

COMPUTERS IN METEOROLOGY

WEDNESDAY 20 APRIL 2005

How advances in computer technology have influenced the development of NWP at the Met Office. [Brian Golding](#) , Met Office

The foundations of Numerical Weather Prediction were laid early in the 20th Century by V.Bjerknes and L.F.Richardson, but it is in the last 50 years that this branch of meteorology has become dominant, producing one of the most successful scientific developments of the past century. In my talk, I shall focus on the stepping stones to this achievement provided by successive computing installations used by the Met Office. Particularly in the early days, speed and memory limitations called for considerable perseverance and ingenuity from those using computers. Using recollections from those involved at the time, I will try to recreate something of the challenge and excitement of those times as well as showing how their work has developed into the capable systems of today.

Web: <http://www.metoffice.gov.uk/research/nwp/numerical/computers/history.html>

References: Golding, B., K. Mylne and P. Clark 2004 "The history and future of numerical weather prediction in the Met Office", Weather vol 59 pgs 299-306

Towards earth systems modelling and interactive global ensembles - [Alan Dickinson](#),
Met Office

Over the past decade Numerical Weather Prediction and Climate Prediction models have gradually evolved into earth systems models that include a wide range of oceanic and atmospheric sub-systems and processes. At the same time ensemble techniques have been increasingly used to capture the uncertainty in predictions on all timescales. In addition, there is still much that can be gained from increasing resolution in terms of the accuracy and detail of predictions, and over the next few years it is expected that the first 1 kilometre resolution regional model for the UK will be introduced into operations.

All of these developments continue to be made possible through huge advances in technology, especially in supercomputing, archiving and communications. However, new challenges such as the increased international collaboration of initiatives such as THORPEX will put additional demands on the computing infrastructures and international networks of the future.

This talk will review recent and planned future developments and the challenges these will put on computing technologies of the future.

Web: <http://www.metoffice.gov.uk/research/nwp/index.html>

Progress and prospect of high-resolution and super-high-resolution climate modelling with the "Earth Simulator" [Seita Emori](#), NIES, Japan

The Earth Simulator (ES), developed in 2002 at Yokohama, Japan, is the most powerful super-computer in the world that is available to climate science and meteorology. It has 5,120 vector processors interconnected by fast networks and its peak performance is 40 Tflops. We have performed climate change simulations on ES with a coupled ocean-atmosphere climate model at the world highest resolution. I'll try to make general comments on strengths and difficulties of such a gigantic machine from our experience. As one of the ultimate ways of using ES, the idea of global cloud resolving simulation will also be mentioned.

Web: <http://www.es.jamstec.go.jp/esc/eng/>

Climateprediction.net - How distributed computing is revolutionising ensemble forecasts - [David Stainforth](#), University of Oxford

In most areas of climate and earth system modelling an important constraint on scientific research is the availability of computational resources. Uncertainty analyses in predictions of climate change require very large ensembles consisting of at least tens of thousands of simulations. Such a GCM based ensemble would be infeasible on any supercomputer where it would be in competition with other projects for scarce resources. But the problem is trivially parallelisable and therefore well suited to distributed computing. Using a public resource distributed computing (PRDC) approach climateprediction.net has accessed a sustained capacity of between fifteen and thirty-seven thousand PC nodes for a period approaching two years. The types of meteorological and climatological problems suited to this methodology will be discussed along with design, security and reliability issues.

Web: <http://www.climateprediction.net>

Whither the weather by internet: the Royal Meteorological Society's flagship online weather project MetLinkInternational - [Malcolm Walker](#), RMetS

The essence of the project is that participants make and exchange weather observations by means of an online database and, with the help and guidance of meteorological professionals, analyse and interpret the observations. The project is for primary and secondary schools (age range 7-19) and for individuals of any age. It supports geography, science and information technology. A feature of the project is that weather reviews are provided daily on weekdays (Monday to Friday, inclusive) and reference is made in them to weather observations made by MetLink participants. Reference is also made to weather charts, satellite images and weather web-cams. The talk will focus upon the aims, objectives, methodology and successes of MetLinkInternational and the lessons learned from the project in respect of science and geography education and the computer

literacy of participants. The future of the project will also be considered.
Web:<http://www.metlink.org>

Advances in high-performance computing technology and prospects for its exploitation -
Walter Zwiefelhofer (ECMWF) Walter.Zwiefelhofer@ecmwf.int

The talk will look at some of the basic architectural features of computer systems that are required for high-resolution Earth System modelling. Existing computer architectures will be reviewed and an outline of upcoming designs/technologies will be given. The prospects of using these designs/technologies for meteorological applications will be discussed.

Web: <http://www.ecmwf.int>