

Integrating national e-research investment in Climate System Science

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INTRODUCTION

In Australia, the national strategy with respect to e-research is managed and resourced through the Department of Industry, Innovation Science, Research and Tertiary Education (DIISRTE). They have supported a series of programs with strong co-investment from the University sector. On high performance computing they support the National Computational Infrastructure (NCI). On data storage they support Research Storage Infrastructure (RDSI). On how to manage data, they support the Australian National Data Service (ANDS). On ways to actually process or use data they support the National eResearch Collaboration Tools and Resources (NeCTAR). The Australian E-Research and Innovation Council (AeRIC) provide an overseeing guide to these programs, reporting through the National Research Infrastructure Council (NRIC).

Some areas of science have been particularly well supported by this investment, and one of these areas is climate system science. To undertake world-leading climate system science the community now needs a petascale computer. However, this on its own is insufficient; we also need petascale data storage, tools to manage our code and data in a suitable workflow environment and we need bandwidth to connect researchers. Climate System Science is therefore one of the research communities who have the most to gain from a well integrated e-research environment. Our problem is slightly peculiar of course. We have very large data sets sourced from instruments ranging from ocean buoys to satellites. The data streams from these have to be processed, quality controlled and stored in ways that are accessible to users. However, these data are then supplemented by communities that use it in various ways; for example the weather and climate modeling communities. Climate modelers produce huge amounts of data – the current Coupled Modelling Intercomparison Project (CMIP-5) is measured in tens of petabytes. Had all the models used twice the spatial resolution – say 100 km pixels rather than 200 km pixels we would have approached an exabyte and pretty much swamped the community trying to analyze these data. Unfortunately, to meet the needs of policy makers, climate adaptation managers and associated planning communities there is also an urgent need for climate system science to deliver climate projections, at very much finer resolution using approaches that enable probabilistic estimates of risk, mapped onto pre-determined assessments of vulnerability. Thus, not only are we at risk of being swamped by the data explosion, we are also becoming increasingly dependent on larger and larger computing facilities.

In the climate system science community, we therefore have an environment of increasing demands for high performance computing, increasing needs to store data, and to process data. In this environment, how each component of the national e-research fabric fits together is as important as the on-going support for each component. In my talk I will summarize where NCI, RDSI, ANDS and NeCTAR are supporting the climate science community and note how strategies to align investment in these components is transforming the landscape for leading researchers. However, I will also identify remaining impediments, how these are being addressed (where they are) and highlight the threats that exist as the climate system science community begins to plan the transition through the petascale to the exascale in order to meet the demands placed upon us.

ABOUT THE AUTHOR

Andy Pitman is a Professor in climate science at the University of New South Wales. He is the Director of the ARC Centre of Excellence for Climate System Science. His expertise is in climate modeling, with broad interests extending across climate change, climate impacts and land cover change. He has worked extensively on how land cover change and increasing greenhouse gases change the probability of extremes. He was a lead author on the Intergovernmental Panel on Climate Change 3rd and 4th assessment reports and he is a Review Editor of the 5th assessment report. He was appointed to the Australian Federal Government's science advisory panel to the Climate Commission in 2011. He is a member of the Australian E-Research and Innovation Council (AeRIC) and contributed to the 2011 Strategic Roadmap for Australian Research Infrastructure Discussion Paper eResearch Infrastructure Expert Working Group