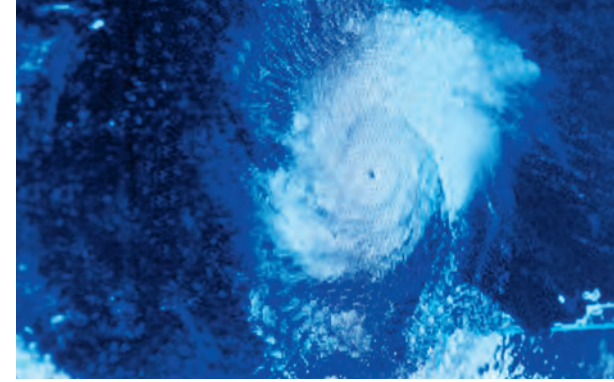
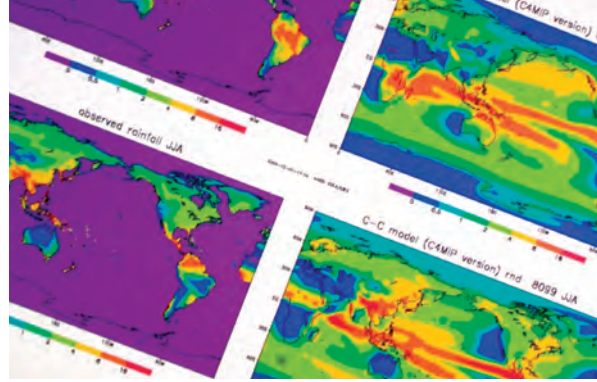


# FORETELLING OUR CLIMATE FUTURE

AN ULTRA-POWERFUL NEW PREDICTOR IS PROBING WEATHER AND CLIMATE CHANGE PROSPECTS



When the world's leading climate scientists gather in 2013 to report to humanity on the consequences of its activities, a detailed understanding of the southern hemisphere and how it drives the earth's energy budget will be essential to the global picture.



Now under development, ACCESS, the Australian Community Climate and Earth System Simulator, aims to win that insight. ACCESS will be the most powerful climate model ever created and run in this country and one, potentially, capable of predicting the global climate of 2100 or the outlook for rainfall trends round Narrandera, NSW, or Katanning, WA, through 2030.

ACCESS is being assembled and tested on the NCI supercomputer by a research consortium including CSIRO, the Bureau of Meteorology and several Australian universities precisely to perform these prodigious feats of climate prediction and local weather forecasting from models that replicate, far more faithfully than any yet, events great and small in the Earth's churning atmosphere and oceans as global warming takes hold.

ACCESS represents the fusion of no less than six of these enormous mathematical constructs and is so byte-ravenous it can run effectively on no other computer in the country, says project leader Dr Tony Hirst of CSIRO. It fuses the power and precision of the UK Hadley Centre's atmospheric chemistry model with the US's Geophysics and Fluid Dynamics Lab's unsurpassed oceans model, the French-developed OASIS 'coupler' to link them at the right resolutions, an advanced sea-ice model which incorporates this vital element into the earth's heat budget and ocean circulation, and CABLE, an Australian land-surface model, which describes soil water retention and runoff, seepage and carbon uptake and release in local detail.

The output from these phenomenal calculations will arrive in every living room and farm ute in Australia in the form of more 'skilful' local weather forecasts and seasonal predictions—and will help shape vital policy decisions of the kind to be considered when the Intergovernmental Panel on Climate Change (IPCC) delivers its fifth assessment in 2013 and—as many now anticipate—tells humanity some uncomfortable home truths about what is happening, and what is likely to occur, in our world.

The timeline is tight. Through 2010, says Tony, ACCESS will be run for many hundreds of years of test simulations, to ensure the model performs consistently. The team will then run it in direct comparison with the actual 20th Century, to see how accurately it reproduces what happened historically with climate. They will then send it surging forward in time to raise the veil on what the future holds for Australia in the remainder of the 21st century.

Dr Hirst says the Australian community is already seeing the benefits of the model in nightly weather forecasts, made with greater confidence and precision than possible before. The task of running the larger simulations begins in late 2010, with a view to making a major contribution to the IPCC climate modelling in 2011, leading up to its fifth assessment of global climate conditions and prospects.

"The southern hemisphere and Southern Ocean in particular are really vital in terms of what happens to the world's climate and energy budget, but most of the northern hemisphere models reproduce their effects quite poorly. Our job is to help refine the global models by contributing improved modelling of southern processes. The Hadley Centre, for example, is most appreciative of our input to its atmospheric model, which is widely acknowledged as one of the world's best," Dr Hirst says.

Once ACCESS is fully operational it will begin to explore vital but so far under-tested facets of climate change, such as how the earth's biological systems will respond to warming and elevated CO<sub>2</sub>—will they absorb or release more carbon, damping the greenhouse process or pushing it into overdrive? At a continental scale it will explore how the Australian landmass itself will 'breathe' carbon and water, taking them in and releasing them and the subsequent net gains or losses.

The answer to questions such as these affect everyone on the planet, determining how quickly society must move to zero carbon emissions and how steep will be the adjustments forced on people and the economy by the risk of dangerous change.

To run such vast models and support the memory they demand will absorb a massive 3 terabytes—three trillion bytes—of computational power a month, a feat that nothing but the NCI's supercomputer can support.

Research Support:  
- CSIRO and CAWCR  
- NCI Grant: P66