Global Energy and Water Exchanges Project

GEWEX

WCRP

World Climate Research Programme

WMO IOC ICSU International Council for Science

GEWEX DATA **ANALYSIS** PANEL: Report to WDAC-7

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and

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GDAP Mission

Core Mission

- Sponsor **production and analysis** of satellite datasets (e.g. ISCCP, GPCP, SeaFlux, LandFlux)
- Oversee **dataset assessments** to provide critical uncertainty information for data records
  - Assess adequacy of current observing systems and identify gaps/future needs
- Support **ground based networks** (e.g. BSRN, GPCC)
- Act as an **interface** between GEWEX activities and datasets
  - PROES, GAP, GEWEX panels
  - New Earth's Energy Imbalance initiative
- Represent GEWEX at various WCRP meetings, WMO, and other requests
  - Outreach to various other bodies within WCRP
  - Strong links to WMO/CGMS working groups
    - GVAP meets during ITGW
    - co-chair of ICWG is a member of GDAP
    - Joint IPWG/Assessment
  - Rémy Roca sits in WDAC
  - Coordination with GCOS (although it needs improvement)

The GDAP Activities Portfolio

Panel members
Rémy Roca, chair
Tristan L'Ecuyer, vice-chair
Wouter Dorigo
Andrew Heidinger
Seiji Kato
Christian Kummerow
Hirohiko Masunaga
Isabel Trigo
Claudia Stubenrauch
Tianjun Zhou
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SSG sugges land assim experts

Invited members
Graeme Stephens, SSG Chair
Sonia Seneviratne, SSG Chair
Peter van Oevelen, IGPO
William Rossow, Founder

« GEWEX » datasets production

Paul Stackhouse	Surface Radiation Budget
Bob Adler	Global Precipitation Climatology Project (GPCP)
Stefan Kinne	Global Aerosol Climatology Project (GACP)
Carlos Jimenez	LandFlux
Caroll Ann Clayson	Seaflux
Bill Rossow and NOAA NCEI	ISCCP
P Brown and C Kummerow	GEWEX Merged and Integrated Product

Ground data network

Wouter Dorigo	ISMN
A. Becker and Udo Schneider (DWD)	GPCC
Chuck Long (NOAA)	BSRN
Jim Mather (ARM)	ARM

« GEWEX » Assessments

Claudia Stubenrauch (CNRS)	Clouds
Marc Schröder (DWD)	Water Vapor
Jeffrey Reid (NRL)	Aerosols
Hirohiko Masunaga	Precipitation

GEWEX PROES
Claudia Stubenrauch (CNRS) UTCC
Sue Van Den Heever (CSU) GAP

The 2017 GDAP meeting, Boulder, CO, USA

Joint with CONCEPT-HEAT meeting
Hosted by K. Threnberth at NCAR facility. Very nice setting and local support from Kevin !

- 2 days of very busy meeting
- Half a day of GDAP centered discussion with only the panel members

All usual activity + new presentations (LST; OHC from Alimetry-GRACE ; TWS)
Next meeting in late Nov 2018 in Portugal hosted by Isabel Trigo

CORE Activity Message 1:

Application-centric approaches are key to maximize value of assessments

- Recently completed GDAP Water Vapor assessment used to draft recommendation in the new Decadal Strategy
- Updated cloud assessment with improved representation of active sensor observations is nearing completion
- Aerosol assessment is being resurrected
- Joint IPWG-GEWEX Precipitation Assessment is now underway
  - Specific attention to « high priority » regimes (arid, orographic, high-latitude)
  - Established links to GASS, GHP, GAP, etc. and modeling communities
  - Representation from NASA PMM, NOAA, JAXA, and European communities
  - Seeking agency support for comprehensive activity
- GDAP promotes a new comprehensive view on assessment
  - Document on good practices to be finalized this year

Precipitation assessment: Joint IPWG-GEWEX effort

#	Name	Leads	Short description
1	Standard quality assessment	T. Kubota and H. Masunaga	catalogue with summary descriptions; intercomparisons; regime sorted statistics;quality & traceability (including WDAC doc+ FIDUCEO)
2	Uncertainty	J. Turk and P. Kirstetter	uncertainty metrics (detection, estimation); intrinsic uncertainty (sensitivity); algorithm limitations;
3	Consistency	A. Beranghi and D.B. Shin	water and energy budgets consistency; regional budgets; ancillary datasets (description and assessment for robustness)
4	Evaluation of analysis data from numerical models	H.J. Kim and G. Balsamo	performance metrics; model scales (spatial and temporal)
5	Ground based data	C. Kidd and S. Durden	sources (including weather radar where available); calibration and uncertainty characterization of sources, including polarimetric ground radars
6	Validation at weather scales in regions without ground measurements	R. Ferraro	consistency with other remotely sensed data at weather scales; consistency with reanalysis
7	Variability and trends	F.J. Tapiador	sub-seasonal, seasonal, annual, inter-annual; extremes and the ability to capture them faithfully; correlation with climate indices;
8	End users applications	Z. Haddad and G. Huffman	phenomenological assessment (consistency with agricultural indices, etc); latency issues;
9	Recommendations to algorithms developpers	G. Huffmanf and Z. Haddad	assessment of assumptions underlying the algorithms , including retrievals from ground measurements (physical validation);
10	Programmatic recommendations	G. Stephens and V. Levizzani	product sensitivity to satellite constellation configuration; sensitivity to instrument capability and performance , including ground /airborne instruments product sensitivity to satellite constellation configuration; sensitivity to instrument capability and performance , including ground/airborne instruments

CORE Activity Message 2:

Ground-based networks are vital to uncertainty characterization

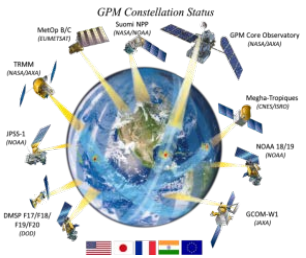
- E.g. BSRN
  - Critical reference for SRB
  - New SI-traceable reference for downwelling LW irradiance being established
  - Recommend adding 2m temperature to standard BSRN observations suites
  - Workshop to define accuracy standards for buoy sites
  - BSRN chief Chuck Long is stepping down
  - Replacement search underway – goal to announce successor in July (short time)
- New feasibility study for a regional land surface energy balance/water cycle closure assessment centered on a DOE ARM site

A New GDAP Vision

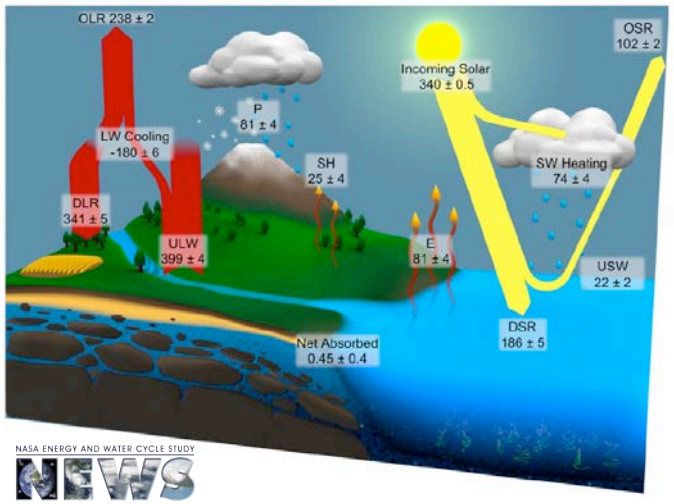
Consistency as a way of life

An integrated approach to energy-water-mass consistency based on refined uncertainty characterization

Precipitation

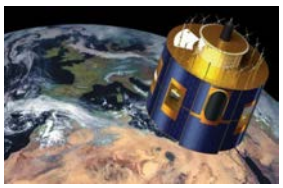


Radiation

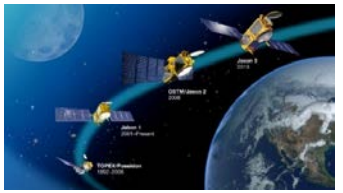


Surface Flux

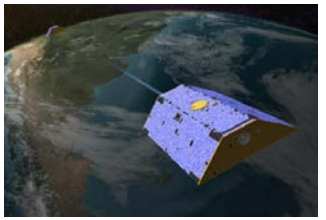
Cloud



Sea level



Gravimetry



Related Activities

GEWEX Integrated Dataset

- GEWEX sponsored or supported datasets on a common 1◦, 3-hourly, equal-area grid
- Supports regional water and energy budget closure analyses
- User workshop in Spain in 2019

Integrated Surface Water and Energy Assessments

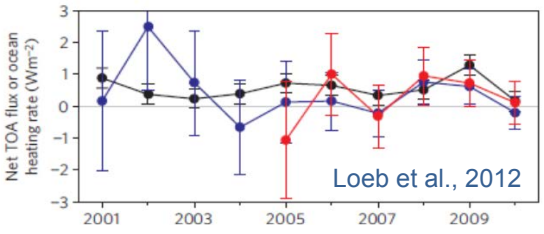
- Advance land-ET and surface radiation measurements by explicitly linking to new/proposed land surface temperature, soil moisture, terrestrial water storage, and ground heat storage assessment activities

Earth's Energy Imbalance

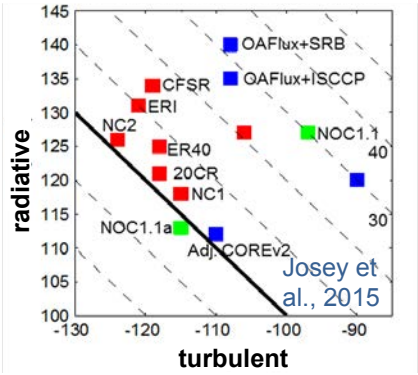
- Grew out of CLIVAR CONCEPT-HEAT and NASA NEWS
- Integrated assessment of methods for quantifying fundamental driver of climate and reconciling top-of-atmosphere vs. surface perspectives

Quantifying Earth's Energy Imbalance…

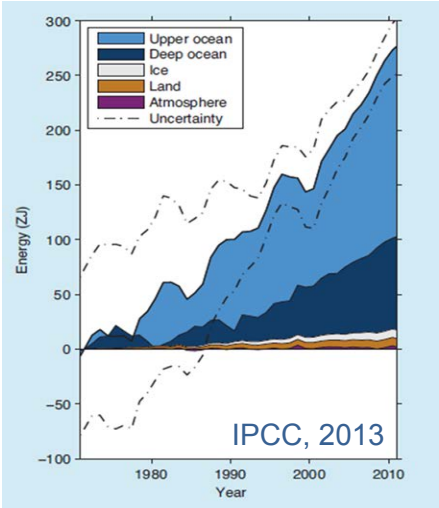
Radiation at TOA



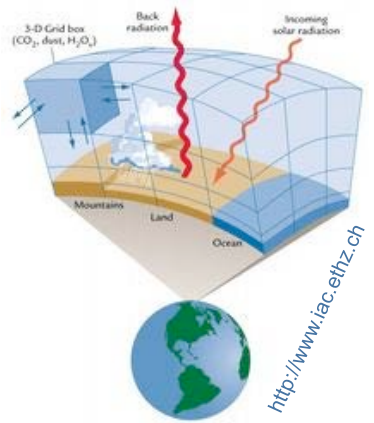
Surface flux



Storage Inventory (OHC)

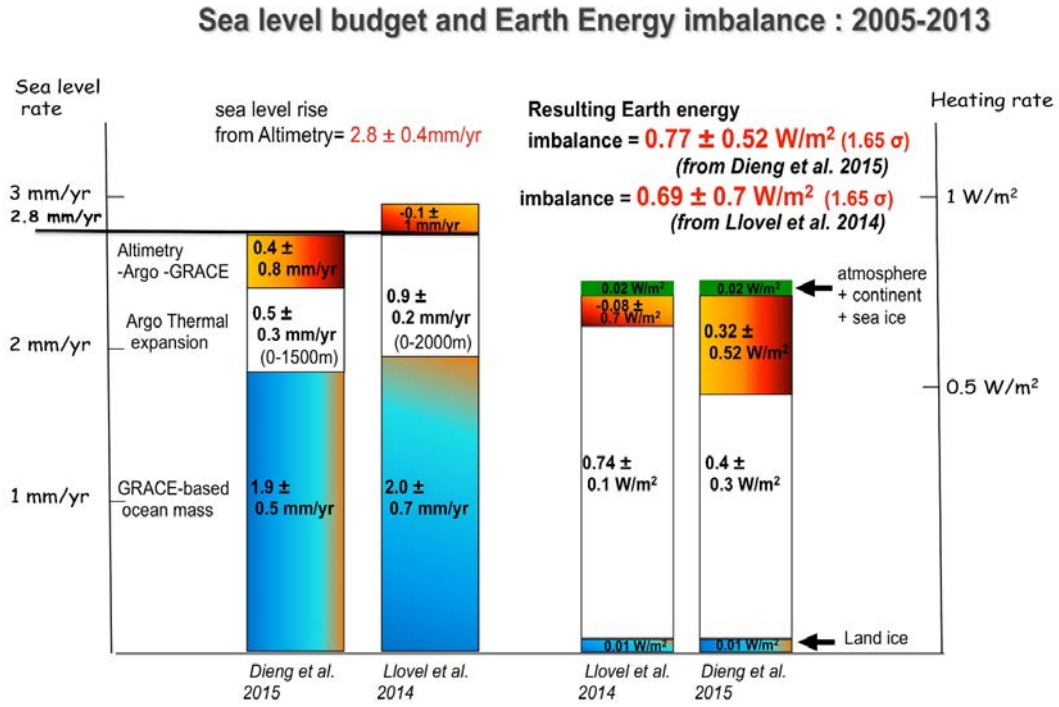


Hindcast and Climate Projection



Recent Advances from Satellite Gravimetry and Altimetry Measurements

- Sea level (from satellite altimetry) minus ocean mass (from space gravimetry) provides a satellite-based alternative to Argo for estimating OHC
- The current best estimate of the OHC change from satellite is 0.7±0.5 Wm^{-2} over 2005-2015
- GDAP endorses expansion of this activity to regional and shorter timescales as part of a new EEI-themed energy budget assessment.



Joint WCRP/CLIVAR/GEWEX:
« Synergy community on the Earth energy imbalance »
13-15 Nov 2018, Toulouse, France

Overall goal:
Strengthen and extend the synergy community on the Earth's energy imbalance aiming to discuss cross-links between the different WCRP core programs, in particular between CLIVAR and GEWEX, but also including CliC.

Expected outcomes:
The workshop will identify research goals and opportunities on the Earth's energy imbalance, and synthesize and focus the various aspects across WCRP. A main outcome may include the discussion and reporting on how the CONCEPT-HEAT activity could evolve into a WCRP topic.

Extra slides

Continuing a Key Climate Data Record: ISCCP-Next Generation

- Cloud properties constitute a core geophysical climate record
- Instruments and expertise exist to generate a calibrated, global, 10-channel, multi-parameter cloud at 3 km with 30 minute coverage
  - Heritage to deal with such data volumes also exists (e.g. AIRS and MODIS)
- Excellent opportunity for coordinated NASA and NOAA activity to maximize scientific benefits of new geostationary and low-earth orbiting satellites
- GDAP endorses the formation of a team to develop a unified analysis approach built around the current geostationary radiance data record augmented by MODIS/VIIRS and sounder cloud information
  - Agency support for a series of international workshops
  - Target 2021 for initial implementation
- A multi-institutional (multi-national) processing chain similar to ISCCP is encouraged
  - Individual satellite operators, collect, quality control, and sub-sample radiances and provide these data to an analysis center that would conduct a refined calibration and the quantitative cloud analysis.
  - Data products to be archived and distributed by existing data centers.