CAS - XIV

Michel Beland (ICSC Co-Chair) & David Burridge (IPO)
ICSC President's Report

- The CAS established the International Core Steering Committee (ICSC) for THORPEX in 2002
- In 2003, Cg-XIV established THORPEX as a 10-year long international global atmospheric research programme to accelerate improvements in weather forecasting on short-, medium- and extended-range time scales
- Trust Fund established in May 2003
- Science and Implementation Plans approved 2003/4
- First International Symposium held in Montreal
ICSC President's Report

- Director of THORPEX IPO appointed in May 2005
- Boards and Working Groups formed - Autumn 2005
- Current financial commitments to the Trust Fund and the secondment have enabled the start-up
- However, there is a considerable shortfall in commitments compared with the budget adopted by the ICSC
THORPEX: A World Weather Research Programme

A 10-year international research and development programme to accelerate improvements in the accuracy of one-day to two-week high-impact weather forecasts for the benefit of society, the economy and the environment.
To Mitigate Natural disasters

To fully realise the societal and economic benefits of improved weather forecast especially in developing and least developed countries.
“The Observing System Research and Predictability Experiment”

- To reduce and mitigate natural disasters;
- To fully realise the societal and economic benefits of improved weather forecast especially in developing and least developed countries.
THORPEX - A WMO Sponsored Research Programme designed to

- To provide the research underpinning the WMO strategy to reduce by 50 per cent over the decade 2010-2019 the number of fatalities caused by meteorological, hydrological and climate related natural disasters compared with the ten-year average fatalities of 1995-2004.

- To increase the effectiveness of advanced warnings of high impact weather globally.

- To enable governments, societies and economic sectors to realise fully the benefit of weather and climate related information in critical decision-making.

- To demonstrate ways to increase cooperation and collaboration between National Meteorological Services to deliver the benefits of new global earth observations, advanced communications, and new global forecasting systems to all societies.
By

- Advancing our knowledge of global-to-regional influences on the initiation, evolution, and predictability of high-impact weather
- Designing the strategy for interactive forecasting and targeted observations thus contributing to the process of evolving the WMO Global Observing System (GOS) which is recognized as a core component of the Global Earth Observation System of Systems (GEOSS)
- Creating and evaluating systems for the assimilation of targeted observations from satellites and in-situ measurements
- Accelerating improvements in the accuracy weather forecasts
- Testing and demonstrating the utility of a multinational multi-model multi-analysis global ensemble forecasting system
- Improving and demonstrating decision support tools, which utilize advanced forecasting products to benefit directly social and economic sectors

CAS-XIV
Framework: Why THORPEX?

- THORPEX establishes an organisational framework for international collaboration between
  - Operational centres and academics
  - Developed and developing countries
  - Research scientists and end users
- THORPEX will use this framework to coordinate research on interactive forecasting systems that allows information to flow interactively between forecast users, NWP models, data assimilation systems and observations
- THORPEX will contribute to the development of a future global truly integrated interactive forecast system, which would generate probability-based decision-support tools, available to all nations, developed and developing.
THORPEX Science Plan

- THORPEX International Science Plan
- Shapiro and Thorpe (2004)
  www.wmo.int/thorpex

- Four research sub-programmes
  - Predictability and Dynamical Processes
  - Observing Systems
  - Data Assimilation and Observing strategies
  - Societal and Economic Applications
- Science Plan peer-reviewed
- Implementation Plan 2004-2015 approved
- Approved annual expenditure 1.5M SFR through a Trust Fund
- First Symposium (Montreal, 2004)
- Regional Committees - RAll, IV, VI
- Southern Hemisphere alliance

GEOSS
THORPEX and WCRP

- JSC/WCRP member of ICSC and science groups
- THORPEX in WCRP/COPES
  - Joint project initiated to develop a unified approach to the development of ultra-high-resolution global systems for weather prediction and climate simulation
  - Collaboration in TIGGE
- TIGGE and Task Force on Seasonal Prediction (TFSP)
  - Similar technical issues (data, archiving, policy)
  - Potential for “seamless” days-seasons prediction systems
  - Links established between THORPEX and TFSP
THORPEX and WCRP

- Cooperation with WGNE – links to GIFS-TIGGE WG, OS WG, DAOS WG & PDP WG
- March 2006 “kick-off workshop”
- Cooperation with GEWEX
- Cooperation with TFSP
- Views on OSEs
Observing strategies

- Prediction of sensitive areas where extra observations will provide most benefit to forecasts
- Adaptive control of observing network
- Targeted use of satellite data (adaptive, intelligent thinning)
ATReC

- Took place Oct 15 – Dec 17 2003
- The Atlantic THORPEX Regional Campaign (ATREC) was a collaborative effort between EUCOS (EUMETNET Composite Observing System) program and THORPEX to test the targeting ability of a wide range of observational platforms in a real-time quasi-operational environment. It involved high degree of coordination and collaboration among UK Met office, ECMWF, Meteo-France, NRL, NASA, U of North Dakota, Meteorological Service of Canada, NCEP, FSL, NCAR and U of Miami
- Two methods were used to identify the areas where supplemental observations might help to mitigate forecast errors in regions selected for verification over Europe and the eastern US.
- A variety of observing platforms were deployed where data were collected from instruments aboard or released from these platforms. They include aircraft, AMDAR, ASAP ships, GOES rapid-scan winds and radiosondes to supplement the routine observational network.
Report on the A-TReC
(Florence Rabier) based on Results from ECMWF, Météo-France, Met Office, NCEP and NRL

- Various data impact experiments
  - Small but slightly positive impact
  - More impact in Nov/Dec, more impact when cycling
  - Impact not always +ve over verification area (random processes in DA) and not always consistent between centres;
- Dropsondes: high impact per obs, low but positive total impact
- Different targeting techniques give different areas
- Data denial over Atlantic only amount to 3% degradation over Europe
THORPEX (Regional) Campaigns

- ATReC (2003) - many groups are actively working with the data – a summary of current views will be available for the ICSC meeting in Melbourne
- European ETReC – D-Phase (MAP), COPS supported by the European regional committee
- Pacific Asian Regional Campaign (PARC 2008) – on tropical cyclone tracks, extra-tropical transitions, tropical warm-pool physics and down-stream propagation (link to, Beijing Olympics & IPY)
- IPY cluster proposal
- Winter Olympics in Canada (2010)
- Tropical convection (2012)
Global Interactive Forecast System using the THORPEX INTERACTIVE GLOBAL GRAND ENSEMBLE (TIGGE)

End-to-end forecast system “tuned” for end users, using targeted observations called on in ‘sensitive areas’, adaptive data assimilation, grid computing and distributed archives accessible through a single entry point.
Key objectives of TIGGE

- An enhanced collaboration on development of ensemble prediction, internationally and between operational centres and universities
- New methods of combining ensembles from different sources and of correcting for systematic errors (biases, spread over-/under-estimation)
- A deeper understanding of the contribution of observation, initial and model uncertainties to forecast error
Who will benefit from TIGGE?

- The research community at large, and in particular the science working groups of THORPEX
- A number of research/development projects targeted at specific applications of severe weather forecasts (health, energy, flood warning, fire weather, etc...)
- The forecast demonstration projects of THORPEX and WWRP (e.g. BeiJing 2008 FDP/RDP)
- Future field campaigns on adaptive observations
- IPY projects may become active users of TIGGE
- The hydrological community (e.g. through HEPEX)
TIGGE Partners
(all subject to confirmation)

- Archive and Distribution Centres: CMA, ECMWF, NCAR (+more in phase 2!)
- Data providers: BMRC, CMA, CPTEC, ECMWF, FNMOC, JMA, KMA, Meteo-France, MS Canada, NCEP, UKMO
- TIGGE Web site: ECMWF
- Meta-data centre: NCAR
- Verification Web site: JMA
Progress in 2005

- TIGGE Workshop (March)
- Technical proposal for Phase 1 developed by the 3 archive centres and agreed by the technical representatives of the ten potential data providers
- The GIFS-TIGGE working group of THORPEX has been appointed and will lead the project
- First meeting of the GIFS-TIGGE WG took place at NCAR on 15-16 November 2005
- Proposal approved by the ICSC in December 2005
- THORPEX/IPO will send letters to request commitment of all partners of the project
- Creation of data bases expected before mid-2006
Data to include in priority

- Ensemble forecasts generated routinely (often operationally) at different centres around the world. This is the core data of the TIGGE archive. The total daily data volume is expected to be around 200GB, based on a preliminary list of required parameters developed at the workshop.
- Observational data and existing datasets including re-analyses and re-forecasts
- Additional special datasets generated during the TIGGE project for specific research and applications.
User access: Registration

- Data Providers to supply their products to the Archive Centres under an agreed set of rules, which will include re-distribution rights
- Access to be provided for Research & Education through a simple electronic registration process, with valid e-mail address and acknowledgment of conditions of supply
- Under the simple registration process, access to be given with a delay (48 hours) after initial time of the forecast (reference time of data in GRIB2)
- Registration for real-time access to be handled via the THORPEX IPO
TIGGE and the Task Force on Seasonal Prediction

- Under WCRP, the TFSP plans to organize an international coordinated experience in seasonal prediction.
- This involves large commonalities with TIGGE regarding the data formats and exchange procedures.
- Coordination will be sought.
- Cross-participation in the groups is currently organized.
European Wind Storms: December 1999

100 lives lost

Destruction of the church in Balliveirs (left) and the devastation of the ancient forest at Versailes (below).
Lothar (T+42 hour $T_L255$ rerun of operational EPS)

Ensemble forecast of the French / German storms (surface pressure)
Start date 24 December 1999: Forecast time T+42 hours
14 EPS members with greater intensity storms than verification
ECMWF strike probability map for hurricane Katrina. After crossing Florida the tracks of the hurricane were predicted with a high degree of consistency.
Average annual number of tropical cyclones

Based on a 2 x 2 degree resolution gridded analysis using 30 years of data (1969/70 to 1998/99 tropical cyclone seasons).

CATEGORY 4 AND CATEGORY 5 TROPICAL CYCLONES
North-West Australian region
1989 - 1999
Impact of TCs

Australia

- Much of impact is the effect on industry
- e.g. Mining industries in NW Australia depend on access to one of the ports.
- Estimated cost of closure of one of the ports is estimated to be $3 million per day
The beginning (left panels) and the end (right panels) of the cold spell that affected Europe from end January to mid-March 2005 was relatively well predicted two to three week in advance by the ECMWF monthly forecasting system.
SST anomalies in the Nino3.4 region (5N-5S,170W-120W) observed and predicted by the ECMWF seasonal forecasting system. So far, all major anomalies observed have been well predicted several months in advance.
THORPEX and the IPY

- THORPEX IPY Cluster proposal lead by Thor-Erik Nordeng
  - Explore use of satellite data and optimised observations to improve high impact weather forecasts
  - Better understand physical/dynamical processes in polar regions
  - Achieve a better understanding of small scale weather phenomena
  - Utilise improved forecasts to the benefit of society, the economy and the environment
The implementation of AMMA

Jan Polcher
IPSL/CNRS, Paris
7 November 2005
The aims of AMMA are:

- To improve our understanding of the West African Monsoon and its physical, chemical and biological environment.

- To provide the underpinning science that relates climate variability to issues of health, water resources and food security and defining the relevant monitoring strategies.

- To ensure that the multidisciplinary research is efficiently integrated with prediction and decision making activities.
Forecasting in 2006 and beyond

The dry run was a very useful exercise which started the exchanges between the major actors of forecasting in the region. It allowed to:

☆ Set up some basic tools and methods for the forecasting
☆ Identified key problems which will have to be solved before 2006
☆ Provided an estimate of model skills in the region.

The forecasting group of AMMA has set itself the goal to create a “Forecasters' Handbook for West Africa” by 2009.

This is an ambitious objective but an essential one to achieve the full potential of current forecasts for agriculture, water management and public health in the region.
THORPEX & AMMA

- Improve linkage with the informal AMMA-THORPEX group and EB
- Role for THORPEX Working Groups in the scientific aspects of AMMA
- Involvement of operational centres in the AMMA filed campaign
- As a results stronger links are being developed with AMMA for observing system experiments, modelling & predictability and societal and economic applications
- Links with TWP – ICE
THORPEX and GEOSS

- Contribute to GEOSS societal benefit areas, for example,
  - HEALTH - use advanced weather forecasting methods to improve predictability of major health hazards in W. Africa
  - WEATHER - further develop TIGGE and societal applications
  - AGRICULTURE - help improve the predictability of food supplies in Africa
  - ENERGY - demonstration project utilizing the TIGGE databases to improve energy management techniques (particularly those linked to hydro-power)
SEA WG 1
Sectors and Interest Groups

- Health
- Agriculture
- Energy
- Transport
- Tourism and recreation (e.g., Olympics)
- Public safety
- Households
- Communication / Risk communication
- Valuation / economic impacts
- Verification
- NMHS / PWS bench forecasters
- Media
- Financial Services (incl. insurance)
- Water resources / Management
- “stakeholders”
Societal and Economic Applications

- Identification of high-impact weather forecasts
- Development of systems that respond to users’ needs
- Evaluation of benefits of forecasts to users

II) Real-time display from the winter road Maintenance Decision Support System (MDSS) showing the predicted 24-hr snow depth, road temperature, and treatment plan for snow impact mitigation on state highway 30 near Ames, Iowa. This system is used by highway maintenance personnel for planning de-icing operations. In this example, the system recommends a single snow removal operation followed by several salt applications of between 100 and 350 pounds per driving-lane mile (courtesy Bill Mahoney NCAR/RAP).
THORPEX within the WMO structure
The IPO supports:
- the activities of the International Core Steering Committee (ICSC)
- The Executive Board (EB)
- Advisory Boards and Working Groups

The IPO coordinates and monitors activities between various management elements.

The IPO is in the WMO AREP Department and the Executive Director of the EB manages the day to day activities of the IPO.
Boards and working groups

The following groups have been established:

- Science Advisory Board (SAB)
- Technical Advisory Board (TAB)
- Predictability and Dynamical Processes working group (PDP WG)
- Observing System working group (OS WG)
- Data assimilation Observing Strategies working group (DAOS WG)
- Societal and Economic Applications working group (SEA WG)
- Data Policy and Management Working Group (DPM WG)
- GIFS-THORPEX Interactive Grand Global Ensemble working group (GIFS-TIGGE WG)
- Executive Board (ex-officio membership with invited observers from the SAB & TAB)
Boards, working groups and key meetings (continued)

- The EB met in Geneva in September 2005
- The GIFS-TIGGE WG met in Boulder on 15 & 16 November 2005
  - A technical plan for the first phase of the TIGGE data bases is under development
- Southern Hemisphere Planning Meeting in Melbourne (late November 2005)
- ICSC 5 meeting in Melbourne (November/December 2005)
- SEA WG 1 – January 2006
- There will be a THORPEX/WCRP meeting on the MJO, organised by Julia Slingo, Mel Shapiro and the PDP WG which will be held at ICTP (Trieste – 13-17 March 2006).
- There will a “kick off” workshop for all working groups which will be held in the University of Reading (20-22 March 2006; this will be followed by meetings of the SAB and the TAB (23-24 March 2006).
Pre-CAS Conference Programme

- **Monday**
  - Disaster mitigation
  - THORPEX Science
  - Societal Applications

- **Tuesday**
  - NWP
  - Observations
  - High impact weather phenomena
  - Regional Activities including Southern hemisphere activities

- **Wednesday**
  - Regional activities
  - Southern Hemisphere plans for THORPEX
  - Concluding Remarks
A Science Plan is being finalised with contributions from Australia, New Zealand, South America, Southern Hemisphere Africa and Pacific Islands.

The Draft plan was discussed earlier this week at the THORPEX Conference ......

...... and, a number representatives of countries agreed to form a SH Regional Committee for THORPEX activities.
2nd THORPEX International Science Symposium
4-8 December 2006, Landshut, Bavaria, Germany

THORPEX: A World Weather Research Programme

"Accelerating improvements in the accuracy of one day to two week high-impact weather forecasts for the benefit of society, the economy and the environment"

Organizing Committee:
Hans VOLKERT (DLR-IPA, chair)
David BURRIDGE (THORPEX IPO)
George CRAIG (DLR-IPA)
Pierre GAUTIER (Env. Canada)
Sarah JONES (Univ. Karlsruhe)
Djellou MAJEWSKI (DWD-FE)
Ulrich SCHUMANN (DLR-IPA)
Mel SHAPIRO (NOAA)
Harry WEBER-PHILIPP (Univ. München)
Heini WERNLI (Univ. Mainz)

Deadline for submission of abstracts:
15 June 2006
Further information to appear at
www.wmo.int/thorpex/meetings.html
or contact
George.Craig@dlr.de
Hans.Volkert@dlr.de

Venue at the bank of river Isar
Budgetary Issues

- The Implementation Plan for THORPEX adopted by the ICSC in December 2004, foresees an annual expenditure of ~1,500,000 SFR.
- The current level of the financial commitment by supporting countries is 540,369 SFR (and China has seconded and administrative assistant to the IPO).
- A full-year baseline budget of 900,000 SFR would support the IPO, the work of the Boards and Working Groups and one major meeting (workshop or symposium) a year.
- For 2006 the current level of commitment and the surplus from previous years will yield 800,000 SFR.
- For 2007 there will be a shortfall which is anticipated to be 400,000 SFR for the baseline budget.
Other Issues

➤ Staffing
  ➤ Director of the IPO (currently funded)
  ➤ Two senior consultants (~ funding for one at half time is available)
  ➤ One administrative assistant (currently seconded)
  ➤ Possible duplication of programmes