Submission

To the Inquiry
By
The House of Representatives Standing Committee
on Industry, Science and Innovation

into

Long-term meteorological forecasting in Australia

Contents: 16 pages + 2 page appendix

The terms of reference of the Inquiry

1. The efficacy of current climate modelling methods and techniques and long-term meteorological prediction systems;
2. Innovation in long-term meteorological forecasting methods and technology;
3. The impact of accurate measurement of inter-seasonal climate variability on decision-making processes for agricultural production and other sectors such as tourism;
4. Potential benefits and applications for emergency response to natural disasters, such as bushfire, flood, cyclone, hail, and tsunami, in Australia and in neighbouring countries; and
5. Strategies, systems and research overseas that could contribute to Australia's innovation in this area

Executive Summary

This submission addresses TOR1 and TOR5 and in doing so recommends that a certain weather forecasting technique new to this country be considered and that climate modelling is of very limited value because key issues are poorly understood and poorly incorporated into those models. It is considered that modelling cannot progress in any meaningful way until knowledge of key factors is improved considerably.

Biographic Note

My name is John McLean and I am an information technology specialist who for the last 4 years has applied his skills in analysis to various issues relating to climate change. I believe that my critical analysis of various CSIRO climate reports[1] was the first such study to be published in a peer-reviewed journal and may have been the first study of its type.

Since that time I have investigated the peer review process undertaken for the latest report from the Intergovernmental Panel on Climate Change (IPCC)[2] and separately investigated the authorship of the pivotal ninth chapter of the Working Group I contribution to that report[3]. Both of these documents have been widely cited on the Internet but neither was published in a peer reviewed journal because the work involved mere counting, the investigation of author lists and the correlation of names - nothing very novel and nothing that could not have been discovered anyone else, if only they had put in the effort.

[1] McLean, J (2006) - A Critical review of Some Recent Australian Climate Reports, Energy and Environment, vol 17, no. 1 (March 2006), available, I believe, in the Australian National Library and available online at http://mclean.ch/climate/docs/EE%2017-1_03%20McLean%20ok.pdf

[2] See http://mclean.ch/climate/docs/IPCC_review_updated_analysis.pdf

[3] see http://scienceandpublicpolicy.org/images/stories/papers/originals/McLean_IPCC_bias.pdf

1. Introduction

It would seem to go without saying that accurate long-term weather forceasts would be of considerable benefit to everyone. Anyone whose activities or income are dependent on the weather would no longer be responding to events as they occur, or at most with a few days advance notice, but could plan their activities accordingly.

Term of Reference number 3 (TOR3) mentions agricultural production and tourism but to that we could add sporting activities (e.g. snow skiing), electricity generation (especially hydro), energy distribution (for anticipated loadings), water supply management and pre-emptive measures against possible bushfires. If the rest of the world is an accurate guide then perhaps we should include fishing because water temperature is a factor in the size of fish catches.

My primary focus to this inquiry is in relation to TOR1 but indirectly also to TOR5.

To begin, I am somewhat disturbed by the term 'efficacy' - ("n. Power to produce a desired effect", according to my dictionary) - rather than the term 'accuracy'. To whose desire does the "desired effect" refer and is it any different to accuracy?

Likewise the expression "long-term" warrants clarification, especially when the one sentence mentions meteorological prediction and well as climate prediction. Climate is generally recognised as long-term (typically 30-year) averages of meteorological factors. From the context of the other TORs it seems that "long-term" could be anything from 7-day meteorological forecasts, through "inter-seasonal" forecasts, to 70-year climate forecasts.

Having flagged those two ambiguities I will start by discussing a technique of weather forecasting that goes far beyond the 7-day forecasts that we are familiar with. After that I will concentrate on climate predictions that are aimed at approximately 10 to 100 years into the future. I will discuss the accuracy of climate predictions made in the last 15 to 20 years with respect to various areas of Australia, then move to the deficiencies and limitations of climate modelling and to other issues that impede the accuracy of these models.

I will conclude with a brief list of recommendations to this inquiry.

2. Long-term Weather Forecasting

(with reference to TOR 5)

The current 7-day weather forecasts for Australia appear to be based on mathematical projections or many years experience of how current situations are likely to develop, paying particular attention to systems approaching from the west. These have the benefit of having a starting point for which the conditions are well defined.

At a longer timescale the Bureau of Meteorology produces seasonal forecasts are clearly indicated as being based on probabilities according to a statistical analysis of previous developments from similar situations to what we might be experiencing at a given time. The seasonal forecasts are of limited accuracy firstly because weather is a relatively chaotic phenomenon and secondly because of the problem of determining what comprises a "similar situation".

One company that appears to have had good success in forecasting weather several months ahead is Weather Action, a London-based company that bases its forecasts on emissions of solar charged particles. Forecasts from Weather Action[4] have often been shown superior to those from the UK's Met Office especially in the magnitude of storms or other adverse conditions.

Independent confirmation of the accuracy of Weather Action's forecasts is not easy to find. One such confirmation in a peer-reviewed journal is by Dr Dennis Wheeler, of the University of Sunderland, in the *Journal of Atmospheric and Solar-Terrestrial Physics*, vol 63 (2001) p29-34. (I am quoting from a Weather Action web page here.)

Just recently Weather Action has expanded its area of interest from the United Kingdom to a more international service and made 3 predictions for Australia.

Prediction 1 - dated 30 Jan 2009 - "Around 2-5 March 2009: Tropical Cyclone formation &/or rapid development Coral Sea off Eastern Australia - Queensland staying out at sea."

Prediction 2 - dated 28 March 2009 - "Around 5-7 April: Tropical cyclone off Queensland; land touch not likely. Confidence 75%".

Prediction 3 - also dated 28 March 2009 - "Around 18-21 April. Tropical cyclone off Queensland, chance of land hit < 10%. Confidence 75%"

According to the Bureau of Meteorology synoptic charts (obtained by the archive on the Internet), the observed weather conditions in the pertinent regions were as follows:

Outcome 1 - (on prediction made 30 days ahead) Tropical Cyclone Hamish developed rapidly between 06 hours and 12 hrs UTC on 5 March. Its path was out to sea and parallel to the coast.

Outcome 2 - (on prediction 8 days ahead) No tropical cyclone developed.

Outcome 3 - (on prediction made 20 days ahead) A multi-day low-pressure cell developed in the Tasman Sea with midnight UTC MSLP of 991, 996, 998, 997, 990 (19 to 23 April respectively). This was relatively stationary and centred about

[4] Website http://www.weatheraction.com

halfway to New Zealand along the line of Latitude 30 South, which makes in line with northern NSW.

Bearing in mind that the predictions deal with several factors - date, location, type of event and magnitude of events - the work from Weather Action is quite impressive and to my mind worthy of detailed investigation, especially when it seems to extent the forward range of forecasts and improve on the probability-based seasonal forecasts that the Bureau of Meteorology currently uses.

3. On Climate Models

(with reference to TOR1)

3.1 Introduction

In this section I will look first at the CSIRO's track record in climate models. This is particularly relevant as that part of the CSIRO seems bent on merging with the Bureau of Meteorology to produce a single dominant entity.

From there I will discuss 3 key climate model problems in varying degrees of detail before adding brief notes about many other areas of concern. Together this will show that climate models are highly dubious and little credibility should be assigned to them.

3.2 Problems with the CSIRO's climate modelling

In March 2006 my analysis of several CSIRO climate reports[5] published between about 2001 and 2005 was published in the peer-reviewed journal "*Energy and Environment*".

(Please be aware that the climate reports that I cited are no longer at the Internet addresses that I gave for them. If searching for the documents does not reveal them then perhaps the CSIRO gave provide the information.)

My analysis of these documents concluded that these reports typically

(a) included discussion of historical meteorological data (or trends thereof) that only dealt with post-1949 conditions. The Bureau of Meteorology website shows that conditions were generally much drier from 1901 to 1949 than 1950 to 200 and the notion that 1901-49 might have been typical of Australia and 1950-2000 been abnormally wet was never considered.

(b) focussed only on the period since 1950, a period characterised by increased rainfall and increased temperature compared to 1901-49, so trends across this time were different to the overall picture since 1901. The output of climate models was in fact a poor match prior to 1950.

(c) featured a discussion based on historical observations that included mention of the influence of the El Nino-Southern Oscillation (ENSO), but there was no mention of such events (i.e. La Nina or El Nino) when it came to climate modelling either of past conditions (a retrospective prediction or hindcast) or of future conditions. In at least one report readers were told "*the causes of ENSO are complicated and not fully understood, which makes ENSO difficult to represent in climate models,...*"

(d) used a selection process for models, whereby the output of the models was compared against observational data typically since 1950, that was remarkably generous in deciding which models to include. Some models had rainfall predictions that had RMS errors of more than 300%, while others failed to produce temperatures that reasonably corresponded to what had been observed. (E.g. For South Australia, the annual average rainfall in the period under review was 236mm, whereas most of the climate models predicted rainfall of at least 360mm, which is more than 50% greater.)

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[5] McLean, J (2006) - A Critical review of Some Recent Australian Climate Reports, Energy and Environment, vol 17, no. 1 (March 2006), available online at http://mclean.ch/climate/docs/EE%2017-1_03%20McLean%20ok.pdf

(e) showed huge variations in the output of these models that were allowed to pass without comment, including the spectacular variation of between 30 and 200 hot days (over 35 degrees) in the north of the Northern Territory in year 2070. Which should be believed - 1 month, more than 6 months or something between?

(f) featured a consistent assertion that warming was due to anthropogenic (i.e. manmade) emissions of carbon dioxide but nary a shred of evidence to support such a claim. These reports usually cited the findings of the IPCC but its proof is woefully flimsy too.

(g) and overall had a pattern of progressive obfuscation of how the output of the models compared to observational data. Often the two graphs were small and on different pages of the report, and in one instance (a report for Queensland) the scale on the "predicted" graph was different to the scale for the observational data and gave the illusion of being a reasonable match.

In total, my review pointed to
- likely critical climate factors being omitted from the models,
- the work concentrating on only a select period (since 1950) when observational data prior to that time is rather different in character,
- repeated unsubstantiated assertions as to the causes of climate change,
- similar assertions about the accuracy of models, and
- the (deliberate?) obstacles in the path of the reader who wanted to compare historical data with predicted values

Seen in this light there is little reason to have confidence in the climate predictions made by the CSIRO. In my paper I asked why was it necessary to try to predict climate to 2100 or 2070 using mathematical models that are still in their infancy, and have inaccuracies that are so abundant and obvious? In the three years since this paper was published I have seen no good reason to revise my opinion.

3.3 Trying to model the impossible

The climate models used to date for Australia attempt to model the impossible. Here are details of 3 issues that models either claim to deal with but cannot, or that they omit entirely.

Why should we accept the output of such models when we know that these matters are not accurately incorporated? Why should climate modelling receive much funding when "upstream" matters require investigation before models can be created?

3.3.1. Predictions of rainfall

The above-mentioned CSIRO climate reports attempted to predict rainfall in the regions that the reports focussed on. At first glance this might seem a reasonable thing to do because accurate information would be extremely useful. The big question is how did those models make their predictions.

For some time the Bureau of Meteorology has suggested that Australia's rainfall correlates reasonably well to sea surface temperatures in the ocean to the south and southwest of Indonesia (usually referred to as the "Indonesian warm pool").

Just a few months ago a team of researchers from the University of New South Wales claimed that our rainfall correlated quite well with an Indian Ocean dipole, where a dipole was the difference in air pressure between two points. From personal communication with Professor

Stewart Franks, a hydrologist at the University of Newcastle, I learned that Franks and his researcher had examined several possible definitions of the Indian Ocean dipole and found that strong correlations existed for some but only a small change in the definition would produce a very weak correlation.

At this point in time it seems very unclear as to whether it is a very specific and precise dipole or the ocean temperature near Indonesia or perhaps something else that drives Australia's rainfall.

This situation begs a very serious question about how the climate models that have been used to date can predict rainfall in Australia given that they were created before either the BoM's finding or the recent claims about a dipole.

It also highlights that climate models are of dubious value if fundamental issues are poorly understood and cannot be accurately modelled.

3.3.2 The number of hot days

The number of hot days predicted by climate modellers says a lot about the assumptions and credibility of models. These claims are based on fallacious reasoning because, with no exceptions that I know of, heatwaves are due to winds drawing warm air from one location and depositing it in another.

This, along with exceptionally dry conditions, caused Europe's heat wave of 2003 that resulted in many fatalities, especially in France where elderly people died while their children who might otherwise have cared for them, were on holidays; there was no need to invoke the spectre of manmade warming to describe this event.

The IPCC[6] described the cause of this European heatwave:

> The 2003 heat wave was associated with a very robust and persistent blocking high-pressure system that may be a manifestation of an exceptional northward extension of the Hadley Cell (Black et al., 2004; Fink et al., 2004). Already a record month in terms of maximum temperatures, June exhibited high geopotential values that penetrated northwards towards the British Isles, with the greatest northward extension and longest persistence of record-high temperatures observed in August. An exacerbating factor for the temperature extremes was the lack of precipitation in many parts of western and central Europe, leading to much-reduced soil moisture and surface evaporation and evapotranspiration, and thus to a strong positive feedback effect (Beniston and Diaz, 2004).

Locally the situation has been described Geosciences Australia, first for Perth[7] ...

> Perth's summer patterns often follow a typical sequence. A ridge of high pressure south of the state combines with a deepening trough off the west coast to direct east to northeasterly winds over the Perth region. This pattern causes rising temperatures over successive days. The trough then moves inland allowing early

[6] IPCC Report (2007), Working Group I contribution, chapter 3, Section 3.8.4, (Box 3.6)
[7] Geosciences Australia - "Natural Hazard Risk in Perth, Western Australia" (complied by Trevor Jones, Miriam Middelmann and Neil Corby) online at http://www.ga.gov.au/image_cache/GA6523.pdf, (extract from page 53). This document also cited on http://www.bom.gov.au/weather/wa/sevwx/perth/heatwaves.shtml

> seabreezes along the coast resulting in a cool change. A new ridge then develops to the south producing southeasterly then easterly winds and the sequence begins again. Prolonged spells of hot days occur when this pattern is slow moving, the high being maintained south of the state and the west coast trough remaining off the coast. On such occasions, the east to northeasterly winds prevent the early arrival of the seabreeze and cause temperatures well above the average.

Then for southeast Queensland[8] ...

> "In South-East Queensland, heat waves typically occur between November and February, but days of excessive heat can occur between October and March. During these events the predominant wind is generally from the south-west to the north-west, i.e. from the interior of the Continent. Winds from these quarters have the potential to nullify the cooling effects of any sea breeze."

The Bureau of Meteorology has weighed in with a summary on conditions that brought Adelaide's sustained heatwave in March 2008[9]

> "The event was largely the result of a very slow-moving high pressure system in the southern Tasman Sea, which directed north- to north-easterly winds across much of southern Australia. Such 'blocking highs' are not unusual, but the persistence of this system over more than two weeks is almost unprecedented in the summer half of the year. Previous systems1 with similar longevity have occurred in late autumn and winter and have therefore been associated with much lower temperatures.
>
> "Most significantly, Adelaide had 15 consecutive days of 35°C or above and 13 consecutive days of 37.8°C [equiv 100°F] or above, breaking the previous records of 8 and 7 days respectively. These are both records for any Australian capital city, although much longer runs have occurred at inland locations, both in South Australia (e.g. 46 days of 35°C or above at Marree from 30 December 2000 to 13 February 2001) and elsewhere (e.g. 200 days of 35°C or above at Marble Bar, Western Australia, from 5 October 1923 to 21 April 1924)
>
> "A La Niña event has been in progress in the tropical Pacific Ocean for several months. Preliminary research indicates evidence of a link between La Niña events and prolonged hot spells at Adelaide. Further investigation of such links elsewhere in Australia, and possible mechanisms responsible for them, is currently an active area of research."

For Melbourne I can speak from personal experience and say that with very few exceptions hot days in Melbourne feature northerly winds regardless of the season. This was certainly true on "Black Saturday" (7 Feb 2009), but this day was exceptional because the strong monsoonal activity in northern Australia had put a pool of very warm air in central Australia.

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[8] Geosciences Australia (2001) - "South-East Queensland Community Risk Report", (chapter 10, "Heat Wave Risks" by Ken Granger and Michael Berechree) online at http://www.ga.gov.au/image_cache/GA4213.pdf

[9] National Climate Centre, 2008. An Exceptional and Prolonged Heatwave in Southern Australia, Bureau of Meteorology, Special Climate Statement 15. (issued 20 March 2008, updated 3 April 2008) (available at http://www.bom.gov.au/climate/current/statements/scs15b.pdf)

For the two weeks from 26 January to 8 February, Tibooburra, Bourke and Broken Hill (all in New South Wales), Moomba in South Australia and Mildura in Victoria all reported very hot conditions with at most 2 days that had maximum temperatures below 40 degrees. Further north, at Birdsville and Cunamulla in Queensland and at Alice Springs, temperatures only exceeded 40 on 3 days of those 14 days. It is no wonder at all that northwesterly winds caused high temperatures in Victoria.

All this goes to show that heatwaves are caused by the movement of warm air and typically they are driven by stationary or near stationary cells of High or Low pressure.

Climate models are unable to predict that pressure cells will be stationary or very slow moving, nor are the models good at predicting what winds will do across a period of maybe a week or two. IN other words climate models are incapable of predicting heatwaves and claims about the predicted number of "hot days" is utterly farcical.

If only this situation stopped here. Unfortunately the high temperatures that these heatwaves bring force the monthly average temperatures higher and these monthly averages are held up as (a) proof of rising temperatures, (b) proof of manmade warming and (c) by extension, proof of the accuracy of models.

3.3.3. The El Nino-Southern Oscillation (ENSO)

The El Nino-Southern Oscillation (ENSO) is well known to most Australians because El Nino periods are usually associated with warm dry weather and La Nina periods with wet and cooler conditions.

The Bureau of Meteorology uses the Southern Oscillation Index (SOI), calculated according to the "Troup system", to measure the strength of the ENSO. By using this scale it can be shown that the La Nina side of the SOI scale was favoured from at least 1950 to 1976 but since the Great Pacific Climate Shift of 1976 the bias has been in favour of El Nino (see **Appendix 1**).

In its 2007 report the IPCC acknowledged the influence of the ENSO on global temperatures, such as the high global average temperatures in 1998 being due to a strong El Nino, and referred several times to the Climate Shift. The CSIRO took a similar position when it mentioned the influence of ENSO events in several of its reports including the report "Climate Change in Australia: Technical Report 2007" (hereafter "CCA report"), that was written in conjunction with the Bureau of Meteorology.

The CCA report makes several observations about how Australia's climate is influenced by the ENSO system. In chapter 2 of the report we are told...

<u>on rainfall -</u>

> "Australian rainfall shows considerable variability from year-to-year, partly in association with the El Nino – Southern Oscillation (ENSO)" (*pg 19*)

<u>on tropical cyclones -</u>

> "... although there have been apparent decreases in [tropical cyclones] in east Australian numbers since the 1970s largely due to increasing numbers of El Ninos" (*pg 22*)

<u>on east coast low pressure cells -</u>

"... showed significant correlation between the occurrence of east coast lows, the Southern Oscillation Index, and the latitudinal position of the subtropical high pressure belt. There is a strong tendency for east coast lows to occur after El Nino years and in particular when an El Nino is followed by a La Nina". (*pg 23*)

on sea surface temperature -

"In the Pacific, an El Nino-like pattern features prominently in the warming trend with stronger warming [of the sea surface] in the eastern Pacific. ... It is not clear whether the pattern is related to greenhouse gas induced warming, or is caused by the fact that since the mid-1970s, natural variability has resulted in there being more El Nino years than la Nina years." (*pg 25*)

on ocean currents -

"The [Leeuwin] current is stronger during a La Nina year and weaker during an El Nino year. ... Since the mid-1970s there have been more El Nino than La Nina events" (*pg 25*)

This report made no direct mention of the influence of ENSO on temperatures over land but this is easily demonstrated.

Australia's long-term mean temperature pattern is often illustrated by a graph with a single trend line across the entire period. If we take the year of The Great Pacific Climate Shift, 1976, and examine the mean temperatures to either side of it (see Figure 1) we find that this caused a "step" in Australia's temperatures, with the two parts separated by a period of readjustment[10].

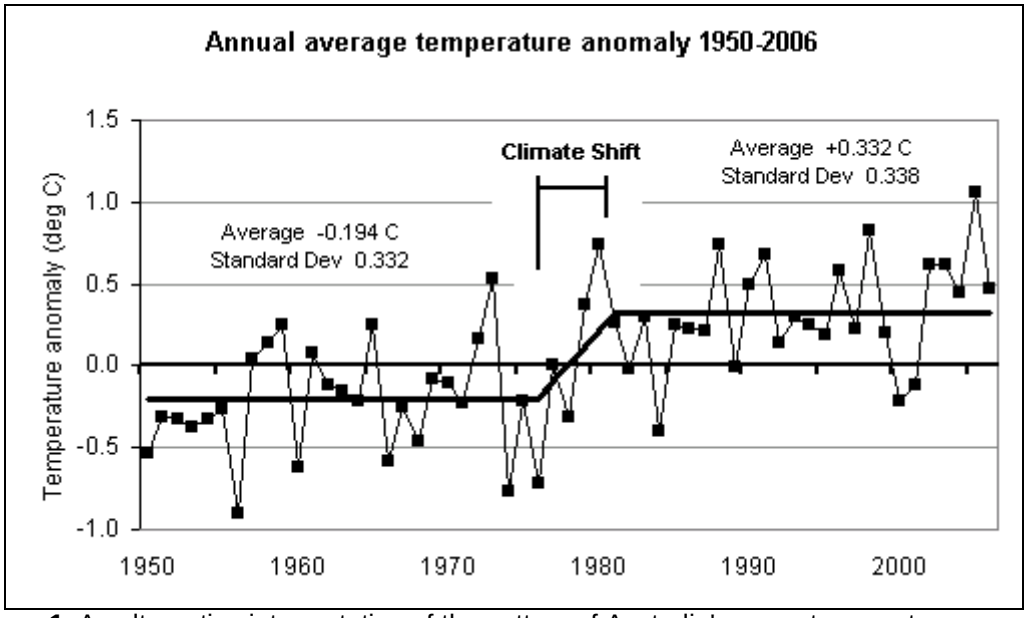

Figure 1. An alternative interpretation of the pattern of Australia's mean temperature

Over the 25 years from 1951 to 1975, which is the period before the climate shift, the average temperature anomaly across Australia was -0.194 ºC (i.e. 0.194 ºC below the 1961-1990 average). The standard deviation associated with these temperatures was 0.332 ºC and the

[10] For more details see http://mclean.ch/climate/Aust_temps_alt_view.pdf

standard error was 0.0664 ºC. During the 25 years from 1981 to 2005, which is immediately after the climate shift, the average temperature anomaly was +0.315 ºC with a standard deviation of 0.338 ºC and a standard error of 0.0675 ºC.

In other words the two periods were statistically very similar. The average temperature shifted but the standard deviation (i.e. variance) remained virtually the same.

Thus far I have shown that the IPCC acknowledges the influence that the ENSO exerts on global weather and that the CSIRO, alone and with the BoM, agree that that ENSO events have a profound effect on Australia's weather conditions.

The huge problem is that it has proven impossible to predict and model ENSO events with any greater accuracy than about 12 months ahead. The 2007 IPCC report says as much in chapter 8 of the Working Group I contribution[11] ("considerable model skill out to 12 months for ENSO prediction").

Several important points should be noted in relation to this.

(a) Climate models that could not predict ENSO conditions were calibrated against historical observational data that did contain ENSO conditions. No wonder the models produced the wrong results !

(b) When modellers could not produce accurate retrospective forecasts of conditions since the mid-twentieth century they did not admit to the absence of accurate ENSO modelling but drew on the disputed influence of carbon dioxide to fill the gap. It is very likely that this action by modellers put a completely unjustified focus on carbon dioxide as a major cause of the observed temperature increase from 1975 to about 1995 when the Pacific Climate Shift and the subsequent bias towards El Nino can account for that warming.

(c) The use of climate models to predict conditions in the future (e.g. to 2070) is of no value whatsoever until such time as the predictive capability for ENSO events dramatically improves beyond the current 12 months. (I assume, quite reasonably I think, that the kind of ENSO events that have operated for the last 125,000 years will continue at least for the next 70 years.)

Finally on this subject, I must mention that I understand that either the CSIRO or BoM has attempted to investigate whether the ENSO has an impact on Australia's climate. Despite the clear statements made in the CSIRO climate reports and the CCA report mentioned above, it was concluded that no sustained influence could be found.

I find this very difficult to believe because in a paper recently accepted for publication in a leading peer-review journal I show that the ENSO correlates very well (coefficient > 0.8) to average global temperatures as measured from satellites. I therefore question the diligence with which the CSIRO or BoM investigated a possible link and in passing a note a possible conflict of interest in this work vis-a-vis a major source of funding for research. (NB. I make no judgement as to whether the conflict of interest caused blatant abuse of scientific methods and analysis or whether it was the subtler situation that "line ball" decisions were taken in favour of one scenario over another.)

[11] IPCC, 2007: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 996 pp.

3.4 Other obstacles to the accuracy of climate models

I suspect that this inquiry may be told that climate models are quite accurate. My analysis of the CSIRO climate reports showed the situation to be quite different. Here's a list of further issues.

(a) Why use multiple climate models in the one study, as the CSIRO has done? The IPCC report refers to 22 climate models and the CSIRO reports typically started with more than 10, "disqualified" those that could not make reasonable hindcasts, and still continued each time with a minimum of about 6. (A "consensus of climate models" is even more ridiculous than a consensus of people's beliefs!) At most there can be one model that is accurate in every aspect and any other accurate model can only be a duplicate of it, so why use additional models if that one is correct? This questions is of course rhetorical because no accurate climate model is known to exist - and that's because no accurate climate model can be created until such time as ENSO conditions are fully understood and are completely predictable.

(b) Climate models struggle with processing for clouds, water vapour, wind (or other large scale air movement), solar charged particle emissions (see sect 2 above), and by and large assume that the Earth is flat and has uniform radiation for the whole 24 hours.

(c) As noted in the discussion about the accuracy of CSIRO climate modelling, the primary drivers of Australia's rainfall are still unidentified. How can a model be created to predict rainfall when the factors that determine rainfall are unknown?

(d) Climate models assume carbon dioxide to be a primary driver of temperature but as was noted earlier, this was only introduced into models when the models were inaccurate. No model has proven that carbon dioxide is responsible for what little warming has occurred since 1950 because the models (i.e. computer software) structured to assume a strong influence. The very plausible reason for the inaccuracy of climate models without carbon dioxide was the impossible-to-model influence of ENSO events and the consequences of the Great Pacific Climate Shift, combined with a distinct reduction in volcanic eruptions around the Pacific Ocean. Few people make what seems to be an obvious comment, models cannot predict volcanic eruptions, and yet these events can cause significant global cooling. That's two key influences on temperature that (a) models can't handler and (b) influenced temperatures across the period over which the models were calibrated to observational data.

(e) There should also be a big question about the accuracy of the historical observational data to which the models are calibrated. I assume that in Australia the data from the 72-site reference network of stations is used. The recorded data is a verbatim record of observations but notes are supposed to be made about changes to the local environment that might influence temperature and researchers are advised to draw their own conclusions. I know of three worrying situations in Victoria - Nhill where about 20 years ago the instruments were moved from an old airfield (a training base in World War II) to a site on the edge of town, Cape Nelson, where coastal scrub is now higher than the instrument and shelters it from wind, and Laverton, a former military airfield that was in open country until about 15 years ago and is now being progressively surrounded by housing. I wonder how many Australian observation stations have seen their local environments undergo change, not just in the 3 members of the reference network that I mention here but right across Australia.

(f) Assumptions about climate factors are another sore point. According to some climatologists and meteorologists there's a mid-latitude (i.e. 30N-60N and 30S-60S) system known as the Ferrel Cell Circulation that mixes tropical air and takes it further north. According to other climatologists and meteorologists there is no such thing. How can climate models be

constructed when fundamental issues like this are still being debated? (We might also ask how the IPCC can say that recent heat distribution patterns don't correspond to models, and declare the distribution abnormal and warming must be manmade, when the models are very possibly incorrect.)

These six points raise key questions about the accuracy of climate models and some require resolution before accurate models can be created and a reasonable level of credibility be assigned.

3.5 Other major concerns external to models but related to them

The pivotal chapter of the 2007 IPCC report, the chapter in which temperature variations since the mid twentieth century were blamed on human activity, presented little evidence for its claims. The so-called evidence amounted to little more than ...

> "Our models of natural climate forces could not produce output that matched observed temperature until we added a human influence, which means that human activity must be driving climate."

The more accurate reflection of the situation can be described with the addition of some words...

> "Our ***incomplete and inaccurate*** models of natural climate forces could not produce output that matched observed temperature until we added a human influence, which means that human activity ***or some other external influence that we failed to test, or possibly the forces that we failed to accurately include in our original models***, must be ***considered as possible forces that are*** driving climate".

This key chapter of the 2007 IPCC report had 53 authors of whom more than 40 were in a network of people who had previously co-authored papers together, not just any papers but those cited by this chapter. In all probability they had also acted at various times as peer-reviewers for each other's work. The papers they co-authored usually featured climate modelling in some form and this, along with the establishments the authors came from, make it clear that most were climate modellers.

We therefore have climate modellers, using tools that suffer from the problems noted above, making statements with very dubious foundations. Maybe these people have blind faith in their models and are so lost in awe of their own creations that they fail to see the deficiencies.

More than half of these authors came from just 5 establishments so maybe we should also consider whether the conclusions can be interpreted as a retrospective justification for the funding they receive and as justification for future funding.

The claims made by these climate modellers have had a profound influence on modelling and climate research around the world. Few western governments ever reject the statements made by a body associated with the United Nations, and that's what the IPCC is. Governments now direct research funding according to the "policy relevance" of the work. This might ensure that money is not wasted but for an immature science such as climatology it becomes a case of the government pre-empting the results of the research. When no funding is provided for alternative research (i.e. research that investigates other plausible causes) climatologists know that they must make sure that their proposals and results accord with government policy regardless of what (a) they believe and (b) what the true picture might be. It isn't only the researchers who get caught in the maw of saying something in order to get the funding because

reviewers of scientific papers are in the same cleft stick both to ensure that their own jobs are secure and, far too often, support people with whom they have been co-authors of other papers.

Outsiders assume that a "level playing field" exists in climate science but that's far from the truth. Government intervention has skewed the science and in the interests of job security climatologists must conform to the government line - like the Soviet Union all over again.

If you think that I am exaggerating then I suggest that you investigate how much funding was provided over the last 5 years by the Australian government to climate research that did not assume or seek to prove a human influence on climate. I asked Malcolm Turnbull, the then Minister for Science, this same question about 3 years ago and his reply only mentioned how much funding in total had been provided to all climate research.

4. Recommendations

R1 - The methods used by Weather Action to predict future weather should be investigated as a potential enhancement to the Bureau of Meteorology's forecasts beyond the current short-term predictions. The ability to predict conditions several weeks or months into the future would be very beneficial to the wider community.

R2 - Funding to climate modelling should be curtailed until such time as key factors are better understood and can be described mathematically. Models can only ever be as good as the data fed into them and the level of knowledge drawn upon to develop the computer software. The urgent need is for research into these poorly understood factors even where such funding would be for projects that might contradict the popular but far from proven notion of manmade warming.

I thank the Inquiry for the opportunity to comment on this matter.

APPENDIX 1 - The El Nino-Southern Oscillation and 1976 Pacific Climate Shift

The El Nino-Southern Oscillation (ENSO) is not a 3-state entity that shifts abruptly between La Nina, neutral and El Nino conditions but a range of conditions for which a sustained period at one end of the range is called La Nina and a sustained period at the other is El Nino.

Figure A1-1 shows the annual average Southern Oscillation Index from 1950 to 2006 and it is obvious that negative SOI values (i.e. towards El Nino) of varying strengths dominate since 1976.

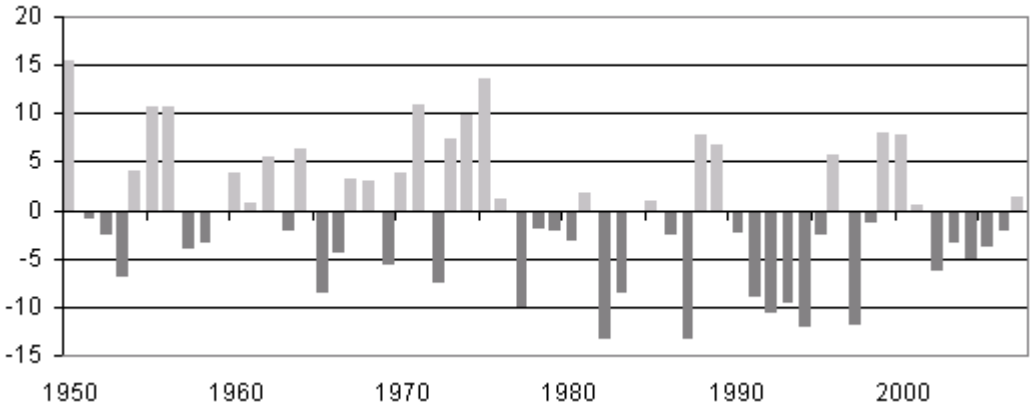

Figure A1-1. Annual average Southern Oscillation Index (1950 - 2006)

Another way to examine this change is by graphing the running aggregate of the SOI. This technique can be used because the index is centred on zero and any important turning points in the sequence of SOI values will be quite obvious.

Figure A1-2 is a graph of the running aggregate SOI since 1950, with sustained rising values indicating sustained positive (or La Nina oriented) SOI values and sustained falling values indicating negative (or El Nino oriented) values. The turning point corresponding to the Great Pacific Climate Shift is obvious.

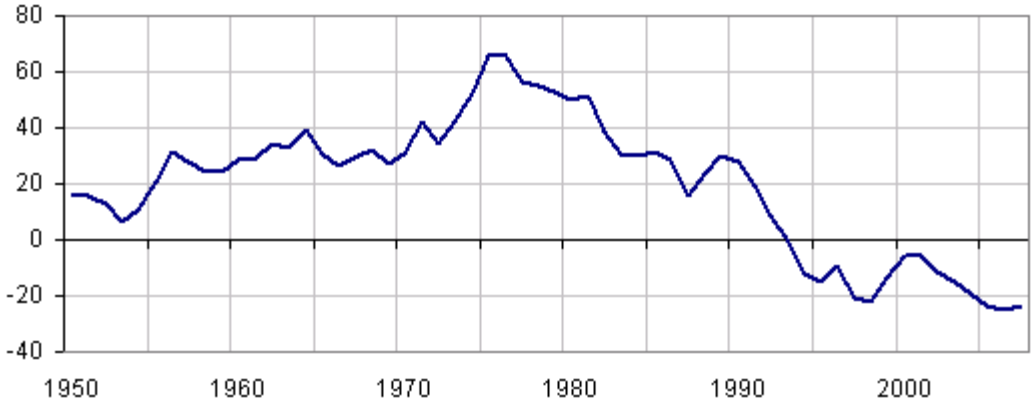

Figure A1-2 Aggregated average annual SOI values

This shift in the SOI is consistent with the findings of Vecchi and Soden (2007)[12] that the Walker Circulation, a west-east transfer of air at upper levels across the Pacific, has weakened over time. El Nino events cause air to rise in the central Pacific and move northward within the Hadley cell circulation, and this condition has become more dominant.

This shift in SOI values is that the mean SOI now greatly favours the direction of El Nino conditions. Figure A1-3 shows the average annual SOI to 1975 for the 25 years from 1946 to 1970 and the average annual SOI from 1977 for the 25 from 1982 to 2006.

The standard deviations, calculated in parallel with the averages in each period, about the pre- and post-shift means are very similar. That indicates that the pattern of variation in the SOI is not abnormal.

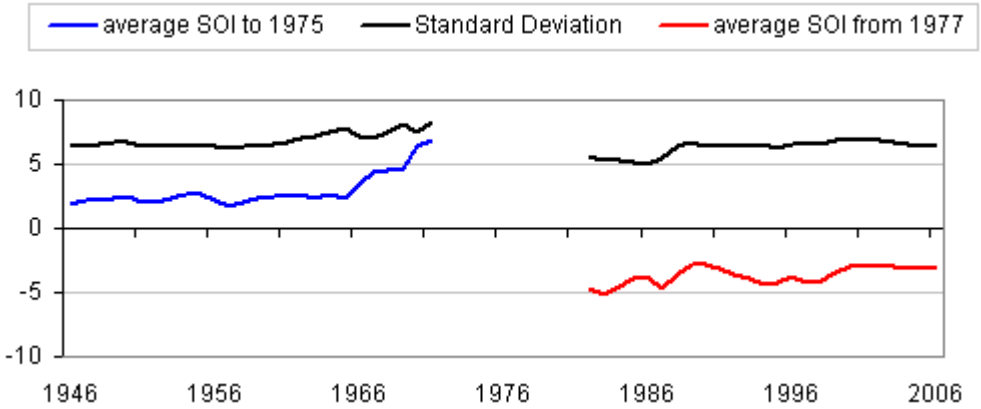

Figure A1-3. Average SOI and its standard deviation leading up to and then away from the Climate Shift of 1976.

Perhaps alarmingly, the climate shift was not in the transient forces that determine if a La Nina or El Nino event will occur but according to that relatively constant standard deviation was in some underlying and relatively consistent force. Whatever that force is, it has been influential in moving the average SOI. Across the 30 years prior to the shift (i.e. 1946-1975) the average was +1.93 and across the 30 years after the shift (i.e. 1977-2006) it was -3.05, making a total shift of almost 5 points. In comparison, a value of around -8 for 3 months is said to be an El Nino and around +8 for 3 months is a La Nina. The 1976 shift has therefore stepped to a point where the average SOI is now about half-way to an El Nino event and La Nina conditions become rarer.

For further discussion see http://mclean.ch/climate/docs/Ignore_natural_blame_humans.pdf

[12] Vecchi, G.A. and B.J. Soden (2007) Global Warming and the Weakening of Tropical Circulation, *Journal of Climate*, vol 20, DOI: 10.1175/JCL4258.1 pp 4316-4340