




Copenhagen Congress – clarifying risks

The University of Copenhagen hosted an international scientific congress on climate change under the heading "Climate Change: Global Risks, Challenges and Decisions", 10-12 March 2009 in Copenhagen, Denmark. The congress was organised in cooperation with nine other universities in the International Alliance of Research Universities (IARU) and attended by more than 2,500 delegates from nearly 80 countries. The main aim of the congress was to provide a synthesis of existing and emerging scientific knowledge necessary in order to make intelligent societal decisions concerning application of mitigation and adaptation strategies in response to climate change.

A preliminary summary of key messages was prepared by the conference organisers and will be followed by a peer-reviewed synthesis report by June 2009. Amongst the key messages is the statement that, given the further scientific evidence of climate change and its social implications, "inaction is inexcusable" .

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New reports confirm sensitivity of West Antarctic Ice Sheet to warming

The prospect of the West Antarctic Ice Sheet (WAIS) melting and raising sea level by around 5 m has been recognised for over three decades . Most of the base is hundreds of metres below sea level and protected by fringing ice shelves (permanent floating ice), making it vulnerable to warming of the ocean and atmosphere now underway (see next item). This week's *Nature* provides new data on WAIS history from sea floor sediment cored by the ANDRILL McMurdo Ice Shelf project led by Tim Naish, Antarctic Research Centre, Victoria University of Wellington . The core has provided a physical record of the growth and retreat of the ice sheet many times in the period from 1 to 5 million years ago. During this period geological data indicate CO₂ levels were <400 ppm, but global temperatures 2-3°C above pre-industrial levels. Such conditions are possible, even likely, in the next few decades.

A companion paper presents results of a new and more sophisticated ice sheet model that allow us to see the pattern of advance and retreat of the whole Antarctic ice sheet over this vast period of time . Ice sheets take time to 'collapse' on account of their size, and the authors say "Transitions between glacial, intermediate and collapsed states are relatively rapid, taking one to several

thousand years." This has been taken by some to indicate slowness of change ("West Antarctic Melt a Slow Affair": New York Times Dot Earth Blog March 18), but others to see incipient risk: "Antarctic ice close to melting tipping point-study" (Reuters March 19) . Expert comment is along the lines of the new model representing significant progress in capturing major processes, but more work being needed to get a robust estimate of collapse rates, and this will take some years. In the meantime it's worth noting that West Antarctica has been losing mass at an increasing rate in the last decade.

New analysis shows Antarctica also warming – and another ice shelf about to go

The IPCC Fourth Assessment Report in 2007 showed that six of the seven continents had been warming, but not Antarctica. Until recently, averaging sparsely scattered climate data from Antarctica showed the larger East Antarctic region to have cooled slightly and smaller West Antarctic to have warmed, but with no clear trend overall. A new assessment published in late January in *Nature* by Steig and others makes use of recent satellite-based estimates of surface temperature continent-wide to improve interpolation between climate records since 1957 from the handful of interior and coastal stations. It is described by fellow climate scientists as "robust" .

with two different approaches indicating the temperature for Antarctica rose an average of $\sim 0.1^{\circ}\text{C}$ per decade from 1957 to 2006, comparable to the warming that has been measured globally. In West Antarctica, the warming was more pronounced.

To the north, in the Antarctic Peninsula, where warming has been $0.5^{\circ}\text{C}/\text{decade}$, the 10th ice shelf, the Wilkins, began to break up in March 2008 but by late February 2009 was still hanging on by a thread. The European Space Agency provides daily updates. These events do not contribute directly to sea level rise, though the larger ice shelves buttress the glaciers and ice streams that feed them, and protect the coastal margins of the ice sheet from the ocean.

Greenhouse Earth much warmer

Greenhouse Earth is the name geologists use for the warmer world before the first Antarctic ice sheet formed 34 million years ago. It was also a period when CO_2 levels were several times higher than those of pre-industrial times. Last year Matt Huber, currently at GNS Science, reviewed new evidence that tropical temperatures were up to 10°C warmer than previously thought. This year Zonghui Liu and others in a recent issue of *Science* focussed on the initial temperature shift from the Greenhouse to Icehouse Earth, with $5\text{-}6^{\circ}\text{C}$ cooling in the polar regions and a global average cooling around 3°C . Earth has cooled several degrees further and remained in the icehouse ever since. Lee Kump in a commentary in the same issue asks what does this tipping point tell us about Earth's climate system and are we pushing Earth toward another state with fossil fuel burning? The more relevant question is how long do we have to avert or adjust to the change, with CO_2 levels in some scenarios projected to approach those of Greenhouse Earth by 2100.

Huber and a number of other overseas paleoclimatologists reported further discoveries about Greenhouse Earth at an international conference organised by Chris Hollis, GNS Science, at Te Papa in January. These included new results from the first deep coring of the Arctic Ocean, with paleotemperature proxies supporting tropical Arctic temperatures previously indicated by fossil palms and crocodiles. New research from temperature proxies indicates the NZ region was also tropical 50 million years ago. And the tropics were even warmer, as indicated by a giant fossil snake recently discovered in Bolivia that was twice as long as any on Earth today.

CO_2 emissions may cease but effects could persist for millennia

A new study of the long-term effects of CO_2 emissions on climate by a group of US and European scientists suggests that despite efforts to combat climate change, the planet

could still be feeling the impacts of anthropogenic global warming in the year 3000. Martin Manning's comments on the Science Media Centre website are worth repeating here:

"The leader of the new research, Dr Susan Solomon, co-chaired the Intergovernmental Panel on Climate Change's assessment of the science completed in 2007. The IPCC report pointed out that around 20% of the CO_2 being added to the atmosphere from the use of fossil fuels is expected to stay in the atmosphere for tens of thousands of years.

"The importance of the new paper is that it shows the implications of this persistence of CO_2 for climate, particularly for drought and sea level rise. To determine what are virtually irreversible effects, the authors use a suite of climate models to consider the amount of climate change that still exists in the year 3000 following a CO_2 rise to different levels during this century and then stopping emissions.

"Peak CO_2 levels close to or a little above current values are still having an effect on climate in the year 3000. But the real concern is that if we take CO_2 much above these levels then there are regions in all continents that, for thousands of years, would face major droughts which the authors of the study suggest could be worse than the 'dust bowl' era in North America in the 1930s.

"I see two policy implications of the new work. First, the UN Framework Convention on Climate Change, agreed by virtually all countries, recognises threats of irreversible damage as of particular concern and that clearly involves CO_2 more than other greenhouse gases. Second, we should be very cautious about suggestions that CO_2 could be allowed to go above a safe threshold in the hope that we could bring it back down later. It doesn't look like the planet would cooperate in that."


New database of observed physical and biological changes on Earth released

Late last year the Intergovernmental Panel on Climate Change approved the release of a new database - Observed Climate Change Impacts Database Version 1.0 - for climate change researchers worldwide, building on data gathered for the IPCC Fourth Assessment Report. The database includes almost 30,000 data series from 80 studies, all spanning over 20 years in the period between 1970 and 2004.

The locations of the observed physical and biological changes were overlaid on a map of observed temperature changes over this period. A spatial analysis showed that the agreement between the patterns of observed significant changes in natural systems and temperature change is very unlikely to be due to natural variability, confirming the conclusion in the IPCC Fourth Assessment Report that it is likely that anthropogenic warming has

had a discernable influence on many physical and biological systems at a global scale.

New global agency for renewable energy

An intergovernmental renewable energy agency, IRENA, was launched by delegates from 120 governments in Bonn last month. IRENA will promote the development and deployment of renewable energy sources, such as solar, wind, water and geothermal . The list of 76 signatory states on the website does not include New Zealand.

IRENA aims at becoming the main driving force in promoting a rapid transition towards the widespread and sustainable use of renewable energy on a global scale. It will do this by informing and advising countries on regulations, financing and technology expertise, along the lines of the International Energy Agency for fossil fuels and the International Atomic Energy Agency for nuclear power.


"Many countries have recognized the opportunities that renewable energies offer for climate protection, security of supply, economic growth and employment," German Environment Minister Sigmar Gabriel said upon the launch of IRENA. "In 2008 over \$150 billion were invested in renewable energies worldwide." Germany, the world's largest solar photovoltaics market and a technology leader in wind energy, has long lobbied for something like IRENA.

"This sends an important message to the world," said Claudia Kemfert, one of Germany's leading energy experts "It is saying: 'Renewables are now just as important as all the other energy sources.'"

Initiative for U.S.-China Cooperation on Energy and Climate

This was announced in Washington DC in early February, two weeks ahead of Secretary of State Clinton's visit to China to discuss climate and energy issues. The initiative addresses the unfolding global climate crisis and the critical roles that both the U.S. and China must play in forging a solution. The project specifically aims to catalyze U.S.-China cooperation to reduce greenhouse gas emissions resulting from energy use, especially the continued reliance on coal to power our respective economies.


The first report of the Initiative, Common Challenge, Collaborative Response: A Roadmap for U.S.-China Cooperation on Energy and Climate Change, presents both a vision and a concrete plan for this new collaboration. With input from scores of experts, stakeholders, and policymakers from the sciences, business, civil society, and politics in China and the United States, the report explores the climate and energy challenges facing both nations and recommends a

programme for sustained high-level engagement and on-the-ground action .

The report, which was co-chaired by U.S. Energy Secretary Steven Chu, prior to his new appointment, said "China and the United States must act fast and in unison on global warming if the world is to be saved from devastating change."

Across the Tasman "the fires of climate change"

The Victorian state government is setting up a full-scale royal commission into the catastrophic bushfires of February 7 in which at least 208 people were burnt to death. The enquiry will be wide-ranging, and include hazard reduction practices, risk assessment processes, evacuation procedures, planning regulations and adequacy of fire fighting resources. It may be a year to 18 months before the royal commission completes its work.

The Climate Institute of Australia in September 2007 produced a comprehensive review of previous bushfires and the circumstances in which they occurred . With regard to the recent bushfires CEO John Connor told ABC news on February 20, 2009, that in his organisation's view: "These are the fires of climate change that we've seen in Victoria and perhaps indeed in Port Lincoln in South Australia in 2005. Climate change is not just about warmer weather. It's about wilder weather. Climate change costs ... climate change kills".