



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





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

*Parallel Science Conferences
with Joint Sessions*



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>





Thank You



GEWEX: The Past – Phase I

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.





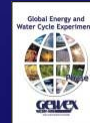
GEWEX Phase I Results

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



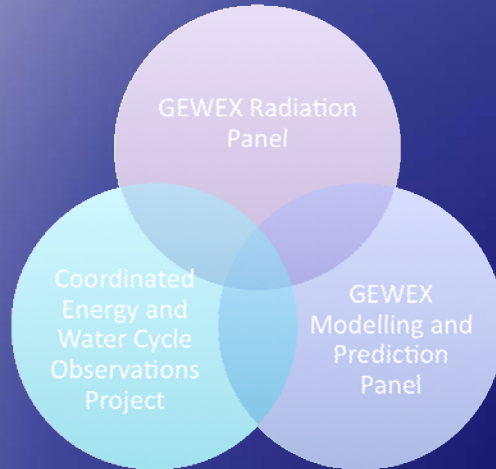
GEWEX Phase II

- 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?





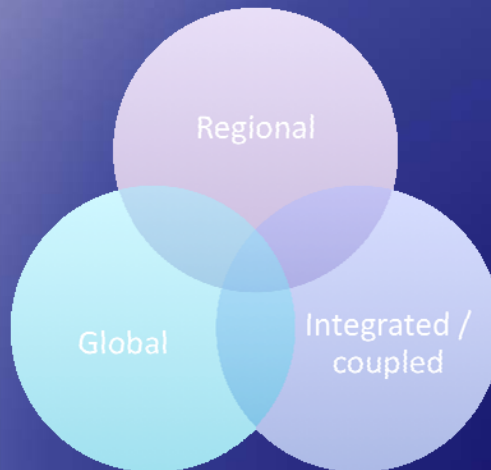
The Tools



GEWEX achieves its goals through data set development and analysis, process studies and model improvement



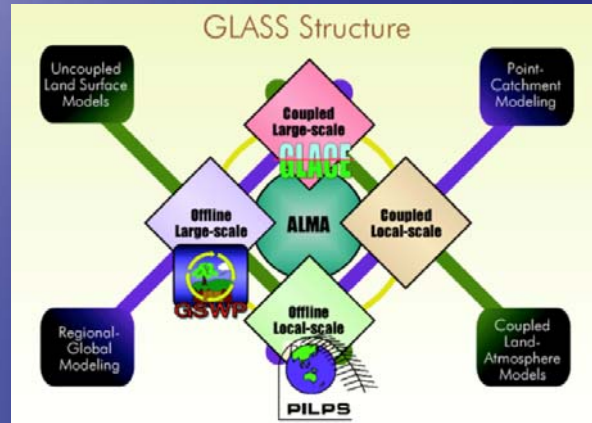
The Field of Use





An Old Example: GLASS

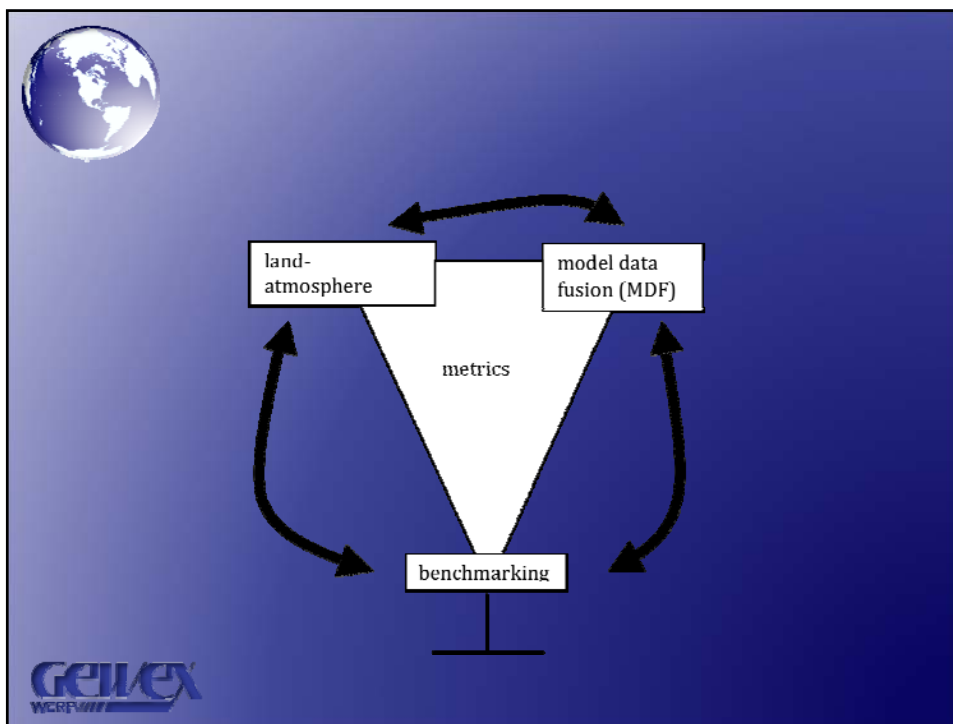
- GEWEX Global Land/Atmosphere System Study (GLASS):



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





GEWEX ORGANIZATION

RADIATION

GEWEX Radiation Panel (GRP) - C. Ramanamirthu, Chair

- **BSRN** Baseline Surface Radiation Network (E. Dutton)
- **CRIC** Continuous Intercomparison of Radiation Codes (L. Orosz)
- **GRIP** Global Aerosol Climatology Project (M. Minobe)
- **GPCP** Global Precipitation Climatology Project (J. Adler)
- **IRIC** Intercomparison of 3-D Radiation Codes (L. Collins)
- **ICRCCM** Inter-Comparison of Radiation Codes in Climate Models (J. Ellinger)
- **ISCCP** International Satellite Cloud Climatology Project (W. Rossow)
- **LandFlux** Land Surface Fluxes (W. Shuttleworth)
- **SRB** Surface Radiation Budget Project (P. Scarbro)
- **SeaFlux** Sea Surface Fluxes (C. Clayson)
- **WVACP** Working Group for Cloud and Aerosol Feeding (T. Ackerman)
- **WVCCM** Working Group on Water Management and Aerosols (W. Rossow)
- **WVCCM** Working Group for Precipitation Under Microphysics (N. Loos)

MODELLING AND PREDICTION

GEWEX Modeling and Prediction Panel (GMPP) - C. Jakob, Chair

- **GCIS** GEWEX Cloud System Study (J. Habig, G. Surmann)
 - Boundary Layer Clouds (S. Loeb)
 - Cloud Cloud System (S. Loeb)
 - Radiative Transfer (S. Loeb)
 - Radiative Transfer (S. Loeb)
 - Radiative Transfer (S. Loeb)
 - Radiative Transfer (S. Loeb)
- **GLAS** GEWEX Global Land Atmosphere System Study (S. Verstra, M. H. Bell)
 - ALBA Assessment for Land-atmosphere Modeling Activities (T. Oki)
 - GLAS-2 Global Land Atmosphere System Study (S. Verstra)
 - GLAS-3 Global Land Atmosphere System Study (S. Verstra)
 - Land-atmosphere Coupling (S. Verstra)

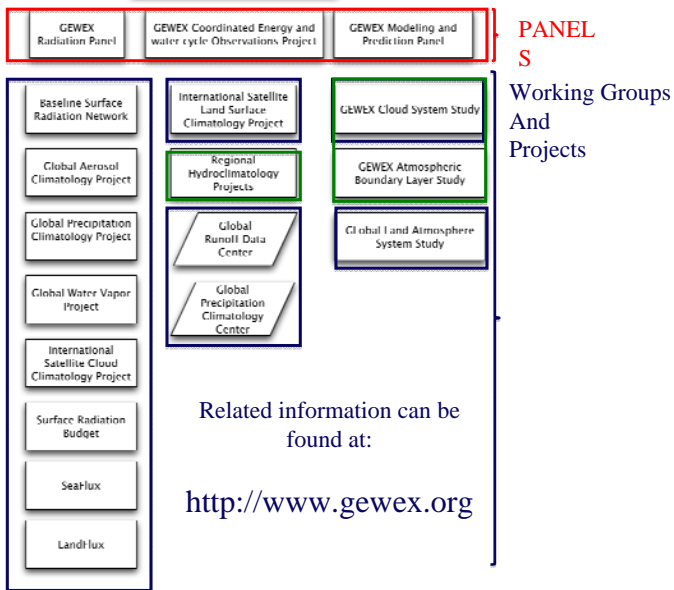
HYDROCLIMATE

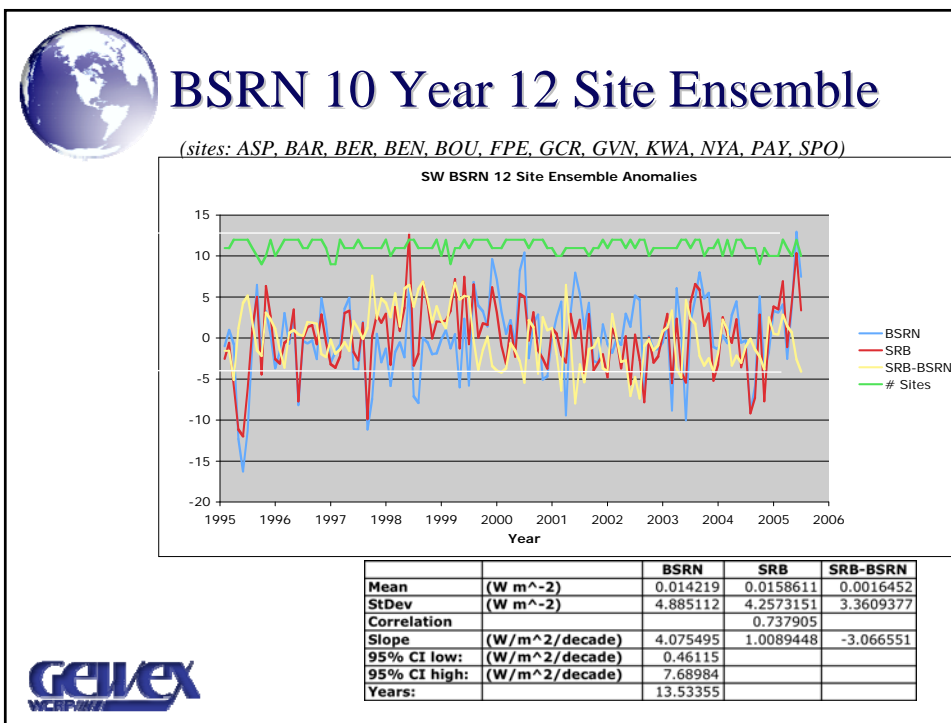
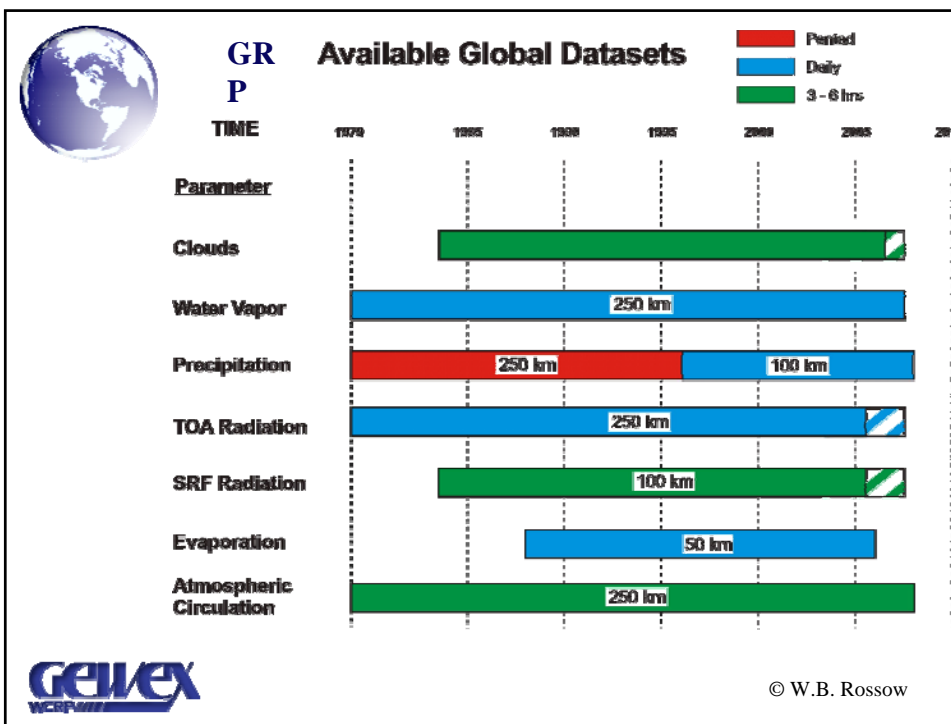
Coordinated Energy and Water-Cycle Observations Project (CEOP) - J. Klein, R. Stewart, Co-chairs

- Regional Hydroclimate Projects (RHPs)**
- **AMMA** African Monsoon Multi-disciplinary Initiative Project (S. Gochis)
 - **AVRDC** Asian Water Cycle Observations (S. Gochis)
 - **CPWA** Chinese Precipitation Program for Wet Seasons (J. Huang)
 - **LBA** Large Scale Monsoon Atmospheric Experiment in Amazonia (J. Klein)
 - **LWF** La Plata Basin Project (S. Gochis)
 - **MUSON** Monsoon Asian Water Cycle Observations (S. Gochis)
 - **MOSES** Monsoon South-East Asian Water Cycle Observations (S. Gochis)
- Global Studies**
- High Altitude (S. Taylor)
 - Cold Regions (T. Oki)
 - Semi-arid (C. F. F.)
- Data Management**
- In Situ, Water Station (S. Williams)
 - Global Observational (S. Williams)
 - Satellite (T. Oki)
 - Data Integration and Information (S. Williams)
 - Coastal Data Integration (S. Williams)
- Core-Climate Studies**
- Water and Energy Budget (S. Williams)
 - Evaporation (S. Williams)
 - Stable Water Isotope Working Group (S. Williams)
 - Aerosols (W. Loeb)
- Modeling Studies**
- Global Studies (S. Williams)
 - Regional Studies
 - Inter-Continental Transportability Study (S. Williams)
 - Regional Modeling for Water and Energy (S. Williams)
 - GEWEX Modeling and Prediction Panel (S. Williams)
 - Land Surface Models (S. Williams)
 - Hydrologic Applications Project (S. Williams)
- Associated Global Organizations**
- **GPCP** Global Precipitation Climatology Project (J. Adler)
 - **CRIC** Global Radiation Codes (L. Collins)



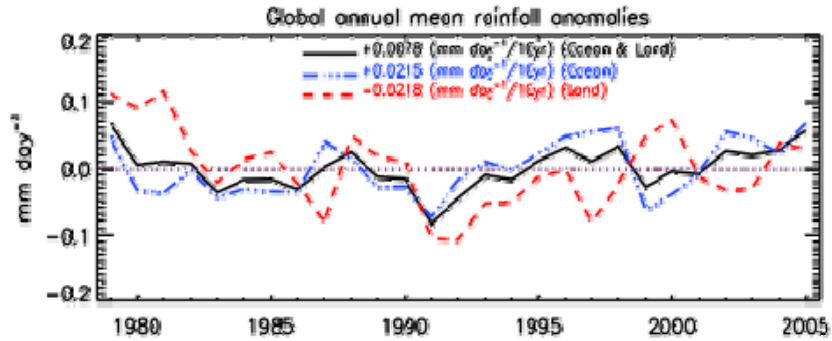
GEWEX Regional Data Sets







Global Variations in Precipitation (1979-2005) 90N-90S



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

Ocean and land precipitation tend to compensate

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



Re-Processing





COMMON DATASETS for Re-Processing

Topography and Land/Water

Ozone (TOMS)

Snow/Ice (NSIDC)

Surface Albedo (MODIS plus ISCCP?)

Surface Emissivity

TS (ISCCP plus SSMI?)

& SST (Reynolds plus diurnal model?)

Aerosol Climatology or GACP

Atmospheric Temperature and Humidity



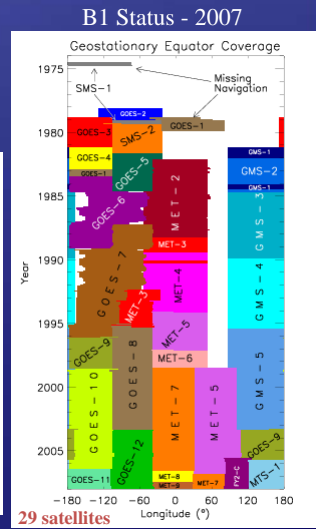
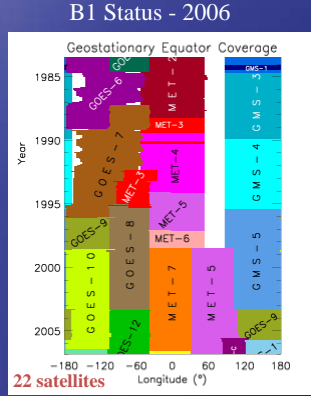
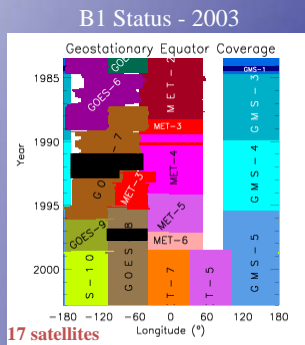
Reprocessing in an era of faster computers
and more disk space

- 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.





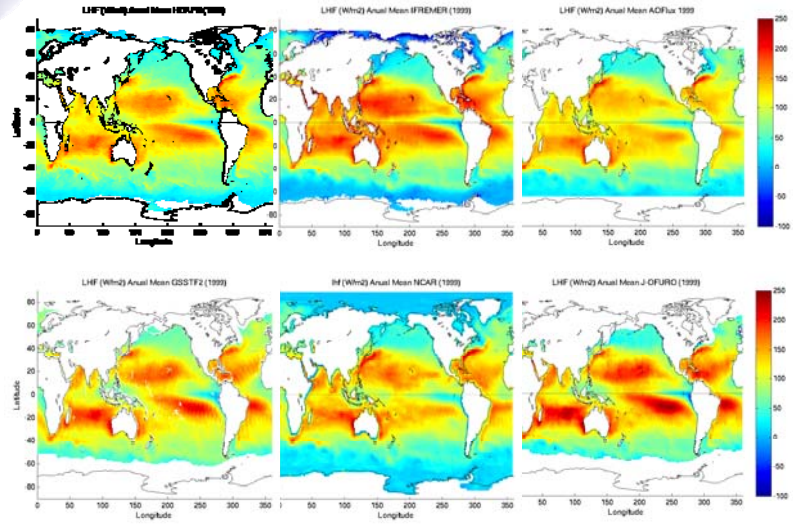
Data Rescue Efforts:



© W.B. Rossow



SeaFlux Global level comparisons - LHF





LandFlux – Turbulent Fluxes

Data Sets	Potential	Status
DEM and Runoff Models	Y	Y
Albedo (Spectral)	Y	Y*
Skin Temp. (Diurnal)	Y	R
Vegetation Properties (hi-res description)	Y	R
Surface Meteorology	Y	Yr
Precipitation	Y	Y
Snow Water Amount	Y	R
Flooding (Standing Water)	Y	R
Water Levels (& Discharge)	P	R
Soil Moisture	P	R
Water Storage	P	R
Surface Radiation	Y	Y



GMPP



• GLACE(-2)

GCSS-DIME





GEWEX Cloud System Study
Data Integration for Model Evaluation

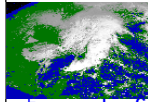


BOUNDARY LAYER CLOUD
WORKING GROUP
FIRE Marine Stratus
ASTEX
ARM-1997 SGP IOP

DYCOMS-II
CROSS-PAC (EUROCS)
EPIC 2001
GPCI
RICO



CIRRUS CLOUD
WORKING GROUP
FIRE I Cirrus
FIRE II Cirrus
ICE-89
EUCREX-93
EUCREX-94
ARM-1994 SGP IOP
CRYSTAL-FACE



EXTRATROPICAL LAYER CLOUD
WORKING GROUP
ARM-2000 SGP IOP
WISP
CFRP III
CASP II
FRONTS 92
FASTEX
GALE
BALTEX



DEEP CONVECTIVE
WORKING GROUP
GTE/TRACE-A
TOGA/COARE
ARM-1997 SGP IOP
CROSS-PAC (EUROCS)
LBA
CRYSTAL-FACE

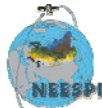
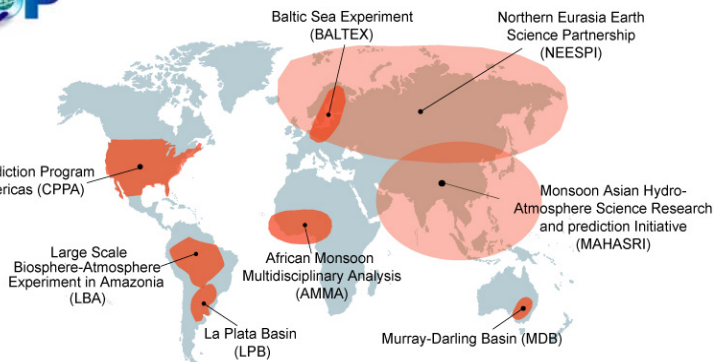


POLAR CLOUD
WORKING GROUP
ARCMIP
BASE
SHEBA
CEAREX
LEADEX
AOE 2001
M-PACE



Regional Data Sets

GEWEX REGIONAL HYDROCLIMATE PROJECTS





Regional Data Sets

- The regional data sets are predominantly organized under CEOP
- Accessible through the CEOP Data and Archiving System:
 - In-situ (UCAR): <http://www.eol.ucar.edu/projects/ceop/dm/>
 - Satellite (Uni. Of Tokyo): <http://ceop.tkl.iis.u-tokyo.ac.jp/data/download.html>
 - Model (MPI): <http://www.mad.zmaw.de/projects-at-md/ceop/>



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



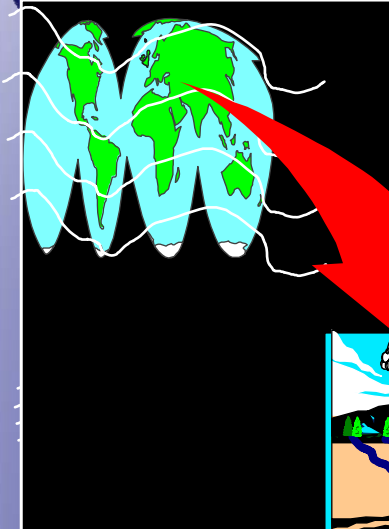


Hydrological Applications Project

- 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.)





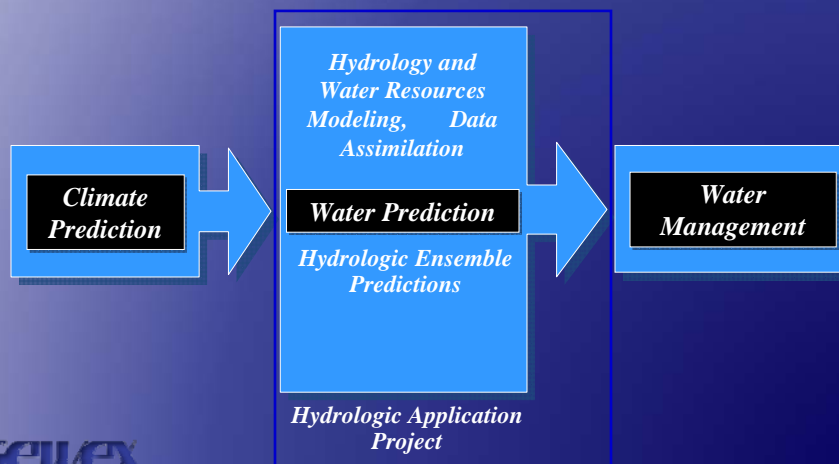
Developing the science behind skillful ensemble hydrologic seasonal forecasts, and demonstrating their usefulness.

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;
4. Working with related projects, like GHP/WISE, HEPEX, Project for Ungauged Basins (PUB).

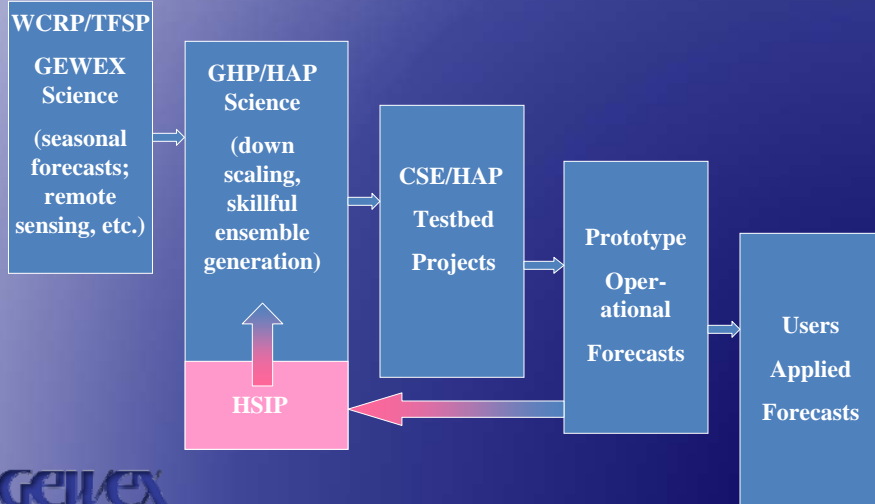


From Climate Prediction to Water Management





HAP Science Infusion Process (HSIP)



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. David 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.





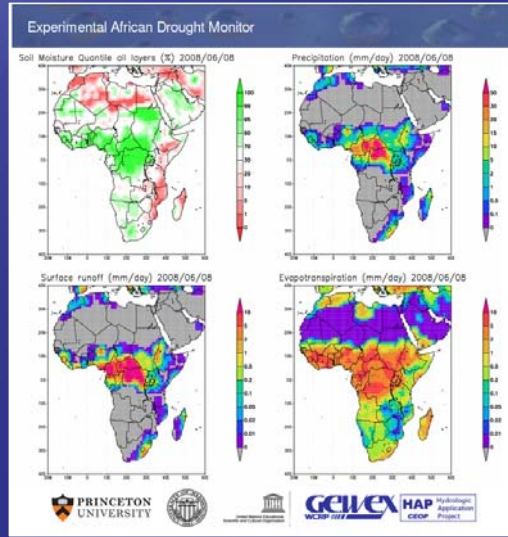
Current HAP Activities

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.



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.



Future HAP Activities

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
-



From the Second Circular (March 28, 2008)

WMO Fourth International Workshop on Monsoons (IWM-4) 20-25 October 2008, Beijing, China

- 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).**
- 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 hichen@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].

