GEWEX Status and Direction
SSG and Executive Meeting Report

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Outline

• General GEWEX Overview
• Past year developments
• GEWEX Executive meeting
• Legacy Document
• Future WCRP/GEWEX Developments
• GEWEX Panel Interaction
• ESA WACMOS
• GEWEX – iLEAPS Conference
To Refresh Your Memory…

The Good News is: WGNE is Rejuvenating

Past year developments

• New Director Joint Planning Staff WCRP: Ghassem Asrar
• JSC meeting more positive (directors ipo’s were invited)
• Strategic framework: COPES is back …
• GEWEX and CLIVAR to lead Monsoon and Extremes cross-cut but…
• Discussion started on future of WCRP and its projects (until 2013 and beyond)
GEWEX Executive meeting

- Two meetings: GEWEX Executive and a joint GEWEX-CLIVAR Executive meeting
- Main topics:
  - Future of GEWEX
  - Legacy document
  - WCRP Cross cut management

Legacy Document

- 2 Tier approach:
  - Major Achievements plus challenges ahead (cf. Phase I accomplishment brochure) (2 pp)
  - What needs to be preserved per panel, how does that fit in with other structures (GEWEX and WCRP and beyond), rationale and which challenges need to be addressed
- Panel input fundamental!
- Time line first draft ready end of Nov’08
Future WCRP/GEWEX Developments

• Budget
  – Funding is still tight but seems to improve
  – IPO’s requested input on travel/meeting support needs for 2009 and 2010.

• Science
  – ICSU Review draft report ready
  – Strategic framework is going to change

A few other things…

• GEWEX Panel Interaction
• ESA WACMOS
• GEWEX – iLEAPS Conference
Parallel Science Conferences with Joint Sessions

The Sixth International Scientific Conference on the Global Energy and Water Cycle

The Second Integrated Land Ecosystem-Atmosphere Processes Study Science Conference

Water In A Changing Climate
Progress In Land-Atmosphere Interactions and Energy/Water Cycle Research

24-28 August 2009 Melbourne, Australia

- Land in the Climate System
- Aerosol, Cloud, Precipitation, and Climate Interactions
- Future Integrated Observations and Modelling Systems

General GEWEX Overview

- Slides for those who would like to have some more background information
- More can be found at: http://www.gewex.org
**Phase I Objectives**

- Determine the hydrological cycle and energy fluxes by means of global measurements of atmospheric and surface properties.
- Model the global hydrological cycle and its impact on the atmosphere, oceans and land surfaces.
- Develop the ability to predict the variations of global and regional hydrological processes and water resources, and their response to environmental change.
- Advance the development of observing techniques, data management, and assimilation systems for operational application to long-range weather forecasts, hydrology, and climate predictions.
GEWEX Phase I Results

Phase I Results Summarized

- 10-25 year global data sets of clouds, precipitation, water vapor, surface radiation, and aerosols--indicating no large global trends, but with evidence of regional variability.
- Implementation of the land surface and cloud parameterization upgrades suggested for most regional and global models--showing improved precipitation.
- Initial results from the GEWEX Continental-Scale Experiments--approaching closure of the regional water and energy budgets and determining the importance of recycling and diurnal processes for regional predictions.

- **GEWEX Accomplishments - Phase I**
  - To receive a copy by mail, please send an e-mail to gewex@gewex.org

GEWEX Phase II

- GEWEX in Phase II (2003-2012/13) addresses the following principal scientific questions:
  - Are the Earth's energy budget and water cycle changing?
  - How do processes contribute to feedback and causes of natural variability?
  - Can we predict these changes on up to seasonal to interannual scales?
  - What are the impacts of these changes on water resources?
GEWEX achieves its goals through data set development and analysis, process studies and model improvement.

**The Tools**

- GEWEX Radiation Panel
- Coordinated Energy and Water Cycle Observations Project
- GEWEX Modelling and Prediction Panel

**The Field of Use**

- Regional
- Global
- Integrated / coupled
An Old Example: GLASS

- GEWEX Global Land/Atmosphere System Study (GLASS):

New GLASS Structure

- Benchmarking land surface model evaluation: set up a strategy/protocol that addresses the question how good a model (improvement) needs to be in order to be actually good enough

- Land-atmosphere coupling (LAC), to combine the current GLACE/LOCO coupling projects and appreciate the fact that the separation between local and global is fairly arbitrary and synthetic separation

- Data Assimilation/Model Data Fusion (MDF), a new workgroup that needs to coordinate or monitor the rapid developments in the area of land data assimilation.
GMPP

- GEWEX Model Development Panel
- Merges with the WGNE
- Stronger and broader push to parameterization and model development
90N-90S

Global mean = 2.6 mm/d  (Ocean [ 2.8 mm/d ]  Land[ 2.1 mm/d ]

Little or no linear change during period [biggest change is +2% over ocean]

Ocean and land precipitation tend to compensate

Re-Processing
Reprocessing in an era of faster computers and more disk space

- Reprocessing is no longer limited by computer technology.
- It is hampered instead by the haphazard nature of the historic data archives. Storage media, data formats, ancillary information, lack of ancillary information, etc.
- GRP needs to be involved in data stewardship discussions to ensure that data are not only preserved, but preserved in such a way that the reprocessing of long time series can be better automated in the future.
Data Rescue Efforts:

B1 Status - 2003
17 satellites

B1 Status - 2006
22 satellites

B1 Status - 2007
29 satellites

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SeaFlux Global level comparisons - LHF
# LandFlux – Turbulent Fluxes

<table>
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<tr>
<th>Data Sets</th>
<th>Potential</th>
<th>Status</th>
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<td>Albedo (Spectral)</td>
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<td>Y*</td>
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<td>Vegetation Properties (hi-res description)</td>
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<td>Precipitation</td>
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<td>Y</td>
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<tr>
<td>Snow Water Amount</td>
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<td>R</td>
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<tr>
<td>Flooding (Standing Water)</td>
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<td>R</td>
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<tr>
<td>Water Levels (&amp; Discharge)</td>
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<td>R</td>
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<td>Soil Moisture</td>
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<td>R</td>
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<tr>
<td>Water Storage</td>
<td>P</td>
<td>R</td>
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<tr>
<td>Surface Radiation</td>
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# GMPP

- GLACE(-2)

# GCSS-DIME
Regional Data Sets

- The regional data sets are predominantly organized under CEOP
- Accessible through the CEOP Data and Archiving System:

Some Challenges

- Most products are research products and not operational
- Primary/Originally intended use is by other research communities
- GEWEX → WRAP → End Users
- GEWEX → HAP → NHS → End Users
- For example: Hydrological Ensemble Predictions
Hydrological Applications
Project

• Basin Scale - Regional
• Process Understanding whilst Events Based:
  – Floods: forecasting, (onset, duration, intensity, extent,…)
  – Droughts: forecasting, (onset, duration, intensity, extent,…)
• Ensemble Predictions – address uncertainty in forecasting (HEPEX)

Implementation Strategy

CEOP/Hydrologic Application Project
-- develop and test probabilistic hydrologic forecasts procedures
-- demonstrate how to produce reliable hydrologic ensemble predictions and their use for water resources
-- develop and test hydrologic nowcasting and monitoring systems useful for water resources.
-- demonstrate the usefulness of GEWEX data products for related activities like WISE, HEPEX, PUB, (etc.)
CEOP Hydrologic Application Project (HAP) goals:
1. Developing procedures for assessing current hydrologic conditions through application of GEWEX supported data products, including remotely sensing;
2. Developing and testing of reliable, skillful hydrologic ensemble forecast procedures based on seasonal climate model forecasts;
3. Demonstrating that the procedures can be applied at scales useful for water resources through test-bed sites and demonstration projects;

From Climate Prediction to Water Management
Current HAP Activities

**New HAP test-beds projects.**

**Uruguay River basin (Brazil)** (with HEPEX)
**Collaborator:** Prof. Carlos Tucci.
**Research goal:** Evaluation of seasonal forecasts for agriculture and water management
**HAP data products:** Downscaled and bias corrected seasonal temperature and precipitation forecasts from NOAA/NCEP Climate Forecast System (CFS) for the period 1995-2006, and with each forecast having 20 ensemble members, for the selected 20 precipitation stations. These will be used with the local hydrological model, calibrated to the specific meteorological stations.

**HEPEX Downscaling test bed in the United Kingdom** (with HEPEX)
**Collaborator:** Dr. Christel Prudhomme (CEH), Mr. Dvid Lavers (PhD student)
**Research goal:** Evaluation of statistical and dynamical downscaling approaches for seasonal forecasts. Initial focus is the River Dyfi basin in central West Wales.
**HAP data products:** HAP has provided Bayesian downscaling software that the test-bed will use and evaluate.
Current HAP Activities

**Hydrologic nowcasting and drought monitoring.**

**Goal:** To develop an integrated Drought Monitoring and Prediction System (DMAPS) that utilizes NASA-supported science and satellite data products that are central to GEWEX and to HAP’s goal of providing GEWEX data and science products to water resources managers and related users.

**Collaborators:** UNESCO’s International Hydrology Programme (IHP)

**Data Product:** Developed “Africa Drought Monitoring” (ADM) system, which runs in real-time at Princeton University.

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**Current HAP Activities**

**Seasonal Hydrologic Predictions.**

HAP is generating a global (land) hydrologic re-forecasts (hindcasts) based on NOAA and DEMETER seasonal forecasts and a 50-year surface meteorological data set that will serve as the basis for bias correction and downscaling. There is close collaboration with HEPEX with this activity.

**Collaboration with HEPEX.**

HAP and HEPEX co-sponsored a workshop on Hydrologic Ensemble Post-Processing that was hosted by Deltares (formerly Delft Hydraulics) in Delft June 23-25, 2008. The workshop goal was evaluate approaches to improve hydrologic ensemble forecasts through statistical post-processing of the output from hydrologic ensemble forecast models.

Development of a “science plan” for a Post-Processing and Hydrologic Uncertainty test-bed project to be established in the near future.
Future HAP Activities

Collaboration with HEPEX.

(2008) HAP and HEPEX will co-sponsor (with several other organizations) a workshop on Post-Processing and Downscaling of Atmospheric Ensemble Forecasts for Hydrologic Applications. This will be hosted by Meteo-France in Toulouse, June 15-19, 2009.

(2008-2009) HAP and HEPEX will develop a test-bed project on Ensemble Representations of Rainfall Observation and Analysis Uncertainty, with a related workshop in the 2009 timeframe.

HAP and HEPEX expect to sponsor a Hydrologic Ensemble Forecast User’s workshop in 2010 where example hydrologic ensemble forecast applications and potential applications can be discussed with the user community.

Collaboration with IAHS (Working Group on Hydrometeorologic Projects)

Complete plans to collaborate with WGHP on applying GEWEX science and data sets to the international Prediction of Ungauged Basins (PUB) and hydrologic model calibration under MOPEX.

Collaboration with GMMP on GLACE-2

HAP seasonal forecasting working group members will continue to participate in the GMPP GLACE-2 experiment whose goal is to assess the role of using soil moisture initial conditions to improve seasonal forecasting.

Develop new HAP test-beds in the RHP regions.

HAP will continue to try and establish test-beds in the RHP regions, but needs the RHP coordinators to help identify collaborators. CEOP management needs top help encourage the RHP coordinators to identify these testbeds so the goals of GEWEX can be met.
Future HAP Activities

*Seasonal Hydrologic Predictions.*
HAP will continue its activity to generate a global (land) hydrologic re-forecasts (hindcasts) based on NOAA and DEMETER/EuroSIP seasonal forecasts. CSEs should identify testbed activities, and groups to evaluate the hydrologic ensemble forecasts. HAP will expand its collaboration with HEPEX.

*Estimation of current hydrologic conditions (snow, soil wetness)*
HAP will try to work with other GEWEX activities and weather centers to obtain real-time data that will allow for such estimation. GEWEX needs to help to facilitate this.

EXTREMES

- Floods and Drought are foci
- Extreme precipitations events
- SWAT team from CLIVAR and GEWEX side will do the ground work
Monsoons

- Two foci to be decided
- Again a small team should do the ground work
- Duration 3 years

The IWM series is a part of the WMO major quadrennial symposia and workshops series under the World Weather Research Programme (WWRP). As a WWRP activity, the IWM-4 will follow the guidance of Commission for Atmospheric Sciences (CAS) XIV (February 2006, Cape Town, South Africa) to emphasize research for the reduction of disaster risks through improved forecast of high-impact weather. IWM-4 activities will also include the Workshop on Operational Monsoon Research and Forecast sponsored by the WMO Education and Training Department.

The workshop will be held jointly with the Second Pan-WCRP Monsoon Workshop (PWM-2).

- The IWM-IV is organized by the Monsoon Panel of the CAS Working Group for Tropical Meteorology Research. PWM-2 is organized by the International Monsoon Studies (IMS) Scoping Group under the Joint Scientific Committee of World Climate Research Programme (WCRP).
- The cosponsors include China Meteorological Administration (CMA), CMA/Chinese Academy of Meteorological Sciences and East Asian Monsoon Activity Center, the WCRP/CLIVAR Asian-Australian Monsoon Panel, Chinese Academy of Sciences Institute of Atmospheric Physics, and other agencies of the host country.
- The deadline for abstract submission of contributed papers is June 30, 2008. Please include “IWM4 abstract” in the subject line of the submission email and send it to Professor C. P. Chang (c/o hjchen@nps.edu).
Initially Proposed Foci

- (1) the role of the monsoons in the global circulation system in a changing climate, in relation to phenomena such as heat and water transport and desertification and with consideration of both the ascending and descending parts of global monsoon circulations.
  - Deliverable: synthesis paper(s) providing input to next IPCC assessment.
- (2) The use of cloud resolving models to improve monsoon predictions.
  - Deliverable: a statement on how applying these techniques affect predictions of monsoon onset, strength and breaks, including how cloud resolving models improve representation of phenomena such as intraseasonal oscillations and the diurnal cycle.

A Few Concluding Thoughts...

- A wealth of information and data sets have been and are being produced (model output, observations, RA…)
  - Accessibility and availability is an issue
  - Duplication and changed versions difficult to track
- GEWEX expand its focus to Monsoons and Extremes, this will be reflected in type of available data products
- GRP Data sets reprocessed and made suitable for climate and trend analysis
- CEOP to link regional and global data sets (e.g. WEBS, HAP, etc.)
Atmospheric Climate Variables
(over land, sea and ice)

- **Surface:**
  - Air temperature, Precipitation, Air pressure, Surface radiation budget, Wind speed and direction, Water vapour.

- **Upper-air:**
  - Earth radiation budget (including solar irradiance), Upper-air temperature (including MSU radiances), Wind speed and direction, Water vapour, Cloud properties.

- **Composition:**
  - Carbon dioxide, Methane, Ozone, Other long-lived greenhouse gases[1], Aerosol properties.

Terrestrial Climate Variables

- **River discharge, Water use, Ground water, Lake levels,**
- **Snow cover, Glaciers and ice caps, Permafrost and seasonally-frozen ground,**
- **Albedo, Land cover (including vegetation type), Fraction of absorbed photosynthetically active radiation (fAPAR), Leaf area index (LAI), Biomass, Fire disturbance,**
- **Soil moisture[Emerging].**