play with the current El Nino episode and then at its likely impact on the weather over the next few months, with some tips on how to avoid the worst.

El Nino is a seasonal weather cycle. NIWA looks at the climate and its seasonal change or variation from normal, and MetService, in consensus with NIWA, looks at the most likely weather patterns as a consequence.

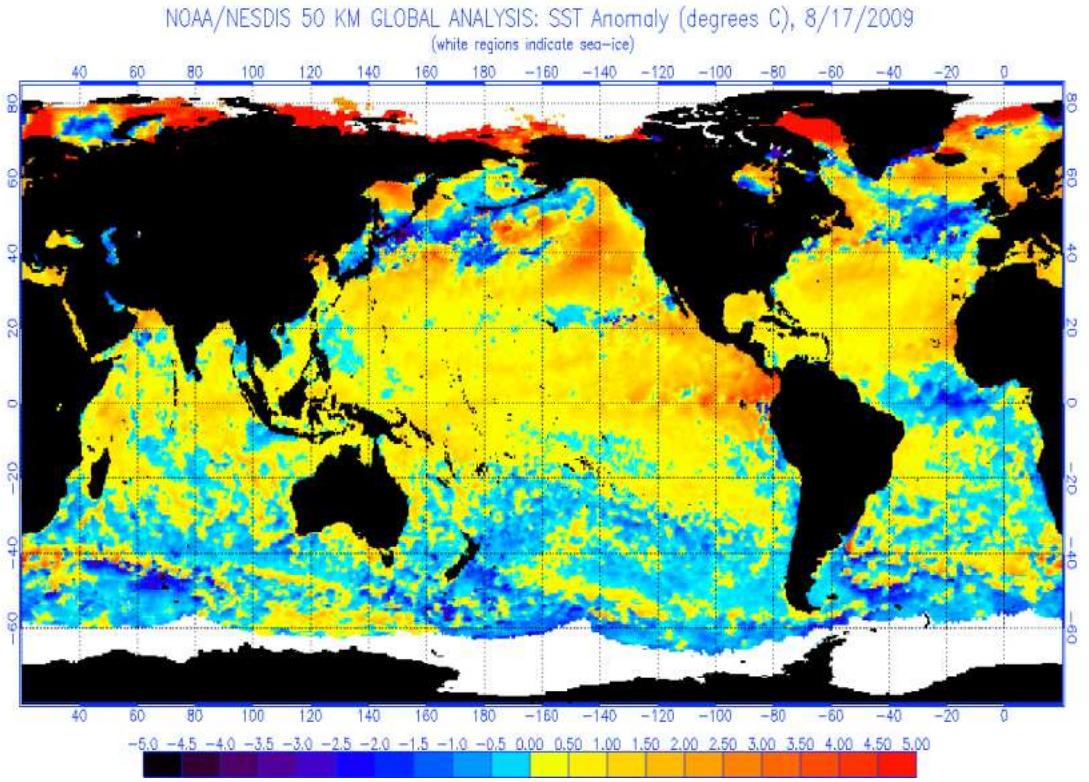
Measuring seasonal trends in the weather is done by looking at related parameters than change slowly. Air pressure is too erratic; it goes up and down several times a week. So we chose Sea surface temperature, which only varies by about a degree per month.

Here is the sea surface temperatures around the world averaged over the past month, taken from
http://www.bom.gov.au/climate/current/meansst.shtml



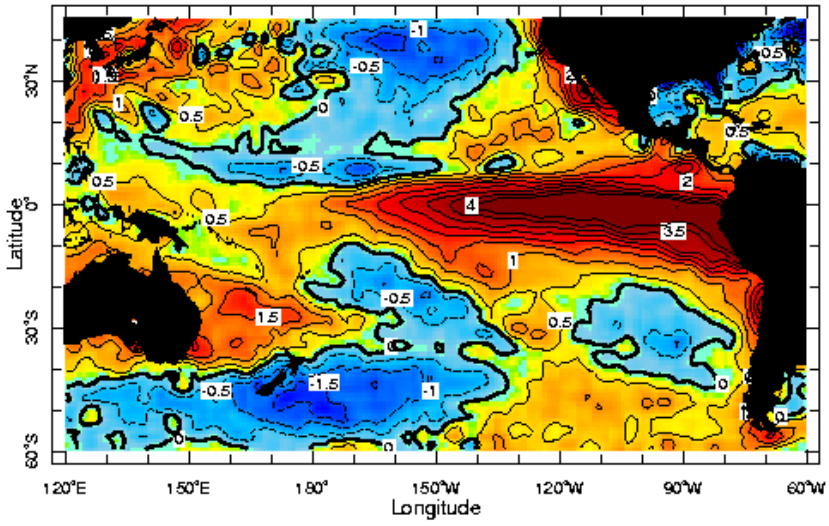
This averaged map has some pattern in it, but to highlight the anomalies we need to remove the normal component (as measured over the pat thirty years) and just look

ant the differences from normal, as seen at
http://www.osdpd.noaa.gov/ml/ocean/sst/anomaly.html



This is beginning to show useful pattern. The two main patterns that we can discern by looking at these anomaly maps are the El Nino and the La Nina. El Nino is used to refer to the seasonal anomaly that occurs when the sea surface temperatures along the eastern equatorial Pacific are WARMER than normal

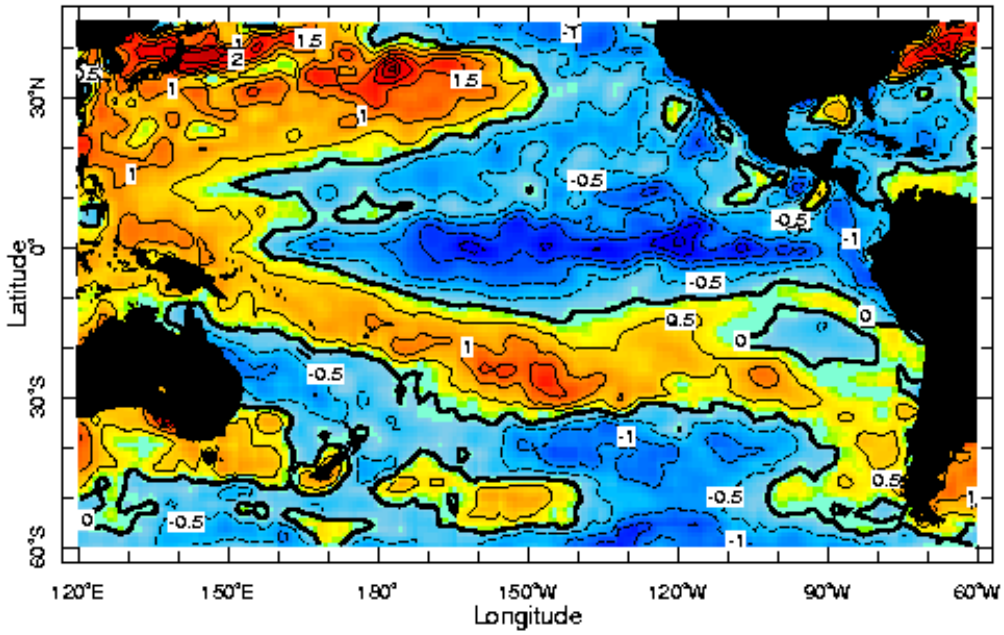
- an extreme example of this happened in Dec 1997:



- Dec 1997

In the mid Pacific the Sea was heated up to 4 degrees above the 29-30C normal… taking it to 33-34C or skin heat—**the heat of a spa pool-** imagine paying the energy bill for this huge spa pool!

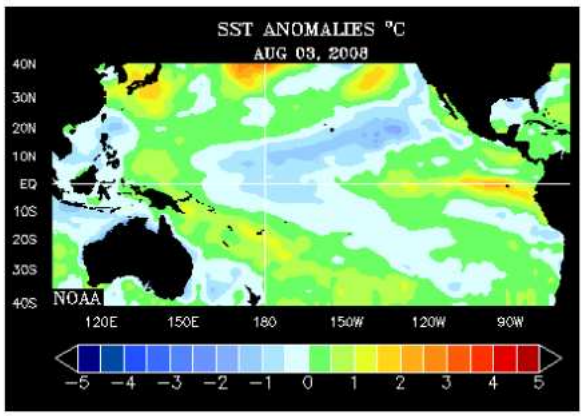
And La Nina occurs when we have COOLER than normal water in the eastern equatorial Pacific, as shown by this extreme example in Dec 1999:



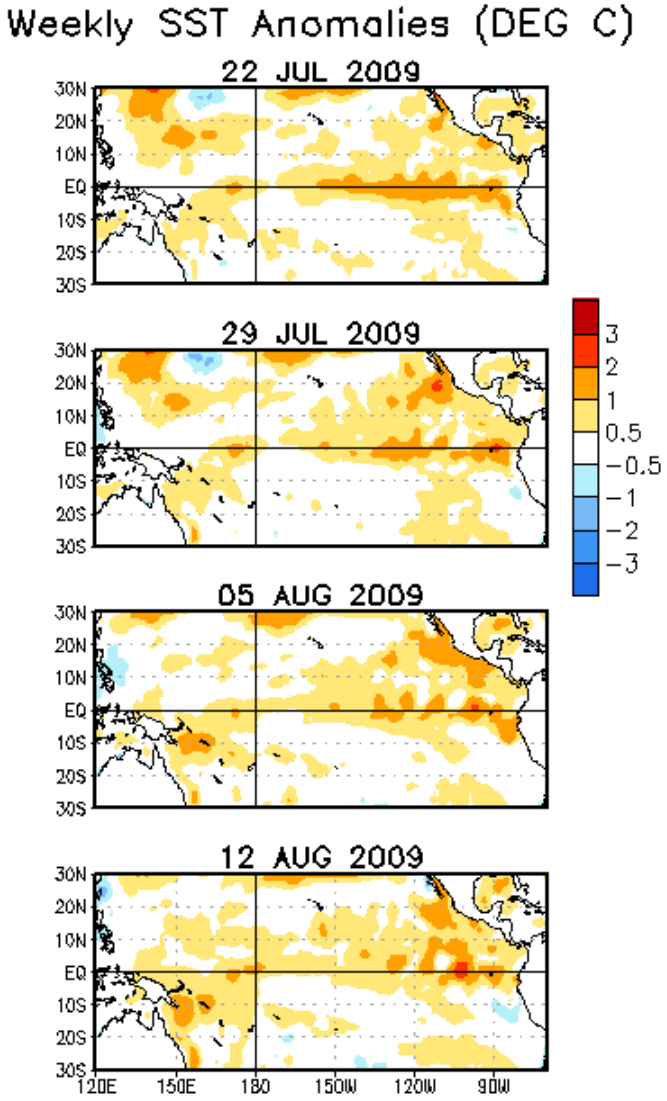
Dec 1999

On Planet Earth, our weather is powered by the sun. Air is transparent, so sunlight doesn't heat the atmosphere directly, but sunlight does heat the ocean, mainly at the equator, and evaporation makes clouds and they forms zones of weather. Our orbit around the sun varies the input energy and makes these zones contract and expand and shift north and south - creating our seasons.
The interplay of heat between atmosphere and ocean keeps changing, and sometimes there is an abundance of energy available for weather and sometime s a deficit. The eastern side of the largest ocean acts like a capacitor or battery--- storing heat when there is an abundance, and withdrawing when there is a deficit.

When we have an El Nino all the weather zones are pulled closer to the equator.
In the South Pacific they are tugged northwards and eastwards towards the warmer ocean, so that in New Zealand we get more of the "roaring 40s" and cooler than normal seas.
An animation of the sea surface temperature anomaly across the Pacific for the past year was played – this showed the cool seas that fed last summer's La Nina and showed the equatorial Pacific going through a warming trend since last May. It was taken from http://www.cdc.noaa.gov/map/clim/sst_olr/sst_anim.shtml
Start of the animation looked like this

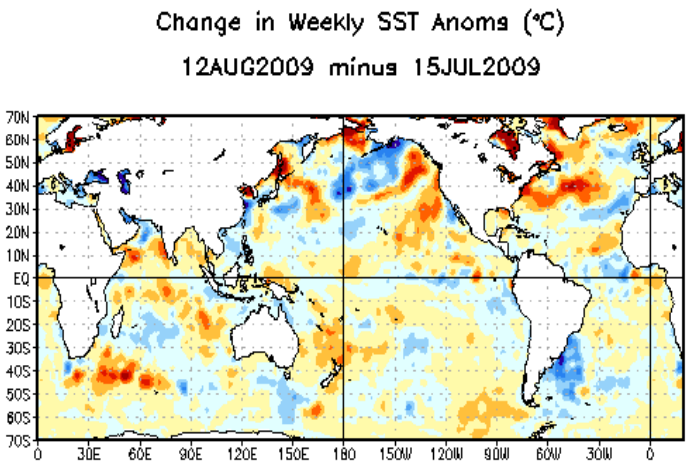


According to the ocean, looking at Sea surface temperatures SST, we now have an EL NINO in the tropical Pacific Ocean (it warmth has exceeded the threshold) . But a look at the weekly maps of the SST anomaly over the past month, …...

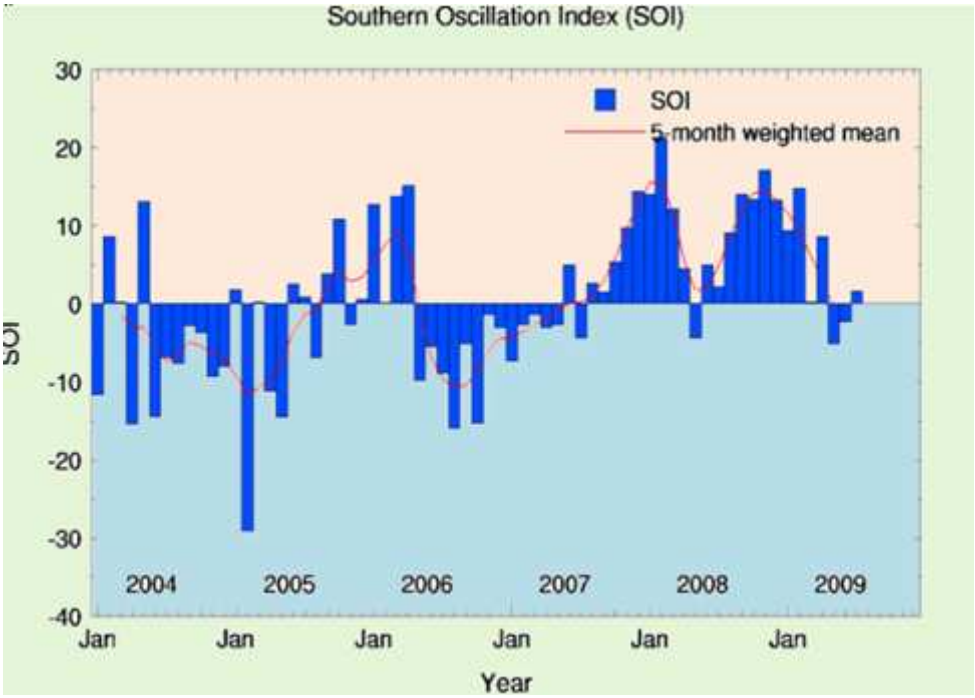


……shows that they are all very similar.

And the TOTAL CHANGE of the anomaly map in the past month shows little movement. SO this El Nino has PAUSED (see below).



Another way of measuring the El Nino is to see its impact in the Atmosphere. This is done by looking at the Southern Oscillation Index, which is based on the normalised pressure difference between Tahiti and Darwin, so it comes as a retrospective look at the weather maps, as recorded at http://www.bom.gov.au/climate/current/soi2.shtml:

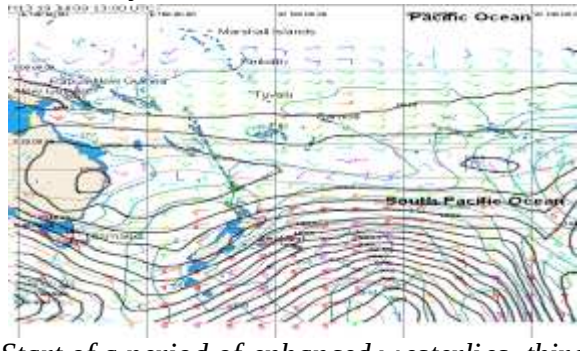


On this graph, the negative zone is El Nino territory, and anything deeper than minus ten is taken as an El Nino episode in the atmosphere. Positive numbers are in La Nina territory with number plus ten or more taken as a La Nina episode in the atmosphere.

So in the past month the atmosphere has been bucking the El Nino trend seen in the ocean. The coupling between atmosphere and ocean is like this—more like a tug-of-war than a marriage, and usually the ocean leads the way. **At present atmosphere and ocean are out of sync,** but the computer models are suggesting they may well get into sync during the next few months and that **we are in a transition to a weak moderate El Nino episode that may reach its peak this coming summer.**

What does this mean for us?

We are in a transition period into an El Nino episode, and that means we should look out for periods of enhanced westerly winds on the weather map—usually associated with anticyclones that take their time to move east across the northern Tasman Sea .



Start of a period of enhanced westerlies, third week of July

We saw one of these periods of enhanced westerlies during the third week of July and ion 21 July there were tornados reported in Opunake and Cromwell, and on 22 July a wet windy front brought slips around Wellington that closed both main motorways out of the city- One slip just north of Upper Hutt derailed the Masterton train.

Periods of enhanced westerly wind are on the menu for the next few months, and during these periods NZ will be divided into three zone--- a western /southern zone with wetter than normal conditions, an eastern zone with warm dry condition, and a in-between zone that will be near normal. To check more regional details and updates of these zones check the NIWA seasonal outlook or its MetService equivalent at http://www.metservice.com/public/ruralWeather/seasonal/north-island.html

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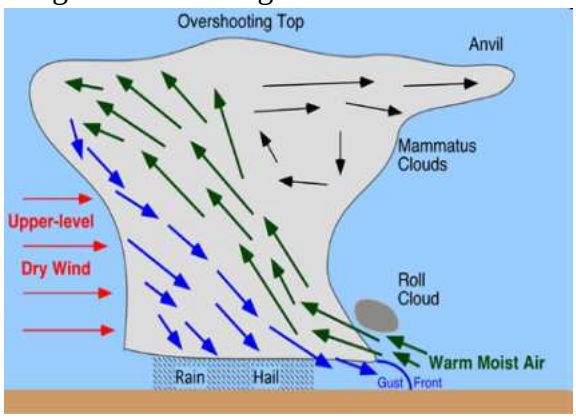
One of the features of these periods of enhanced westerlies will be thunderstorms

These are associated with Cumulonimbus clouds (Cb) .

Each Cb has an updraft and a counterbalancing downdraft, the downdraft brings with it a shower of wind and rain. In the up draught, rising motion form several in-draughts is drawn together into a concentrated chimney of rising air.



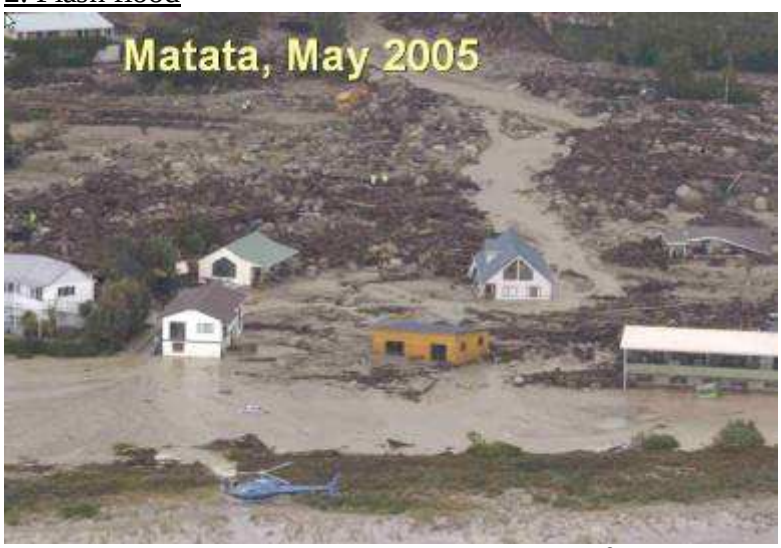
Cb clouds can kill people in six different ways:

1. Lightning

When this rising air is fast enough, molecules of water vapour rub past air molecules on a joy ride upwards and lose electrons in the process. A large positive charge accumulates in the clouds upper frozen layers, and an equal amount of negative charge collect at the cloud's base surface. When these reservoirs of charge exceed the natural electrical resistance of the air between them, there is a discharge a lightning.

Lightning over Waiheke Island as seen from Maraetai about 8pm , 9 December 2006
Photo: Steve Williams, www.thunderstorm.co.nz

2. Flash flood



Downdraughts can sometimes take rain that is forming in a large area and compress it to land over a small area. The threshold for rain from a severe thunderstorm is 25 mm/hr or more.

3. Hail

Normally downdraughts keep to one side of the cloud, but sometimes the stronger upper winds tilt the cloud and part of the downdraught gets blown into the updraught. The falling rain gets held up in the updraught making hail. The threshold for hail from a severe thunderstorm is 20 mm or more (size of a modern day kiwi 20 cent coin).

Traffic shelters from damaging hail under an overpass, Sydney September 2003

4. Wind damage (Downburst)

Downdraughts sometimes act as a guide path to allow the strong winds aloft to get to ground level, producing downbursts. Wind in downburst can be just as strong and damaging and wind in tornados, and the two often get confused. Doesn't really matter, both are "wind damage".

The threshold fro wind damage from a severe thunderstorm is gusts of 110 km/hr (60 knots) or more

Wind damage, Opunake Taranaki 22 July 2009

5.Tornado

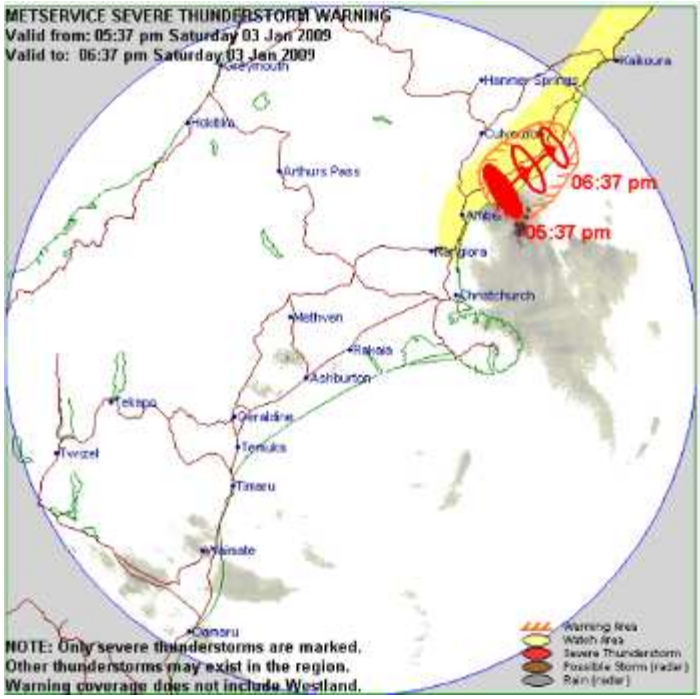
Sometime the downdraught is pushed so far around the updraught that it acts like a cloak, compressing the updraught into a smaller and smaller area. The in-draughts that feed the updraught usually coil around each other like snakes, and this compression , combined with the conservation of angular momentum leads to a tornado. Tornados are measured of the Fujita scale and the threshold for a tornado from a severe thunderstorm is F1 or 116 km/hr (63 knots) or more

Tornado near Ardmore airfield , Auckland, 25 June 2005

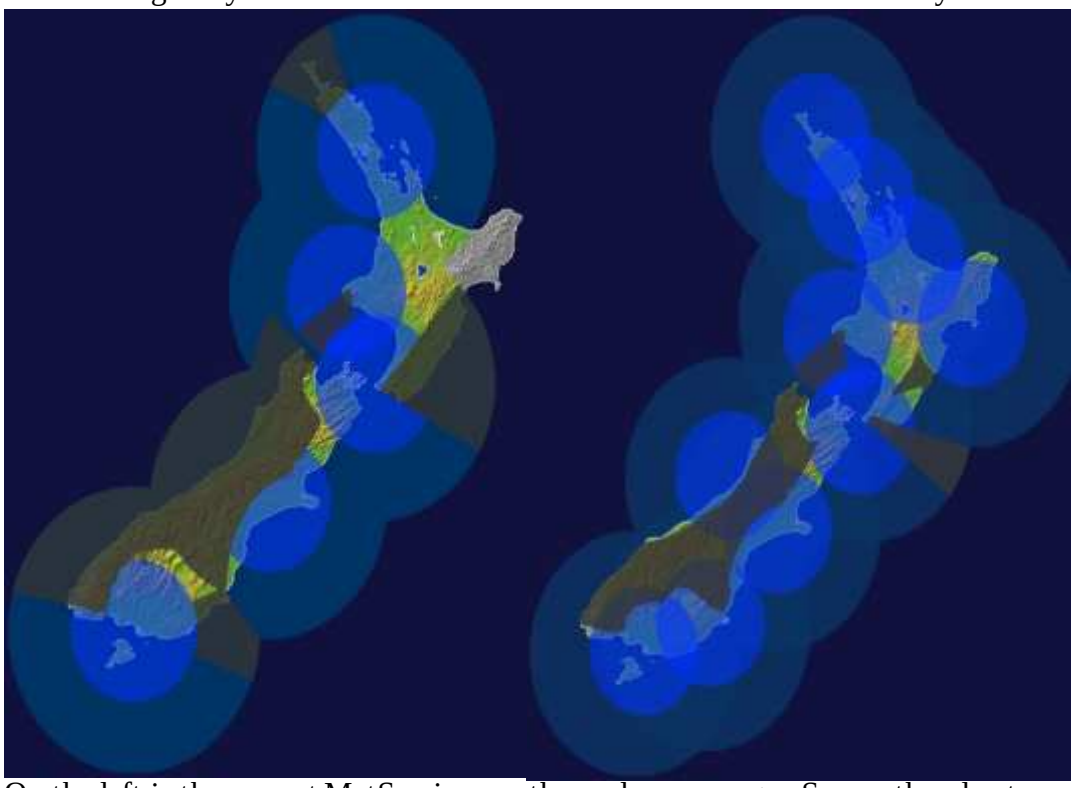
6. Rime Icing

If an aircraft flies too close to a Cb it may take its sub-zero airframe into a zone of supercooled cloud droplets. In this case the cloud deposits itself as ice on the airframe, resulting in reduced aerodynamic efficiency and misleading measurements on the instruments, especially for airspeed. This may be a factor in recent plane crashes.

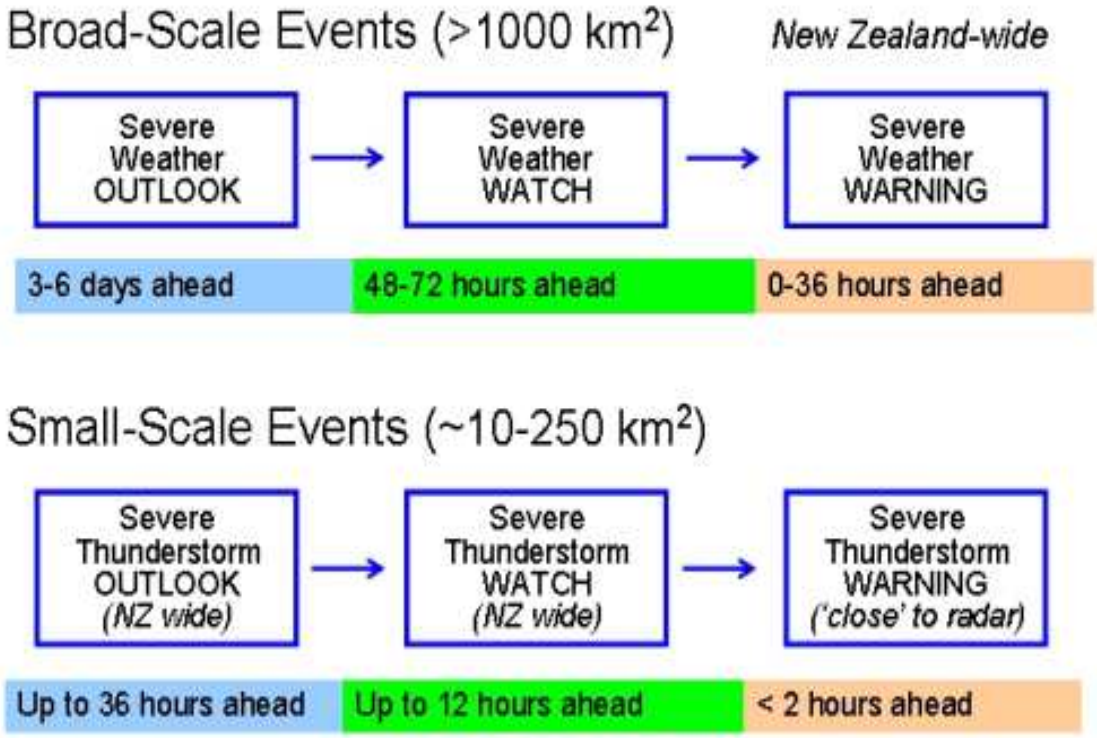
MetService now issues **Severe Thunderstorm warnings**, and here is a SAMPLE



The warnings only mention detected severe thunderstorms and their likely track.

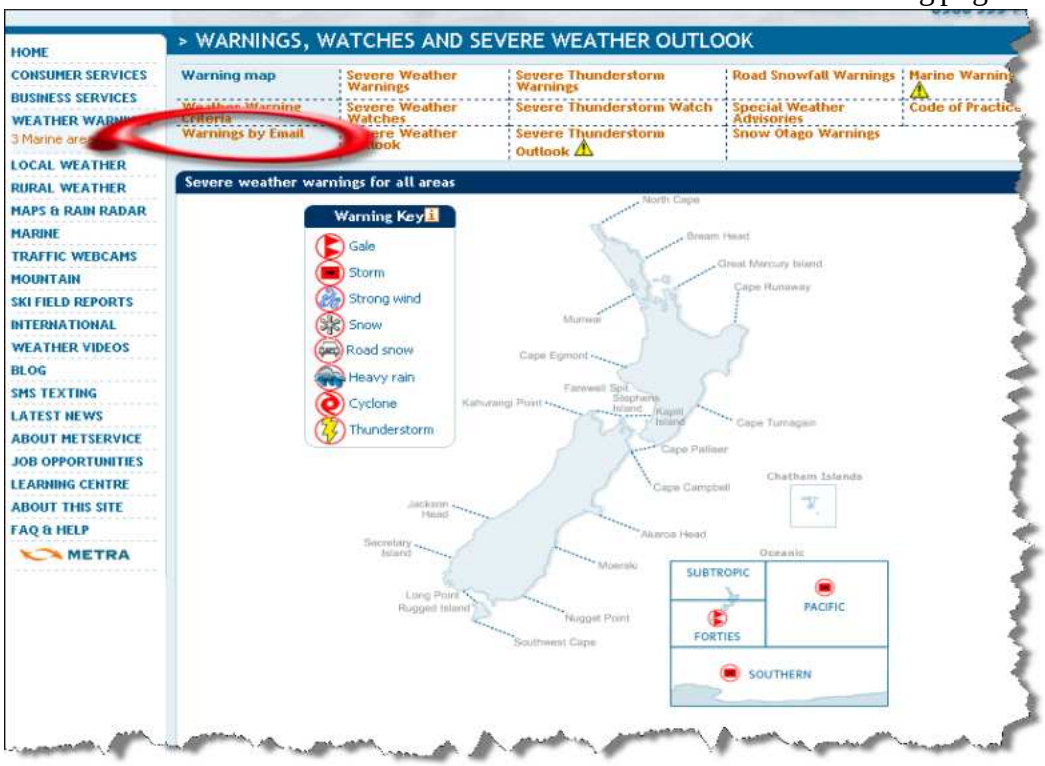


On the left is the current MetService weather radar coverage. Severe thunderstorms can only be detected in the darker blue areas (and some may go undetected anyway). On the right is the expected expansion of MetService weather radar coverage by 2012.



Severe **Weather** Outlooks, watches and warnings are issued as nasty weather approaches and each of these bulletins has its own timescale.
A similar naming process is used for Severe **Thunderstorm** Outlooks, watches and warnings…but the time scale (and coverage) is on a much shorter (and smaller) scale.

All these bulletins can be found on the metservice.com web site warning page.



Go to metservice.com and click on the forth on the left.
There is also a **"Warning by email"** service link circled above.

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