GEWEX NEWS

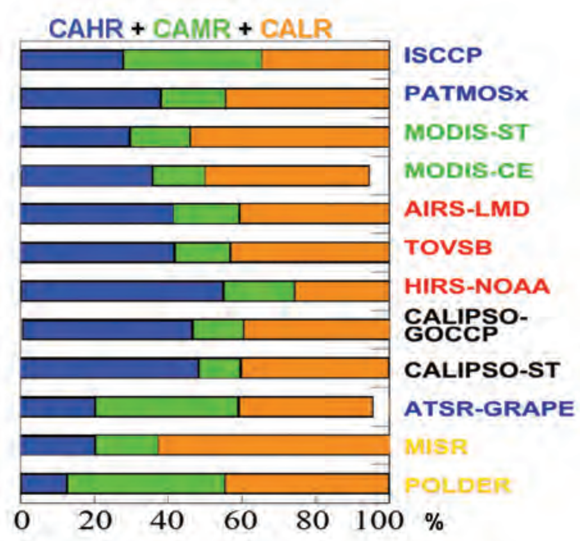
GEWEX is a core project of WCRP on Global Energy and Water Exchanges

WCRP World Climate Research Programme | WMO | UNESCO | IOC | ICSU International Council for Science

Vol. 23, No. 3, August 2013

Call for Abstracts (*see details on page 15*)

GEWEX Cloud Assessment Provides First Coordinated Intercomparison of Cloud Products (see page 7)



Global averages of fraction of high-level, mid-level, and low-level cloud amount relative to total cloud amount (CAHR + CAMR + CALR = 100 percent). Colors of data sets on the right correspond to instrument types illustrated in the sketch at the top of page 8. Statistics are averaged over daytime measurements (1:30–3:00 PM LT, except MISR and ATSR-GRAPE at 10:30 AM LT). About 42 percent of all clouds are high-level clouds with optical depth greater than 0.1. About 16 percent of all clouds correspond to mid-level clouds with no other clouds above. According to the majority of data sets, about 42 percent of all clouds are single-layer low-level clouds.

Newsletter Contents

Commentary

Transitions

Kevin Trenberth
Chair, GEWEX Scientific Steering Group

I started my career as a weather forecaster in New Zealand in the 1960s, before I went to graduate school at the Massachusetts Institute of Technology in 1968, and I returned to New Zealand for 6½ years after getting my Sc.D. At that time there was plenty of information and analyses of the Northern Hemisphere, but not much of the south. Satellite imagery was just becoming available and the limited Southern Hemisphere data sets were frustrating to use because the "action" always seemed to extend beyond the domain where analyses existed. Nonetheless, using station data from New Zealand, I was able to provide what is now considered a classic analysis of the Southern Oscillation in 1976. It was not until 1979 that global analyses of the atmosphere became routinely available as a part of the Global Atmospheric Research Program (GARP) Global Weather Experiment, by which time I had emigrated from New Zealand to the U.S.A. in late 1977.

This may explain why my research perspective has always been focused on the global aspects of climate, perhaps more so than my peers. It is probably not surprising that global data sets, and especially reanalyses, have always been prominent interests of mine. My first foray into ocean heat transports came in 1979, but energy only really became a focus of my research in the early 1990s. Water became a major focal point of my research as a result of the 1988 U.S. drought, especially in the 1990s, when I became convinced that water was likely to be the biggest societal pressure point in climate change, as well as the biggest scientific challenge in understanding moist physics and dynamics.

These perspectives have driven me to be involved in international aspects of science with the World Climate Research Programme (WCRP) and the Intergovernmental Panel on Climate Change (IPCC). I have been continuously involved at a high level in WCRP longer than anyone (since 1989), but really since 1985 [as a member of the U.S. Tropical Oceans Global Atmosphere (TOGA) Panel for 4 years]. I was a panel member of the international TOGA Scientific Steering Group (SSG) for 6 years, then one of the first co-chairs of the new WCRP Project on Climate Variability and Predictability (CLIVAR) for 4 years. I became a member of the WCRP Joint Scientific Committee for 8 years (including four as an officer), chair of the WCRP Observations and Assimilation Panel (WOAP) for 7 years, and a member of the GEWEX SSG beginning in 2008, transitioning to SSG Chair in 2010. Several of these appointments overlapped. I had originally planned to step down from the SSG when my term as a member ended; however, with my SSG colleagues' encouragement, I ended up in the driver's seat as Chair instead. There have been many challenges as GEWEX has transitioned towards becoming a key part of the WCRP post-2013 restructuring, resulting in much planning and associated work. Since 2010 we have come a long way.

GEWEX has a new name, although its acronym remains the same. We have developed a series of strategic goals called "Imperatives" related to basic components of GEWEX: observations and their analysis; data set development, evaluation, assessment, reprocessing, and reanalysis; process studies, model development, evaluation and applications, technology transfer, and capacity building of our own community, as well as users of the information we help generate. Our mission and vision statements go with the Imperatives and have been published in a document to help guide the GEWEX Panels and projects.

We have also developed a more focused set of objectives under the banner of the GEWEX Science Questions that provide the foci for the next 5–10 years on tractable yet important problems related to land, water, and energy in the climate system. These challenges are also published. A series of small workshops are setting the stage for advancing these topics.

Although I will step down as Chair of the SSG at the end of 2013, I will continue as a member for another year. In 2014, GEWEX will hold its 7th International Scientific Conference on the Global Energy and Water Cycle in The Hague, The Netherlands on 14–18 July 2014. Howard Wheater and I are chairing the Conference Scientific Program Committee. The Conference will provide a major forum for involving the science community in addressing the GEWEX Science Questions and associated WCRP Grand Challenges.

I am pleased to oversee the transition of the SSG leadership from a single chair to two co-chairs, and I am very happy with the high quality of the two incoming co-chairs, Drs. Sonia Seneviratne and Graeme Stephens, who nicely complement each other, both geographically and scientifically. There is no doubt in my mind that issues related to water and energy are of paramount importance, but youthful exuberance and enthusiasm is required to continue the promotion of these in the face of tight resources. My best wishes to Sonia and Graeme, and to GEWEX. Also, many thanks to the hundreds of colleagues who have served with me over the years.

GEWEX NEWS

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Call for Participation

GEWEX Hydroclimatology Panel Cross-Cutting Project on Short-Time-Scale Precipitation Extremes

Flood-causing precipitation extremes are an important societal hazard. The potential for these precipitation extremes to change due to increasing greenhouse gases presents a significant risk to life and property if current flood management strategies are inadequate. The WMO Commission for Climatology/CLIVAR/Joint WMO-Intergovernmental Oceanographic Commission Technical Commission for Oceanography and Marine Meteorology (JCOMM) Expert Team on Climate Change Detection and Indices (ETCCDI; *http://etccdi.pacific-climate.org/*) defined 11 indices derived from daily data related to precipitation extremes (Zhang et al., 2011). Gridded global data sets were developed from these indices (Alexander et al., 2006; Donat et al., 2013a, 2013b) and efforts are underway through the CLIMDEX Project (*http://www.climdex.org/*) to update these data sets using various global meteorological station networks. Currently, precipitation is poorly represented in many parts of the world in this global database.

In recent years a number of studies have investigated trends in sub-daily precipitation extremes (e.g., Hardwick Jones et al., 2010; Lenderink and Van Meijgaard, 2008; Dai et al., 2007), and their relationship with atmospheric warming. Results vary geographically, but in some cases show large increases in very short (hourly or less) precipitation extremes without similar changes in daily extremes. Few regions of the world have been investigated for these hourly changes to date.

GHP Cross-Cutting Project

The goal of the GEWEX Hydroclimatology Panel (GHP) cross-cutting project on short-term precipitation events is to better characterize the global distribution and temporal trends in precipitation extremes at daily and shorter time-scales, and their relationship to warming trends. The project will also examine future changes in these extremes as projected by climate models (e.g., CMIP-5, CORDEX) to provide more robust knowledge of the global state of precipitation extremes, the relationship between daily and shorter time-scale extremes, and the potential changes due to global warming.

International cooperation and collaboration is required to increase the regions represented in CLIMDEX for daily and longer time-scales, as well as provide enough shorter time-scale studies and data to move the state-of-knowledge from a series of case studies to a more comprehensive global view.

Principal research questions are:

- What is the spatial distribution of observed precipitation extremes, and their trends, globally at daily time-scales and at sub-daily time-scales?
- What are the principal mechanisms that cause daily and sub-daily precipitation extremes to change as a result of global warming and/or natural variability?
- Are global and/or regional climate models able to simulate precipitation extremes at daily and sub-daily times-scales?
- What are the projected future changes in daily and sub-daily precipitation extremes due to global warming?

Addressing these questions will require significant effort in data collection and quality assurance, particularly, for sub-daily data. The Integrated Surface Database (ISD; *http://www.ncdc.noaa.gov/oa/climate/isd/*) consists of global hourly and synoptic observations compiled from numerous sources. A gridded version of this data set, HadISD, is also being developed. However, most precipitation data only date back to the 1970s, and there are many quality issues and large areas of the world that remain uncovered. A variety of analysis techniques will be applied to the data to address the research questions.

Call for Participation

Researchers with access to daily and sub-daily time-scale precipitation and other climate variables are encouraged to share their data with this project. This includes data collected as a part of a long-term observational facility or a short-term field experiment. All data collected will be subject to a common level of quality assurance and, where possible, will be made available to the research community through a suitable web portal.

A Data Analysis Working Group is being formed. If you have a novel data analysis idea and would like access to the data, contact Prof. Hayley Fowler (*hayley.fowler@newcastle.ac.uk*).

Contributors: Hayley Fowler, Newcastle University, UK; Jason Evans, University of New South Wales (UNSW), Australia; Lisa Alexander, UNSW; Seth Westra, Adelaide University, Australia; Robert Dunn, Met Office, Hadley Centre, UK

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Recent News of Interest

The Climate Historical Forecast Project Database: Seasonal Hindcasts for Scientific Research

The Working Group on Seasonal to Interannual Prediction (WGSIP), in collaboration with the Centro de Investigaciones del Mar y la Atmósfera (CIMA) announce the availability of the Climate-system Historical Forecast Project (CHFP) data set of seasonal hindcasts from leading seasonal forecast centers worldwide for research use.

The CHFP database consists of data from retrospective predictions of the seasonal climate from year to year across recent decades and is available from the website below.

The database currently contains data from 13 systems and will continue to grow over coming years to serve as a quantitative record of progress in global seasonal forecasting capability.

We encourage the research community to take advantage of this new and growing resource in their studies of the seasonal predictability of global climate in parallel with the CMIP database for longer term climate studies.

See the website for access and acknowledgement details:

http://chfps.cima.fcen.uba.ar/

For additional information, contact:

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Francisco Doblas-Reyes (WGSIP co-chair)
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CLIVAR SSG Co-Chair New NCAR Director

James (Jim) Hurrell is the Director of the NCAR Earth System Laboratory (NESL). He is also a Senior Scientist in NESL's Climate and Global Dynamics Division. Jim is currently the Co-Chair of the World Climate Research Programme Climate Variability and Predictability Project (CLIVAR) Scientific Steering Group.

Call for Papers:

WCRP Conference for Latin America and the Caribbean

Montevideo, Uruguay
17–21 March 2014

http://www.cima.fcen.uba.ar/WCRP/

The WCRP Conference for Latin America and the Caribbean has a focus on developing, linking, and applying climate knowledge. The main goals of this Conference are to:

- Address critical knowledge challenge gaps in understanding, simulating and predicting climate variability and change in the Latin American and Caribbean.
- Identify gaps and ways to overcome limitations in the knowledge networks that include basic and applied climate science and processes to inform policy and decisions relevant for the Latin American and Caribbean.

The Conference will provide a forum for building interdisciplinary dialogues among climate scientists, social scientists, policy makers, practitioners, and key boundary institutions. It will be organized around key thematic areas designed to encourage dialogue among the relevant communities.

Closing Date for abstract submission:

30 September 2013

Acceptance of abstracts: By mid November 2013

AGU Medalists and Prize Winners

We congratulate the following colleagues for the recognition of their scientific, technical and communication contributions by the American Geophysical Union.

- Sonia Seneviratne, James Macelwane Medal
- Soroosh Sorooshian, Robert E. Horton Medal
- Kevin Trenberth, Climate Communication Prize

BALTEX Transitions to Baltic Earth

Marcus Reckermann and the Baltic Earth Interim Science Steering Group
International Baltic Earth Secretariat, Helmholtz-Zentrum, Geesthacht, Germany

The Baltic Sea Experiment (BALTEX), one of the original GEWEX continental-scale experiments, has been an active research project in the Baltic Sea region for the past 20 years (see *GEWEX News*, August 2012). As BALTEX approached the scheduled ending date for its Phase II, the Science Steering Group agreed that it was time for a follow-on program with a new name and younger steering group to carry the torch forward.

After two years of careful preparation that included the participation of relevant institutions, stakeholders, and researchers, the successor to BALTEX was launched at the 7th Study Conference on BALTEX held on the Swedish island of Öland on 10–14 June 2013. Baltic Earth was unveiled on the first day of the conference in the presence of H. M. King Carl XVI Gustaf, King of Sweden. With this final conference, the BALTEX community returned to the country where the first Study Conference took place in 1995 (on the island of Gotland).

The 7th Study Conference on BALTEX

The Conference was attended by 120 participants from 14 countries mostly in the Baltic Sea Basin (Sweden, Finland, Russia, Belarus, Estonia, Latvia, Lithuania, Poland, Germany, and Denmark), as well as other countries, including The Netherlands, France, Italy, the United Kingdom, and the United States. The 110 papers presented spanned the scope of BALTEX research, including water and energy cycles, climate variability and change, water management and extremes, and biogeochemical cycles under anthropogenic influence. Most of the papers addressed cross-discipline topics, underlining the interdisciplinary nature of the conference and BALTEX in general. In addition to the topical sessions, there were sessions on European Union-funded BONUS+ projects and contributions from the GEWEX Hydroclimatology Panel. A panel discussion on Baltic Earth began after two presentations on GEWEX and Future Earth.

It was a great honor to welcome some of the founding members of BALTEX at the conference, including Ehrhard Raschke, Lennart Bengtsson, and Sten Bergström, who each presented their recollections of BALTEX. Other founding members present included Jerzy Dera and Valery Vuglinsky. During the conference dinner, these and other members of the BALTEX research community were honored at a special ceremony. Photos and presentations are available at: *http://www.baltic-earth.eu/oland2013*.

Baltic Earth

Baltic Earth inherits the BALTEX network, infrastructure, and scientific legacy. The goal of Baltic Earth is to achieve an improved Earth system understanding of the Baltic Sea region. This means that the research disciplines of BALTEX will continue to be relevant, but will have a more holistic view that encompasses processes in the atmosphere, land, and sea, as well as in the anthroposphere. Specific Grand Research Challenges are being formulated that will represent interdisciplinary research questions to be tackled by the new program in the coming years. Scientific assessments of particular research topics, compiled by expert groups (similar to the approach of the BALTEX Assessment of Climate Change for the Baltic Sea Basin), will help to identify gaps and inconsistencies in current knowledge.

A science plan is being developed by the Interim Science Steering Group (ISSG) and will be available in the summer of 2014. The ISSG is being led by Markus Meier of the Swedish Meteorological and Hydrological Institute and Anna Rutgersson of Uppsala University in Sweden. The science plan will respond flexibly to a continuously on-going definition of core research questions that are identified as key scientific issues, or Grand Challenges for research. These will be identified at upcoming conferences and by assessing existing knowledge in specific research fields by dedicated working groups. Research foci are planned for periods of about 3–4 years. Baltic Earth will communicate with stakeholders and research funding agencies to promote funding relevant to the Grand Challenges.

The continuity in basic research fields, structure (secretariat, conferences, publications), and network (people and institutions) is symbolized by the Baltic Earth logo. Similar to but distinct from the BALTEX logo, it features blue and green arrows that stand for the fluxes between the atmosphere, the sea, and the land surface.

Some of the provisional topics for Baltic Earth Grand Challenges are summarized below.

1. **Salinity dynamics in the Baltic Sea**. Includes the water and energy cycle, which is elementary in understanding the local ecosystem. A decrease of 2–3 salinity units is expected by the end of the century. Regional precipitation patterns (runoff), atmospheric variability (wind), saline water inflows, and the exchange between the sub-basins and turbulent mixing processes will be investigated in more detail. New climate projections from improved coupled atmospheric and oceanographic model systems are needed.

2. **Land-sea biogeochemical feedbacks in the Baltic Sea region**. Issues related to eutrophication and acidification. A lot of experimental data and sophisticated model tools are available but there is a lack of process understanding, and representative process parameterizations. The processes occurring within the drainage area greatly influence the functioning of the Baltic Sea ecosystem.

3. **Natural hazards and extreme events in the Baltic Sea region**. Natural hazards have complex origins, and presently the capability to predict extreme events is very limited. This is generally well recognized regarding infrastructures related to dam safety and urban flooding

Markus Meier (left), Chair of the Baltic Earth Interim Science Steering Group, Marcus Reckermann (middle), Head of the International BALTEX Secretariat, and Anna Rutgersson (right), co-chair of the Baltic Earth Interim Steering Group uncover the new Baltic Earth logo.

risks. However, the range of ecosystem services at risk, including biodiversity and vital societal functions such as drinking water supply, is poorly defined. Many natural hazards have hydrometeorological origins (storms, waves, flooding, droughts) and can potentially be better understood. On the other hand, man-made structures can alter the impacts of extreme events like floods (e.g., through river regulations, land reclamation, dams, soil sealing, and sewage systems in urban areas). All of these factors need to be taken into account when estimating potential impacts.

4. **Understanding sea level dynamics using remote sensing**. The global mean sea level shows large variations at regional scales, which are reflected in the heterogeneous pattern of sea-level trends over the past 30 years. The large uncertainties in future global sea level are thus magnified when considering regional scenarios for sea level change. Currently, there are no comprehensive scenarios for rising sea level in the Baltic Sea. The complex bathysphere of the Baltic Sea, and the influence of the North Sea and the Baltic Sea catchment area present challenges for the prediction of sea level rise that are distinct from the global average.

5. **Understanding regional variability of water and energy exchange**. This topic contributes to the WCRP Grand Challenges and GEWEX Science Questions, and continues some BALTEX research areas that were left open (e.g., efforts for an improved understanding of cloud-aerosol-feedback mechanisms, cloud processes, and atmospheric boundary layer processes for improved modeling capabilities; the diagnosis of natural variability of energy and water components, including changes in extremes; the observation of atmospheric processes and characterization of uncertainties using conventional meteorological and hydrological observations; and surface and satellite-based remote sensing techniques).

Within these Grand Challenges, anthropogenic changes and impacts will be treated together with the natural drivers. In addition to the scientific challenges, outreach and education are expected to be strong components of Baltic Earth. Dedicated working groups on outreach, communication and education have been created. Their tentative aims are threefold:

1. Provide an arena for scientific exchange and discussion to communicate findings within the Baltic Earth research community internally and externally to other researchers and society;

2. Provide an arena for integrating discussions with actors in society as a step to continuously developing the challenges to advertise Baltic Earth and make the research and researchers visible; and

3. Communicate the importance of the Grand Challenges to funding agencies and promote funding of relevant research. Major educational activities will be the organization of summer schools in the Baltic Sea region on specific Baltic Earth topics.

Baltic Earth will build upon the successes of BALTEX, including the international scientific network and interdisciplinary collaboration. We expect the new program to live up to the standard that BALTEX has set over the past two decades.

Results from the GEWEX Cloud Assessment

Claudia Stubenrauch[1], William B. Rossow[2], Stefan Kinne[3], and the GEWEX Cloud Assessment Team

[1]Laboratoire de Météorologie Dynamique/l'Institut Pierre Simon Laplace (IPSL), France; [2]Cooperative Remote Sensing Science and Technology Center (CREST) Institute at City College of New York, USA; [3]Max Planck Institute for Meteorology, Hamburg, Germany

Cloud properties derived from space observations are immensely valuable for climate studies and model evaluation. This assessment has highlighted those that are well determined and has revealed how the statistics of others may be affected by instrument capabilities and/or retrieval methodology.

The GEWEX Cloud Assessment provides the first coordinated intercomparison of publicly available, Level-3 (L3) global cloud products with gridded and monthly statistics from spaceborne multi-spectral imagers, infrared (IR) sounders, and lidar. The Assessment was initiated in 2005 by the GEWEX Radiation Panel (now the GEWEX Data and Assessments Panel). Four workshops were held for investigating cloud property retrievals and eventually led to the creation of the GEWEX Cloud Assessment L3 database (*http://climserv.ipsl.polytechnique.fr/gewexca/*). Extending the self-assessments conducted by the different teams, analyses using this database have shown how cloud properties are perceived by instruments measuring different parts of the electromagnetic spectrum, and how cloud property averages and distributions are affected by instrument choice as well as some methodological decisions. These satellite cloud products are very valuable for climate studies and model evaluation. Even if absolute values, especially those of high-level cloud statistics, depend upon instrument (or retrieval) capability to detect and/or identify thin cirrus, relative geographical and seasonal variations, the cloud properties agree very well (with only a few exceptions, such as deserts and snow-covered regions). Probability density functions of radiative and bulk microphysical properties also agree well, when one considers retrieval filtering or possible biases due to partly cloudy pixels and to ice-water misidentification.

When comparing climate models, the observation time, the view from above, and retrieval filtering have to be taken into account. This can be achieved either by simple methods or by more sophisticated ones, such as the Cloud Feedback Model Intercomparison Project (CFMIP) Observation Simulator Package that consists of individual simulators, with each corresponding to a specific cloud data set. These simulators try to estimate the observation biases identified by this assessment. The study of long-term variations with these data sets requires consideration of many factors, which have to be carefully investigated before attributing any detected trends to climate change. Due to the systematic variations of cloud properties with geographical location, time of day, and season, any systematic variations in the sampling of these distributions can introduce artifacts in the long-term record.

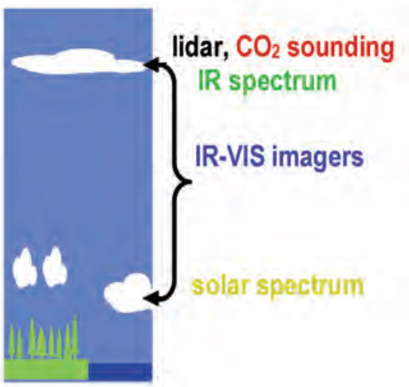
Detailed results and description of the data sets are given in the report, which is available at: *http://www.wcrp-climate.org/documents/GEWEX_Cloud_Assessment_2012.pdf*. Key results are published in the *Bulletin of the American Meteorological Society* (doi:10.1175/BAMS-D-12-00117.1).

Participating Satellite Data Sets

Operational weather satellite sensors have supplied data records extending more than 30 years. Whereas polar-orbiting, cross-track scanning sensors generally only provide daily global coverage at particular local times of day, geostationary satellites are placed at particular longitudes along the equator and permit higher frequency temporal sampling. Multi-spectral imagers are radiometers that make measurements at a few discrete wavelengths, usually from the solar to thermal infrared spectrum. They are the only sensors aboard geostationary weather satellites. The International Satellite Cloud Climatology Project (ISCCP, W. B. Rossow, City College of New York) has been providing GEWEX cloud products since the 1980s (see *GEWEX News*, November 2012). These were designed to characterize essential cloud properties and their variation on all key time scales to elucidate cloud dynamical processes and cloud radiative effects. To achieve the necessary sampling, ISCCP uses multi-spectral imager data from a combination of polar orbiting and geostationary weather satellites.

During the past decade, other global cloud data records have been established from various instruments, mostly onboard polar orbiting satellites, including the Advanced Very High Resolution Radiometer (AVHRR) and the Moderate Resolution Imaging Spectroradiometer (MODIS). The Pathfinder Atmospheres Extended [PATMOS-x, A. Heidinger, National Oceanic and Atmospheric Administration (NOAA)] was developed to take full advantage of all five channels of the AVHRR sensor aboard the polar orbiting platforms of NOAA and of the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT). MODIS data are analyzed by two teams: (1) the MODIS Science Team [MODIS-ST, S. Platnick, National Aeronautics and Space Administration (NASA) Goddard Spaceflight Center (GFSC); S. Ackerman, Cooperative Institute for Meteorological Satellite Studies (CIMSS)]; and (2) the MODIS Clouds and Earth's Radiant Energy System (CERES) Science Team [MODIS-CE, P. Minnis, NASA Langley Research Center (LaRC)]. Multi-angle, multi-spectral imagers make measurements of the same scene with different viewing angles, allowing a stereoscopic retrieval of cloud top height. Together with the use of polarization, the cloud thermodynamic phase can be determined.

The Cloud Assessment database includes data sets derived from the Multi-angle Imaging SpectroRadiometer (MISR, L. Di Girolamo, NASA) and a sensor using Polarization and Directionality of the Earth's Reflectances (POLDER, J. Riedi, Atmospheric Optics Laboratory), both operating only during daylight conditions. Results from the Global Retrieval of Along Track Scanning Radiometer (ASTR) Cloud



Sketch illustrating cloud height interpretation in the case of thin cirrus overlying low-level clouds (less than 20 percent of all cloudy scenes according to CALIPSO) when using different instruments.

Parameters and Evaluation [ATSR-GRAPE, C. Poulsen, Rutherford Appleton Laboratory] are provided only for daylight, but a stereoscopic retrieval has not yet been developed. IR sounders [e.g., the operational High resolution Infrared Radiation Sounder (HIRS) and the Atmospheric Infrared Sounder (AIRS)], originally designed for the retrieval of atmospheric temperature and humidity profiles, use IR channels in absorption bands of carbon dioxide and water vapor. The data have been analyzed by using two retrieval approaches: HIRS-NOAA (P. Menzel, NOAA), as well as TOVS Path B and AIRS-LMD (C. Stubenrauch, LMD/IPSL). The good spectral resolution of these IR sounding instruments allows a reliable identification of cirrus (semi-transparent ice clouds) both day and night. Several MODIS channels are similar to those of HIRS. Active sensors extend the measurements of passive radiometers to cloud vertical profiles. The lidar is highly sensitive and can detect subvisible cirrus, but its beam only reaches cloud base for clouds with an optical depth less than three. The Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO) Science Team (D. Winker, NASA/ LaRC) determines cloud top height from VIS backscatter and identifies cloud ice from depolarization. Noise is reduced by horizontal averaging. The General Circulation Model-Oriented CALIPSO Cloud Products (CALIPSO Cloud Product, GOCCP, H. Chepfer, LMD/IPSL) reduce noise by vertical averaging.

Selected Results: Total Cloud Amount

Total global cloud amount (fractional cloud cover) is about 0.68 (±0.03), when considering clouds with optical depth greater than 0.1. The value increases to 0.74 when considering clouds with optical depth greater than 0.01 (e.g., CALIPSO) and decreases to about 0.56 when clouds with optical depth less than two are considered (e.g., POLDER). According to most data sets, there is about 0.10–0.15 more cloudiness over ocean than over land.

Cloud Height

Cloud top height can be accurately determined with lidar (e.g., CALIPSO). Apart from the MISR stereoscopic height retrieval for optically thick clouds, passive remote sensing provides a "radiative height." The "radiative cloud height" may lie as much as a few kilometers below the "physical height" of the cloud top, depending on the cloud extinction profile and vertical extent. High-level clouds in the tropics especially have such "diffuse" cloud tops for which retrieved cloud top temperature may be up to 10°K larger than cloud top temperature. In general, the "radiative height" lies near the middle between cloud top and "apparent" cloud base (for optically thick clouds, height at which the cloud reaches an optical depth of three). When cloud height is determined via oxygen absorption (e.g., POLDER), it corresponds to a location even deeper inside the cloud.

Long-Term Variability

Global cloud amount and cloud temperature seem to be stable within the global mean interannual variability (0.03 and 2°K, respectively).

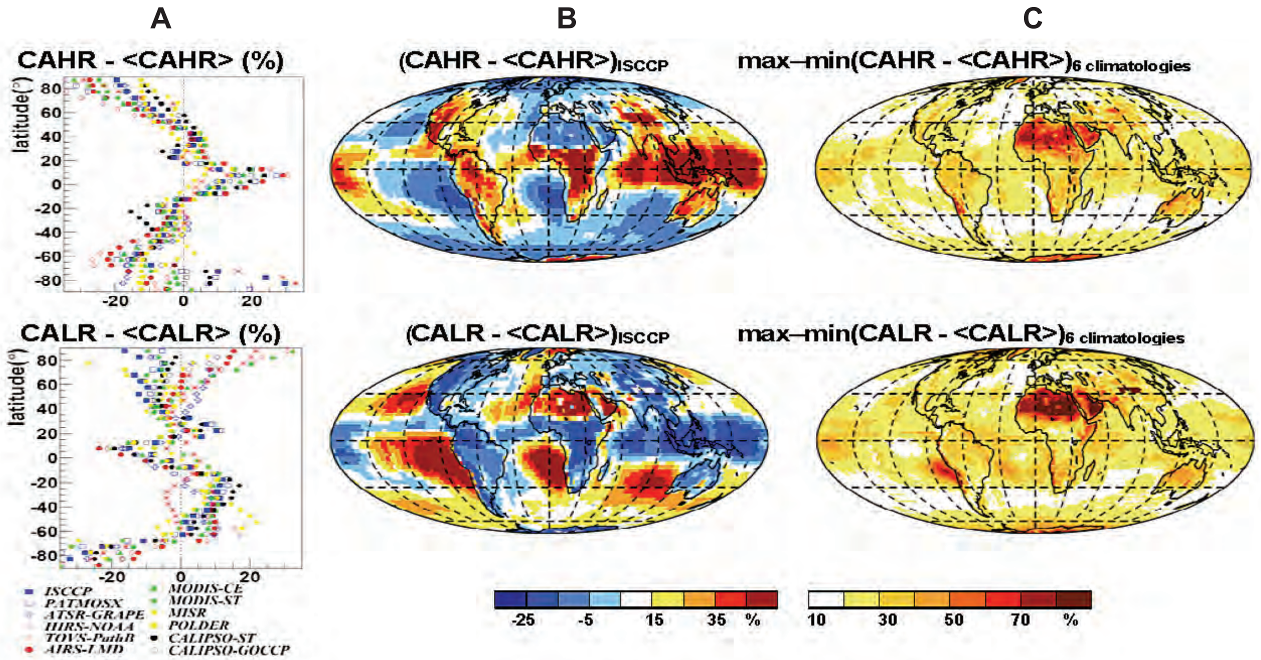
Height-Stratified Cloud Amount

About 42 percent of all clouds are high-level clouds with optical depth greater than 0.1 (see figure on page 1). The value increases to 50 percent when including subvisible cirrus, and it decreases to 20 percent when considering clouds with optical depth greater than two.

About 16 percent (±5 percent) of all clouds corres doi:10.1175/BAMS-D-12-00117.1 pond to mid-level clouds with no other clouds above. The values from ISCCP are 27 percent (day: IR and VIS information) and 40 percent (day and night: night only one IR channel), respectively. These biases are due to semi-transparent cirrus overlying low-level clouds during the day and in addition due to semi-transparent cirrus during the night.

According to the majority of data sets, about 42 percent (±5 percent) of all clouds are single-layer low-level clouds. Outliers are HIRS-NOAA with 26 percent (only one IR channel for

Participants at last GEWEX Cloud Assessment meeting, hosted by the Max Planck Institute at the Harnackhaus in Berlin in July 2010.



Latitudinal variations relative to global annual mean of all cloud data sets (Column A), ISCCP regional variations relative to global annual mean (Column B), as well as relative regional spreads between maximum and minimum within six cloud data sets (ISCCP, PATMOS-x, MODIS-ST, MODIS-CE, AIRS-LMD, and TOVS Path-B) (Column C), of relative high-level cloud amount (CAHR, top) and relative low-level cloud amount (CALR, bottom). Statistics are averaged over all measurements in the left panel and only over daytime measurements at 1:30–3:00 PM LT for Columns B and C.

low-level clouds) and MODIS-ST with 53 percent (misidentification of optically thin cirrus).

Most data sets show similar latitudinal variations in total and height-stratified cloud amount (see figure above). Exceptions are polar latitudes and relative low-level cloud amount from HIRS-NOAA (underestimation of low-level clouds with minimal thermal contrast). Geographical maps show differences in total cloud amount over deserts and land areas, which may be linked to aerosols. Regional anomalies (difference between regional averages and global average cloud properties) agree better between the data sets than regional absolute values. The spread in regional cloud amount anomaly remains below 0.10, and the spread in relative high-level cloud amount anomaly varies between 10 and 20 percent (polar regions and regions with frequent cirrus). Most data sets agree on the seasonal cycle.

Bulk Cloud Microphysical Properties

Remote sensing determines an effective particle size by assuming particle shape and size distribution within the cloud. The height contributions in the retrieval of the effective particle size depend on the absorbing spectral band used; in general, absorption increases with increasing wavelength. However, with increasing cloud optical depth, the retrieved particle size corresponds more and more to particles near the cloud top, which typically leads to overestimates for liquid clouds and underestimates for ice clouds.

Global effective droplet radius of liquid clouds is about 14 µm (±1 µm). Global effective ice crystal radius of high-level ice clouds is about 25 µm (±2 µm). Global cloud water path varies from 30 to 60 gm^2 for liquid clouds and from 60 to 120 gm^2 for clouds with ice tops. Retrieval filtering of ice clouds leads to smaller (25 gm^2 for semi-transparent cirrus) or larger values (225 gm^2 for clouds with optical depth larger than one) of average cloud water path. Differences in probability density functions have been identified due to thermodynamic phase misidentification (leading to larger droplet radii or smaller ice crystal radii, respectively), partly cloudy samples (leading to slightly smaller particle sizes and water path) and retrieval filtering.

Conclusions and Outlook

The GEWEX Cloud Assessment database has provided for the first time ever, a coordinated intercomparison of L3 cloud products from twelve global "state-of-the-art" data sets. The choice of an L3 assessment was driven by the desire to provide an overview of cloud properties retrieved from space observations and by a lack of funding. The GEWEX Cloud Assessment Team recommends that assessments be repeated at regular intervals. The Cloud Assessment database at: *http://climserv.ipsl.polytechnique.fr/gewexca/* can facilitate future assessment activities and also be used for model evaluations, since the multiple data products can be used to give a range of uncertainties on the observations. Participating data sets are encouraged to provide updated versions to the website. Coordinated comparison of satellite-derived cloud properties continues within activities of EUMETSAT (Cloud Retrieval Evaluation Workshop, CREW), which focus on detailed Level 2 data comparisons over limited areas and time periods, and of the European Space Agency, which is establishing long-term data records through its Cloud Climate Change Initiative.

Workshop on Using GRACE Data for Water Cycle Analysis and Climate Modeling

Pasadena, CA, 15–17 July 2013

Felix W. Landerer, Carmen Boening, Michael Watkins, and Graeme Stephens

Jet Propulsion Laboratory/California Institute of Technology, Pasadena, California

Since 2002, the National Aeronautic and Space Administration (NASA) Jet Propulsion Laboratory (JPL) Gravity Recovery and Climate Experiment (GRACE) has provided global observations of the Earth's gravity field variations in unprecedented detail and revealed key insights into global water storage and transport. The JPL Center for Climate Sciences and GEWEX sponsored workshop brought together more than 60 international scientists with backgrounds in hydrology, oceanography, geodesy and climate modeling to discuss the best uses of GRACE data for monitoring, simulating and understanding ongoing changes in the Earth's hydrosphere and water cycle. The main goals of the workshop were to explore: (1) how the understanding of the terrestrial water budget, global water cycle, ocean circulation and sea-level change can be advanced by the 10-year long GRACE data record; (2) how hydrology, ocean and coupled climate models can be improved with GRACE data; and (3) how science data products from GRACE and the follow-on mission can be optimized for model applications and water-related decision support.

During the meeting it was agreed that GRACE observations over land have led to significant hydrology and land-surface model improvements (e.g., in the CLM, WaterGAP, and LM3 models), and in particular for terrestrial water cycle timing and amplitudes and the representation of surface water and groundwater. Drought monitoring and flood forecasting aided by GRACE observations are maturing, and are demonstrating the high utility of total terrestrial water storage (TWS) observations. However, comparisons between CMIP3 models and GRACE TWS variations revealed significant biases and differences in the models, highlighting the need for model process and parameter improvements based on satellite data. Future work will focus on CMIP5-model evaluation, and it was recommended that future coordinated CMIP experiments should include TWS as a high-priority standard variable for consistent model evaluations and observation comparisons.

Participants discussed the potential of other geodetic and ancillary measurements to fill the possible gap between the GRACE mission and its follow-on, which is scheduled to launch in 2017. The presentations demonstrated the broad range of climate topics as well as decision support tools that can benefit from GRACE's time-variable gravity observations. The continuity, global coverage, and unique observation characteristics should further encourage users to incorporate GRACE data into their operations and studies.

2nd Collocation Meeting of EC FP7, ESA, and EUMETSAT ECV Projects

15–16 May 2013, Brussels, Belgium

Z. (Bob) Su, W. Timmermans, and Y. Zeng

Department of Water Resources, Geo-information Science and Earth Observation (ITC) of the University of Twente, The Netherlands

Stakeholders, data producers and end users for climate change projects, and representatives from the European Commission (EC) and its Seventh Framework Programme (FP7), the European Space Agency (ESA), and the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) Essential Climate Variable (ECV) projects met to coordinate the process of generating, validating and updating ECV data records, and to determine the gaps between the records and user needs in climate change adaptation and mitigation policy, and decision making. The meeting sessions were organized to review the current knowledge and practices for producing observational data records and delivering them to end users.

European Capability for Deriving ECVs

The Committee on Earth Observation Satellites, the Coordination Group for Meteorological Satellites, and the World Meteorological Organization (WMO) ECV inventory serves as a baseline for data records now available, as do the inventories from the various climate-related ECV projects. The use of data records in applications, feedback, and update loops for data record production need to be assessed. To evaluate whether or not the creation of a data record follows the best scientific and technical practices, the Coordinating Earth observation data validation for Reanalysis for Climate Services (CORE-CLIMAX) Project proposed the development of a System Maturity Matrix and Application Performance Matrix. This would separate the application, which is dependent partly on the capacity assessment, from the more static best practices. Currently, ECV records contribute to the applications area of the Copernicus Climate Change Services (*http://copernicus.eu/*), with each project making distinct contributions. In terms of future research and development, different projects emphasized different aspects of what is needed, such as: (i) data rescue methods, (e.g., digitalizing paper records, and assessing the consistency of ECVs by comparing them to each other); (ii) consistency between ECVs; (iii) improving quality assurance; (iv) extending the current in situ observing system; (v) advancing understanding of thermodynamics at the mesoscale and sub-mesoscale levels; (vi) developing fully coupled high resolution model systems; and (vii) continuing the evolution of the Global Land Service Project.

Generic Data Record Evaluation Protocol

The discussion on the generic data record evaluation protocol led by the Faculty of Geo-Information Science and Earth Observation at the University of Twente showed that different evaluation strategies or activities can lead to different Climate Data Records (CDRs). The requirement of a strategy for independence regarding evaluation was mentioned by the ESA Climate Change Initiative (CCI) projects. An independence strategy has been adopted by the EUMESAT Satellite Application Facility on Climate Monitoring (CM-SAF). The upstream information in the generation process chain and the process of creating Fundamental CDRs (FCDRs) needs to be monitored and quality controlled, as is done for Thematic CDRs (TCDRs). Also important is the documentation of the evaluation process by using the maturity indexes (e.g., why a certain score is given). For the analysis on product continuity and consistency, EUMETSAT CM-SAF introduced an operational validation and review process for products that will sustain established procedures and methods (e.g., a validation facility). EUMETSAT CM-SAF also highlighted the importance of traceability to the International System of Units (SI) standards, in terms of Calibration/Validation (Cal/Val), and the needs to regularly quantify the current state of the-art in products that are constructed for climate applications. In terms of gap analysis in making instruments SI traceable, developing Cal/Val "best practice" procedures, or meeting the Global Climate Observing System ECV requirements, the efforts by ESA CCI to establish a Product Validation Plan for documenting the validation process were presented.

Reanalyses

Reanalyses are important for improving and synthesizing historical climate records, and for providing the regional detail in a global context that is necessary for policy development and implementation. Over the years, interactions between the European Centre for Medium-Range Weather Forecasts (ECMWF), EUMETSAT, and ESA have shown that there are several feedback processes requiring coordination to ensure that the results of reanalyses are recorded in CDR updates. To understand the feedback mechanisms from reanalyses to CDR updates, a session on "Reanalyses Feedbacks to ECV CDR Updates" investigated what feedback the reanalyses project can provide to ECV and CDR producers, how this feedback can be transferred to producers, and how reanalyses projects can request and receive updates.

The European Reanalysis of Global Climate Observations (ERA-CLIM) and ERA-CLIM2 global reanalysis projects try to extract maximum information from available observations, improve temporal consistency using data from multiple sources, ensure physical consistency among ECVs via the model equations, and provide data quality feedback (e.g., residuals, bias estimates, data usage information). For the 30-year reanalysis of carbon fluxes and pools over Europe and the globe, the CARBONES Project provided fluxes consistent with short-term and long-term vegetation and soil carbon pools and the coherent reanalysis of carbon cycle variables. The Uncertainties in Ensembles of Regional Re-Analyses (UERRA) Project will provide high resolution climate reanalysis gridded data sets for research and climate analyses for all of Europe, including uncertainty measures. To deliver the feedback information and request or receive updates, ERA-CLIM and ERA-CLIM2 are developing the Observation Feedback Archive, which contains all input observations used in reanalysis, with quality feedback. It features a web interface with intelligent data selection and data visualization functions and downloading.

Contributions to the Copernicus Climate Change Service

The last topic covered was how the different EC projects will contribute to the new Copernicus Climate Change Service. The Characterization of Metadata to Enable High-Quality Climate Applications and Services (CHARMe) Project will link data sets with user commentary, annotations, and publications, to try to answer how climate data users can decide if a data set is a good fit for their uses. As this question is directly linked to the Application Performance Matrix briefly described above by the CORE-CLIMAX Project, the CHARMe Project will follow up with the connection in the near future. The Climate Information Platform for Copernicus (CLIPC) Project will provide a portal that will supply service-level integration of existing archives and an extensive knowledge base. It strives to provide the most suitable data needed by decision makers. The Quality Assurance for Essential Climate Variables (QA4ECV) Project aims to include rigorous QA methodologies for multi-decadal satellite-derived global ECV climate data records, and traceable QA applied to ECV retrievals, products and validation data. It will also provide information on quality and a data set's fitness for a particular application. The European Climate and Weather Events Interpretation and Attribution (EUCLEIA) Project will develop and deliver authoritative, reliable, and regular assessments of the contribution of natural and anthropogenic factors to recent (extreme) weather and climate events in Europe.

Most projects in this session mentioned climate data users and decision and policy makers as their targeted users. As for future research and development, the projects had several criteria. CLIPC and CHARMe highlighted the need to provide relevant data to decision makers. QA4ECV mentioned that reliable assessments of satellite data quality are needed to help users judge which ECV CDR to use, and to provide quality assured long-term CDRs of several ECVs relevant for policy and climate change assessments. EUCLEIA noted that there is a clear need for scientifically robust information about the extent to which recent extreme weather can be linked to climate change. Extreme events must have a climate perspective for adaptation if changes in frequency and intensity are expected, and the physical mechanisms of extremes in weather and climate must be better understood. The EUCLEIA Project creates a new challenge for data providers as the required analysis for both long-term climate data records and data close to real time needs to be consistent with the climatology. This is also an issue for reanalyses that are continued in almost real time. The delivery of such data could be planned for in the framework of the Copernicus Climate Change Service.

A third meeting is scheduled for 9–13 September 2013 in Edinburgh, Scotland, and a fourth will be held on 21–23 January 2014 in Darmstadt (EUMETSAT), Germany. For more information, see the CORE-CLIMAX website at: *coreclimax.eu*.

HyVic Planning Meeting

18–19 July 2013
University of Reading

[1]Fredrick Semazzi, [2]Rosalind Cornforth, and [3]Jan Polcher

[1]North Carolina State University, USA; [2]University of Reading, UK; [3]Laboratoire de Météorologie Dynamique, France

The objective of the **Hydroclimate Project for Lake Victoria (HyVic)**, a proposed GEWEX Regional Hydroclimate Project (RHP), is to evaluate the hydroclimatic variability over the Lake Victoria Basin (LVB) in East Africa and improve its climatic predictability and climate change projections (see: *http://www.gewex.org/gewexnews/May2012.pdf*). HyVic will broaden the scope of basic climate research for understanding the water cycle and support planning to build resilience to climate variability and change over the LVB. The Project will convene diverse scientific and climate information applications expertise to create two-way knowledge flow, developing a new paradigm for evaluating confidence in climate models, that in addition to the traditional approaches developed entirely by the climate science community also incorporates end-user information in the evaluation. HyVic will connect the climate research community, the climate services operational provider community, the climate information stakeholders community, the internet provider community, and the capacity building and education community to create a joint front to address this grand challenge. The end-user community will be entrained in the understanding and development of hydroclimatic predictions and projection capabilities that will directly contribute to the development of major policy on climate risk management in the region. Up to 5000 people die each year on Lake Victoria, where sudden thunderstorms and treacherous waves are common. It is anticipated that HyVic's collaboration with the weather research and prediction community will result in fewer deaths.

The HyVic Planning Meeting was hosted by Dr. Rosalind Cornforth of the University of Reading, and chaired by Dr. Fredrick Semazzi of North Carolina State University. The participants of the meeting included leading experts in hydroclimate science and related applications for the LVB, the co-chair of the GEWEX Hydroclimatology Project (GHP), and the executive secretary of Lake Victoria Basin Commission (LVBC) of the East African Community (EAC).

The purpose of the meeting was to assess international interest in the creation of the HyVic RHP, and to make recommendations for the next steps of the planning process, including the preparation of a revised draft science plan. Seventeen presentations were given on key research topics relating to the five research themes of draft science plan. Two background talks were given on the framework by the GEWEX project and the LVBC mission.

HyVic's Main Research Hypothesis

The primary hypothesis and basis for HyVic is that the trend of declining water resources will bottom out during the next few decades and begin to increase sometime later on in this century. This has come to be known as the East African climate change paradox, an idea that originated at the UK Met Office (UKMO). Previous studies are not entirely unanimous on the nature of the climatic trends associated with the paradox. The primary scientific challenge, therefore, is to reduce the present high levels of uncertainty associated with each research theme to address the paradox problem by ascertaining: (i) whether indeed a reversal will occur; (ii) the timing of when it will materialize; and (iii) whether these two factors will be determinable at acceptable levels of confidence to inform the management of the leading regional climate sectors.

The East African climate paradox has major climate risk management and policy implications for virtually all climate-sensitive sectors in the HyVic region. To address these requires dedicated multi-disciplinary and multi-institutional research collaboration to identify the leading policy issues, the corresponding climate vulnerability thresholds, and strategies for building resilience to climate variability and change. Presently, the links among the many international initiatives addressing different aspects of the problem are very weak or non-existent. Consequently, these initiatives operate independently and disjointedly. This results in inefficient use of fiscal and intellectual resources and failure to fill critical gaps in knowledge and in some cases unnecessary repetition. The ultimate goal for HyVic is to build an international network of research, operational, policy-making, and stakeholder communities that leads to resilience to climate variability in the region in the coming decades.

A brief summary of the key objectives for each research theme and primary outcomes from the talks and discussions during the meeting are summarized below.

Research Theme 1

This theme encourages the development of application-based threshold metrics for guiding the basic science themes 2–5, and the undertaking of a series of pilot studies to demonstrate the use of HyVic research outcomes for applications. HyVic will initially focus on needs in specific leading climate-sensitive sectors to prioritize its research objectives and implementation plan. To ensure compatibility with the Global Framework for Climate Services and future partnerships with it, HyVic will initially focus on Agriculture and Food Security, Disaster Risk Reduction (DRR), Health, and Water Resources.

The presentations and discussions highlighted broad community and ongoing activities that could benefit from the creation of the HyVic project in all the four focal application sectors of agriculture, water resources, health, and DDR. Investment in systematic assessment of stakeholder needs was noted as an important pre-requisite to a responsive HyVic research agenda to end-user needs. It was also noted that two possible tracks of delivering end-to-end climate services have been explored in different studies and programs. One approach is to link science and decision makers in a more participative or grass roots approach, bringing scientists, operational agencies, and representatives from society together to decide on the most suitable climate and weather information and how to make it accessible to end users. The other approach is to work through operational agencies to build capacity at weather and hydrological services and work with them on how best to provide the information to the public. Both approaches seem to have worked in Africa, and it is a strategic decision for HyVic which one to propose or emphasize more. This could perhaps also depend on the funding agencies' desired mode of operation. Ultimately, a mix of the two approaches may be best.

Research Theme 2

The objective under this research theme is to partner with the numerical weather prediction (NWP) research and operational communities to use readily available satellite and other products in the development of a marine transport early warning system. In the later phase of the project, fully coupled regional climate models will be required to study and forecast both atmospheric and marine severe conditions (currents and eddies) for the marine navigation safety early warning system.

Specific steps and actions were discussed to create a joint initiative between HyVic, which focuses on climate time scales, and the World Weather Research Programme (WWRP) Severe Weather Forecasting Demonstration Project (SWFDP), which focuses on weather time scales. The joint activity would address the following key scientific questions: (i) identification of thunderstorms that produce hazardous winds; (ii) the relationship of overshooting tops and surface hazardous winds; (iii) the mechanism of producing strong winds from thunderstorms; (iv) the relationship between wind and waves; (v) the relationship between hazardous conditions and lake surface temperature; (vi) identification and prediction of hazardous conditions; determination of skill, accuracy, and precision achievable without radar; and (vii) the capability of high resolution NWP models to represent and predict high-impact thunderstorms. The common denominators among HyVic, WWRP, and SWFDP interests are observations and the occurrence of extreme events.

Research Theme 3

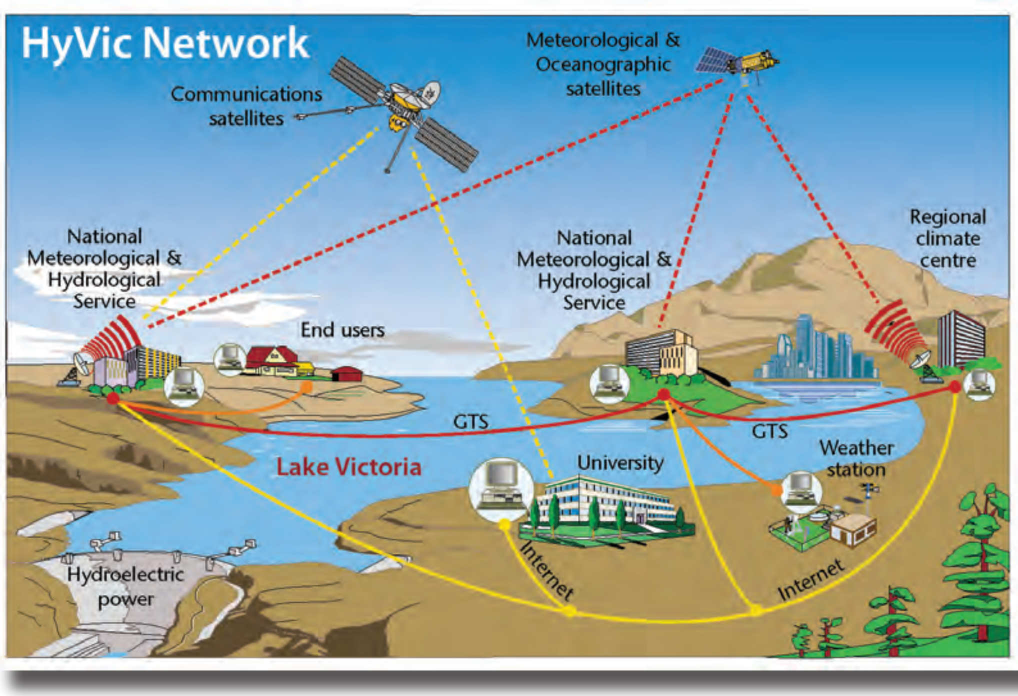
The primary objective of this research theme is to close the hydrological, energy, and nutrients budgets over the LVB to acceptable accuracy. The accuracy required in closing the budgets will be based on the requirements for understanding the variability of the hydrological components, and the accuracy requirements for the application sectors.

The LVB water budget currently has a 33 percent uncertainty, which is unacceptable. HyVic could provide a platform to coordinate improved monitoring of tributary inflow, and monitoring and modeling of the other components of the hydrological balance that could reduce this uncertainty. Several experts and institutions represented at the planning meeting showed a strong interest in this issue. HyVic could provide a platform to coordinate these activities.

Research Theme 4

Theme 4 aims to: (i) understand the variability and effects of climate change on the hydrometeorological components of the LVB; (ii) extend prior modeling capabilities and take advantage of some of the recent developments and advances in coupled regional climate-hydrologic modeling systems to create tools that will enable the investigation of dynamical linkages, interactions, and feedbacks among climate, hydrologic, and land use processes and their influence on present and future hydro-climates of the Lake Victoria Basin; and (iii) make projections of hydrometeorological components of the LVB.

The presentations and corresponding discussions on this theme highlighted a broad range of international research activities in progress (e.g., groundwater, prediction methods, role of lake surface lower boundary conditions, role of land surface changes, formulation of the East Africa climate change paradox). There is need for a three-way coupled atmosphere-lake-terrestrial hydrology regional model formulation to undertake investigations that involve interaction among these components. Prediction tools should also explore a hybrid approach that combines use of statistical and numerical models.



Schematic of HyVic Partnerships and Network.

Research Theme 5

The fifth research goal is to create a comprehensive monitoring strategy and system for the marine, terrestrial, and atmospheric components of the HyVic hydrometeorological system based on an array of remote and in situ sensor platforms.

The highlights of a recent comprehensive study of observational needs conducted by the LVBC were summarized. This investigation is also described in the HyVic draft science plan. The presentations revealed several proposed observational campaigns to monitor the atmospheric and marine conditions for Lake Victoria, along with a variety of efforts planned by the LVBC. There are also several ongoing observational campaigns of limited scope. HyVic has a vital role in linking and consolidating all these efforts under one umbrella. The meeting participants strongly recommended collaboration of HyVic with WWRP and SWFDP, and also suggested that the observational needs for each research theme be broken down. Because most data are in paper format, HyVic must work with the group digitizing data from national archives. A data management scheme needs to be developed as part of the science plan strategy that delineates how data will be shared and provides for a single, centralized location or gateway where it will be stored and accessed.

HyVic Capacity Building

The last objective for the HyVic science plan is to create a coordinated capacity building component to address the needs under all the research themes. Many ongoing activities reported in the presentations under the basic research themes also have capacity building components or opportunities. The goal under HyVic is to consolidate these efforts in a systematic form in one organization. These opportunities include, but are not limited to a SWFDP and UKMO high resolution modeling project that engages national meteorological and hydrological services in building capacity for sustainability in the provision of climate services, UKMO Climate Science Research Partnership fellowship program and modeling capacity building workshops, a Royal Society Department For International Development project for African capacity building involving university students, and Project Victoria.

Main Recommendations

The meeting achieved its objective as key Great Britain partner institutions (UKMO, Center for Ecology and Hydrology, University of Reading, and University of Liverpool) were represented and are ready to engage. There are many more research groups in the UK with relevant expertise and strong interests in Africa. They are expected to join as the project develops and needs are expressed. The US community was represented by North Carolina State University (where the concept of HyVic originated), the University of Minnesota, the University of Connecticut, and Stony Brook University. Similar meetings in the US might be needed to motivate the community and raise awareness within funding agencies. The HyVic geographical region was represented by LVBC, one of the lead potential partners and stakeholders for HyVic's research and products. Outside the UK, East Africa, and the US, there was representation from Australia. Interest from other countries engaged in climate research and services for the region should also be mobilized.

There was consensus among the participants that there is enough international interest to form the HyVic RHP. Towards this goal, the following actions were recommended: (i) GHP will lead the formation of a HyVic International Planning Committee (IPC) with representatives from the research, operational, and stakeholder communities who will, among other tasks, approach potential donors for funding; (ii) develop a concept note and series of presentations with a consistent message; and (iii) the pre-Reading meeting draft science plan and the meeting report will be the starting point for the IPC (first meeting ACC2013 conference on 15–18 October 2013) to prepare the final science plan. The IPC chair will also visit the EAC Secretary General, and provide him with information on HyVic to give to the ministers of environment for all the LVB countries. The HyVic (climate) IPC will work closely with the WWRP (weather) Lake Victoria observational project to organize a side meeting at the Conference to formalize the framework for collaboration. Another side meeting will be arranged with potential donors, NMHS managers, and environmental directors from all LBV countries.

Participants of the HyVic Planning Meeting (photo taken by Rosalind Cornforth).

Trending Now: Water

7th International Scientific Conference on the Global Water and Energy Cycle

The Hague, The Netherlands, 14–17 July 2014 **http://gewex.org/2014conf/home.html**

Call for Abstracts

Background

The 7th International Scientific Conference on the Global Water and Energy Cycle will celebrate 25 years of GEWEX research. It will also set the stage for the next phase of research addressing the World Climate Research Programme Grand Challenges on water resources, extremes and climate sensitivity through observations and data sets, their analyses, process studies, model development and exploitation, applications, technology transfer to operational results, and research capacity development and training for the next generation of scientists.

Submission of Abstracts

Abstract submission will be used to select presentations for poster and oral sessions. Poster sessions will be the main form of presentation during the Conference and only a limited number of oral presentations will given.

Only one abstract may be submitted per registrant. An abstract should have at least 500 words and a maximum of 1000 words.

There is a nonrefundable fee of 40 Euros to submit an abstract. This is separate from all the Confrence registration fee. Abstract fees are only refundable if your abstract is rejected. There is no refund for abstracts withdrawn after acceptance.

Important Dates

14 February 2014	Deadline for Submitting an Abstract
Mid-March 2014	Notification of Abstract Acceptance
21 April 2014	Early Bird Registration Ends
14 July 2014	Conference Begins

All participants, including invited speakers and conveners must register.

Conference Sessions by Category

The following are condensed summaries of the sessions. More detailed information about each session is available on the Conference website.

THE CLIMATE SYSTEM

1. **Advancing Climate System Knowledge through New Observations and Field Experiments**
   Conveners: P. Drobinski and J. Walker

Long time-series of multi-scale and multi-parameter data sets are needed for analysis of regional climate variability and change, and hydrometeorological extremes. This session includes all aspects of field campaigns as keys to process studies.

2. **Advances in Analysis of Observations, Reanalysis and Model Results to Improve Energy and Water Cycle Processes**
   Conveners: J. Schulz, M. Bosilovich, and M. Moncrieff

Simple comparisons of observation variables with numerical models, usually averaged in time and space, can identify model discrepancies but not their causes. This session seeks papers describing and illustrating multi-variate analysis approaches that diagnose process relationships relevant to the global energy and water cycles.

3. **Modeling, Predicting, and Attributing Climate Extremes**
   Conveners: G. Hegerl, A. Scaife, and S. Seneviratne

How well are extremes simulated in models? What are the causes of observed changes in extremes; the role of internal variability and atmospheric circulation for changing probability of extremes; the ability of seasonal to decadal prediction systems to capture extremes and their changes; and the role of land-surface processes in changing extremes and model biases.

4. **Observations and Changes in Climate Extremes**
   Conveners: R. Stewart, X. Zhang, and O. Zolina

Submissions are invited on examining a wide range of extremes (e.g., floods, droughts, extreme precipitation, winter storms) on global, regional and local scales, and especially compound events (e.g., floods forced by snow melt and precipitation) and simultaneous events (such as heavy precipitation adjacent to regions of drought). Submissions are also invited that consider scaling issues associated with climate extremes.

5. **Progress Towards Closing Global and Regional Water and Energy Budgets**
   Conveners: N. Loeb, T. Oki, and P. Robertson

This session solicits papers on innovative ways that observations and reanalyses have been used to gain insight into processes that govern these cycles or alternatively, gain insight into one or more of the products that make up the budgets.

6. **Progress and Challenges for Predicting Monsoon Precipitation**
   Conveners: H. Hendon, D. Gochis, and J. Matsumoto

This session requests papers on all aspects of predicting monsoon rainfall, including short term prediction of extreme events, multi-week prediction of monsoon intraseasonal variability, seasonal prediction, and the role of land. Papers that focus on key model and data limitations and on impacts of climate change on monsoon predictability are especially welcomed.

7th International Scientific Conference on the Global Water and Energy Cycle

Conference Sessions (continued from page 15)

7. Characterizing, Validating, and Improving the Water Cycle in Models

Conveners: Y. Takayabu and P. O'Gorman

This session seeks analyses of precipitation characteristics and their relationship to the large-scale environment as depicted by the models and especially CMIP5 models vs observations.

8. Analyzing, Validating, and Improving Global Precipitation Products

Conveners: R. Adler and G. Huffman

This session seeks to validate and improve analyses of precipitation characteristics over the ocean; including climate means, variations and error estimates thereof, and finer scale properties, and multi-scale processes resulting in these properties.

LAND

9. Use of Climate Information and Predictions in Hydrology and Water Resources Management

Conveners: E. Wood, M. Bierkens, and J. Verkade

The session focuses on advances in regional and global water cycle information systems and their usefulness in understanding water cycle variability and change, which is important for water management over all time scales.

10. Land Surface Model Benchmarking and Development

Conveners: M. Best, D. Lawrence, and E. Blyth

This session will focus on the evaluation of metrics and benchmarks of land model processes using existing and new data streams to help direct future land model development.

11. The Role of Land Parameters (and Land Cover Change) on Weather and Climate Prediction

Conveners: S. Kanae, M. Ek, and A. Pitman

The focus of this session is on LSM improvements for NWP and seasonal time scales through use of new land data sets and land-related parameters, (e.g., higher-resolution vegetation and soil data sets, snow cover).

12. High Resolution Hydrological Processes and Sub-Surface Waters in Land Surface Models

Conveners: T. Oki, P. Bates, and S. Sorooshian

Improving terrestrial hydrologic representation in land-surface models and their impacts on coupled weather and climate prediction is the focus on this session (e.g., runoff processes, river routing, ground water dynamics, etc.)

13. Modeling Anthropogenic Impacts of Land-Water Management in Land Surface Models

Conveners: R. Harding, J. Sheffield, and S. Grimmond

Developments in land-surface models and the anthropomorphic impacts on states, fluxes and flows within the Earth system.

14. Data-Assimilation in Land Surface and Hydrological Models

Conveners: R. Reichle and P. deRosnay

This session highlights advances in the development and applications of land data assimilation systems, such as studies that evaluate, compare, or improve land data assimilation methods, etc.

15. Biosphere, Water, Carbon, and the Climate System

Conveners: M. Reichstein and S. Stitch

This session focuses on the evolution of atmospheric models towards fully integrated Earth system models and bridging the gaps between the GEWEX and iLEAPS communities and models.

16. New Satellite Observations for Water Cycle Research and Their Utility in Land Surface Model Development

Conveners: J. Famiglietti, X. Li, and D. Yamazaki

The session focuses on the potential of recent and planned satellite missions and their contributions to water cycle research, and usefulness for improved assessment of land surface models and their development.

17. Cold Season Precipitation: Projected Changes in Snow from Observations, Models, and Reanalyses

Conveners: S. Kapnick, C. Derksen, and R. Bennartz

This session seeks papers dealing with snow in its various forms (i.e., snowfall and snow on the ground) in observations, models, and reanalyses.

18. Hydrology of High Elevation Areas

Conveners: J. Pomeroy, R. Essery, and M. Yaoming

This session will focus on advances in high mountain hydrology, including precipitation, process understanding, observational advances, model development and validation, applications, climate change impacts and projections of future snow and ice hydrology under a changing climate.

19. Land Precipitation and Drought: Observations, Modeling, Errors, and Uncertainty

Conveners: R. Roca, O. Zolina, V. Levizzani

The session will focus on changes and variability in land precipitation (including accumulations and statistical distribution) across different scales from local to global in as seen in both models and observations.

ATMOSPHERE

20. Cloud to Rainfall Transitions: Linking Multi-Parameter Observations to Processes and Models

Conveners: C. Kummerow, G. Stephens, Jay Mace, H. Morrison, and B. Shipley

Fundamental questions remain regarding the onset of precipitation in warm phase clouds around the globe. This session seeks improved understanding from field campaigns, modeling studies and satellite observations relating cloud processes in various large scale environments.

21. The Coupling of Clouds, Precipitation, and Radiation to Large-Scale Circulation

Conveners: S. Bony and C. Bretherton

This session addresses the coupling of clouds and precipitation to the large-scale atmospheric circulation, both in the present-day climate and in climate change.

22. Improving the Representation of Precipitation, Cloud, and Radiation Processes in Atmospheric Models

Conveners: J. Petch, R. Pincus, and S. Woolnough

Clouds, precipitation, and radiation are central to atmospheric modeling across time and space scales, from a few hundred meters to global, and from hours to centuries. Submissions are invited on science that can improve the representation of these processes at all scales.

23. Improving the Understanding and Modeling of the Land and Atmosphere Interface

Conveners: P. Dirmeyer, B. Holtslag, A. Lock, and J. Santanello

This session addresses the advancement of insights into the representation of land-surface states and fluxes, and the complex interactions with the atmospheric boundary layer.