

## What is WGNE?

The Working Group on Numerical Experimentation, jointly established by the WCRP and the WMO Commission for Atmospheric Sciences, has the responsibility of fostering the development of atmospheric circulation models for use in weather prediction and climate studies on all time scales and diagnosing and resolving shortcomings.

## WGNE

- Role in support of CAS, WWRP and WCRP
  - supporting numerical experimentation research activities of the WCRP, WWRP and WMO global atmospheric watch (GAW) programme, and research links to operational weather and climate prediction
- Atmospheric model and data assimilation developments (dynamical cores and physical processes)
- Custodian of their quality
- Fundamental NWP and climate modelling issues
- Characterizing systematic model errors
- GEWEX Modelling and Prediction Panel (GMPP)
- Workshops, reports etc

## WGNE mission

### \* Terms of Reference

- (i) Advise the JSC and CAS on progress in atmospheric modelling.
- (ii) Review the **development of atmospheric models for use in weather prediction and climate studies on all scales**, including the diagnosis of shortcomings.
- (iii) **Propose numerical experiments** aiming to refine **numerical techniques** and the formulation of **atmospheric physics processes, boundary layer processes and land surface processes** in models.
- (iv) Design and promote **coordinated experiments** for:
  - validating model results against observed atmospheric properties and variations;
  - exploring the intrinsic and forced variability and predictability of the general circulation of the atmosphere on short to extended ranges;
  - assessing the intrinsic and forced variability of the atmosphere on climate timescales.
- (v) **Promote the development of data assimilation methods** for application to numerical weather and climate predictions, and for the estimation of derived climatological quantities.
- (vi) Promote the development of **new methods for numerical weather prediction and climate simulation**.
- (vii) Maintain **scientific liaison** with other WCRP and CAS groups as appropriate.
- (viii) Promote the timely exchange of information, data and new knowledge on atmospheric modelling through **publications, workshops and meetings**.

## Outcome of World Modelling Summit for Climate Prediction

(hosted at ECMWF May 6-9, 2008)

This was an impressive gathering of international climate and weather experts and was fully-funded through wide-ranging international sponsorship, and jointly organized by the WCRP, WWRP and IGBP.

The goal was to develop a strategy to revolutionize prediction of climate through the 21<sup>st</sup> century to help address the threat of climate change, particularly at regional scales

- Over 140 invited participants from 19 countries representing the global weather and climate communities
- The emphasis of the Modelling Summit was primarily on the simulation and prediction of **the physical climate system**
- These communities were brought together
  - a) because **advances in weather prediction** should be/are an **integral part of advances in climate modelling**, especially the predictive understanding through constraining of climate models
  - b) it was **vital that the communities were in basic agreement** about future strategies for significant progress to be made
- Opening session had **distinguished speakers** to set the scene, including:
  - Michel Jarraud (WMO), Jeffrey Sachs (Earth Institute), Chris Llewellyn-Smith (CERN), Ari Patrinos (Genome project)

The presentations were grouped under **5 Themes** which then provided the basis for **breakout group sessions** and reporting of discussions etc

These themes were:

- The **current status** of weather and climate modelling and strategies for seamless prediction
- Strategies for **next generation** modelling systems
- Prospects for current **high-end computer systems**
- Strategies for **model evaluation and experimentation**
- **Strategies for revolutionizing climate prediction**

So these themes dealt with how **to enhance human and computing resources, key scientific challenges, and what might be the requirements and possible organizational frameworks in the future**

So what came out of what most considered a very interesting and challenging meeting!?

The key written output was **'The Summit Statement'** which was formulated to represent a unified viewpoint.

It centred round the concept of **'The Climate Prediction Project'** co-ordinated by the three organizing bodies and involving national weather and climate centres.

An important and urgent initiative of this Project would be **a world climate research facility** to enable national centres to substantially accelerate progress in improving operational climate prediction at all timescales (seamlessness - especially decadal/multi-decadal).

A key component of this facility would be one or more **dedicated high-end computing facilities (up to 1000 times more powerful than typical national systems)** to provide a quantum leap in the exploration of the limits of our ability to predict climate with a level of detail and reliability that is not possible now.

As well as the official statement there is a meeting report submitted to BAMS and an extended report (including the reports from the 5 breakout groups) being submitted to WCRP etc.

There is also a proposal to have a special edition of BAMS in which four separate papers will be published together (Shapiro et. al., Brunet et al. on seamless prediction, a YOTC paper, and a Modelling Summit paper).

Since Theme 2 is most relevant to WGNE and I was it's Chair here are a few key points/thoughts on this that resulted from the breakout discussions.

We discussed future modelling systems, issues of parametrization and the balances required and/or implied between resolution and complexity on the one hand and multi-models and unified modelling on the other.

➤ In the context of the Project and its research facility the group was overwhelmingly of the view that there must be a strong focus on science and the facility should have the character of a scientific enterprise

➤ There was a clear consensus that progress could be dramatically accelerated by focussing on grand challenge 'dream' or 'demonstration' experiments maybe two generations ahead of national efforts at individual centres

➤ There was general agreement that much higher resolution of the major components is a fundamental prerequisite for a more realistic representation of the climate system and more relevant predictions (e.g. extremes, variability, regional, local...)

➤ Improving basic model physics should be a key part of any proposal.

- Unanimous anticipation that **very high resolution** studies would substantially **improve predictions of tropical climate** and variability this benefiting the most populated and poorest areas of the globe
- The **excitement** of addressing good science questions, identifying and **tackling 'road blocks'** was an essential part of any endeavour and crucial for **the engagement of young scientists** who might otherwise see modelling as unattractive
- Although a topic primarily for Theme 3 , the major and **potentially 'show-stopping' issue of running models efficiently on future computers with ~ a million processors** was considered a critical problem to be tackled in a multi-disciplinary way
- It was clear both in the group discussions and in the Plenary that **the role of a new international facility and its relationship to existing major national centres** was a sensitive area.

#### Further developments:

- **WMO Executive Council (EC) Paper**
- There was a French proposal (French Presidency of the EU) for a **'European Centre for Research into Climate Change and its Impacts'**  
(Follows the general recommendations of the World Modelling Summit. " CERN-like with a central computing facility etc")
- There is a WMO EC Research Task Team resulting from the above EC paper
- There are various reports/papers in the mill especially for the BAMS edition