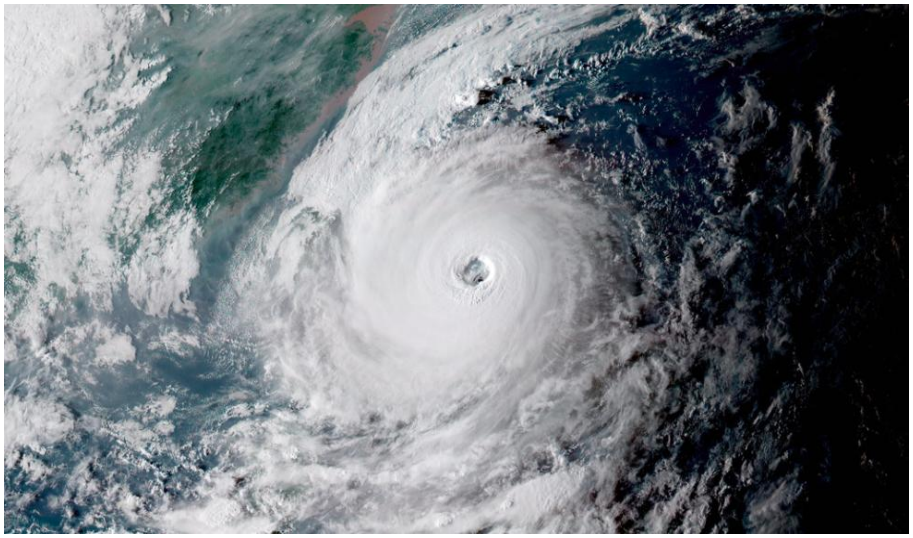
GDAP Report

Jörg Schulz, Chair
Matthew McCabe, Vice Chair
Credits to all GDAP members, data project and assessment leads and reviewers

GDAP Annual Meeting 2015

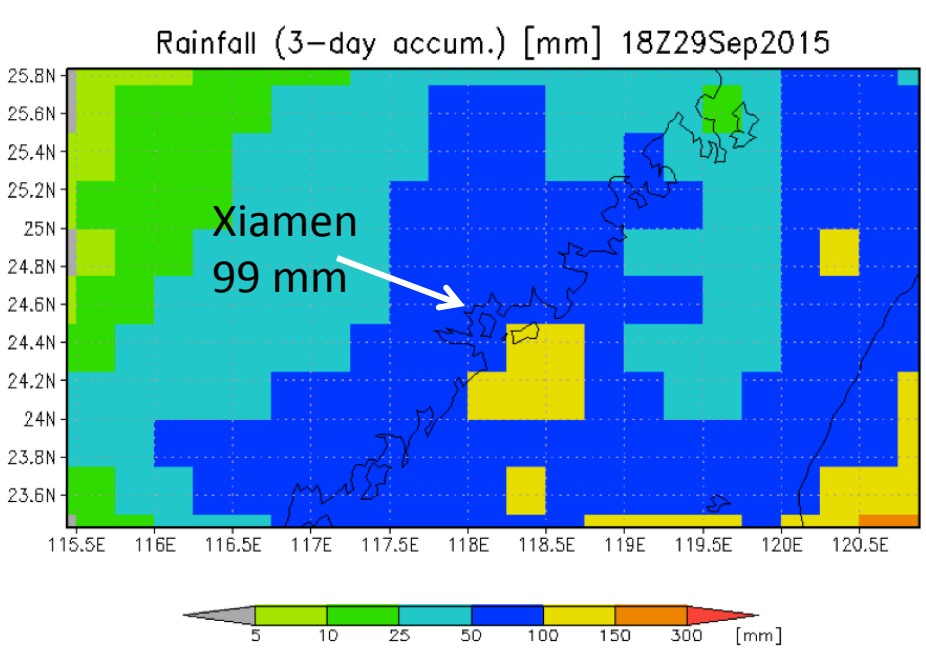
XIAMEN, CHINA, 29 Sep – 1 Oct 2015

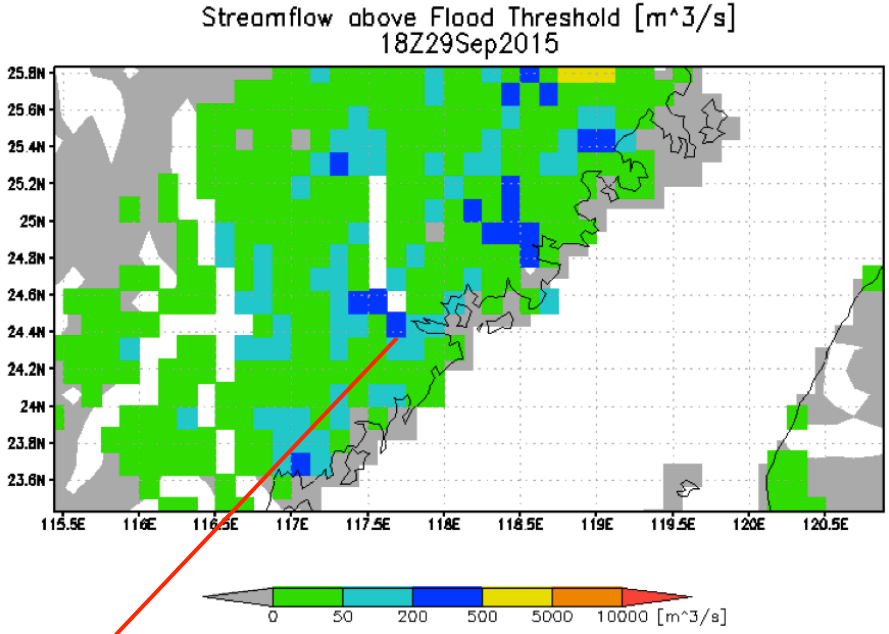


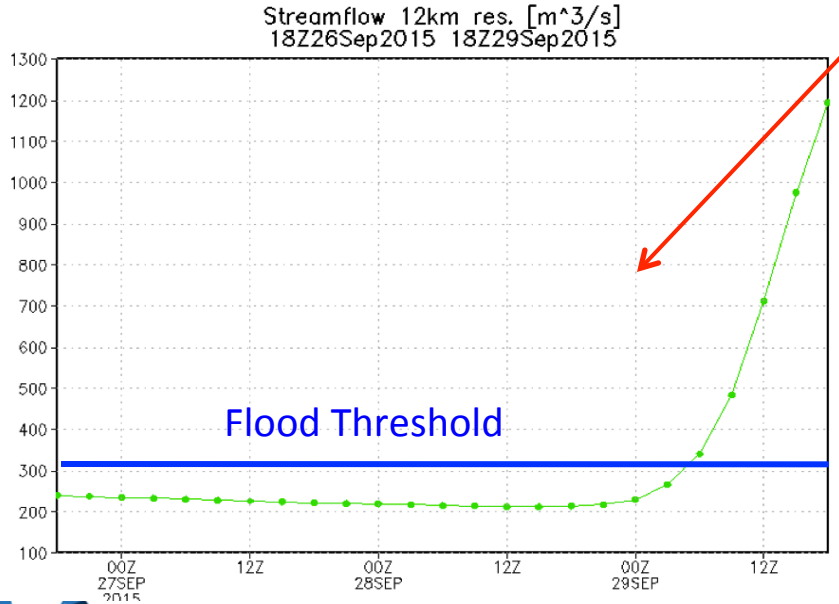
Credit: CIRA/RAMMB/Himawari

Threatened by tropical storm Dujuan

Satellite Rainfall and Flooding in Xiamen Vicinity from GPCP







Satellite rainfall (TMPA/3B42) into global flood model in "real-time".

flood.umd.edu U. of Maryland

Content

- GDAP Objectives
- GEWEX Data Products
- GEWEX Data Quality Assessments
- GEWEX Ground-Based Observations
- GDAP New Activities
- GDAP contributions to GEWEX Science Questions
- GEWEX links to other WCRP or ex WCRP activities

- Membership
- Issues for the SSG

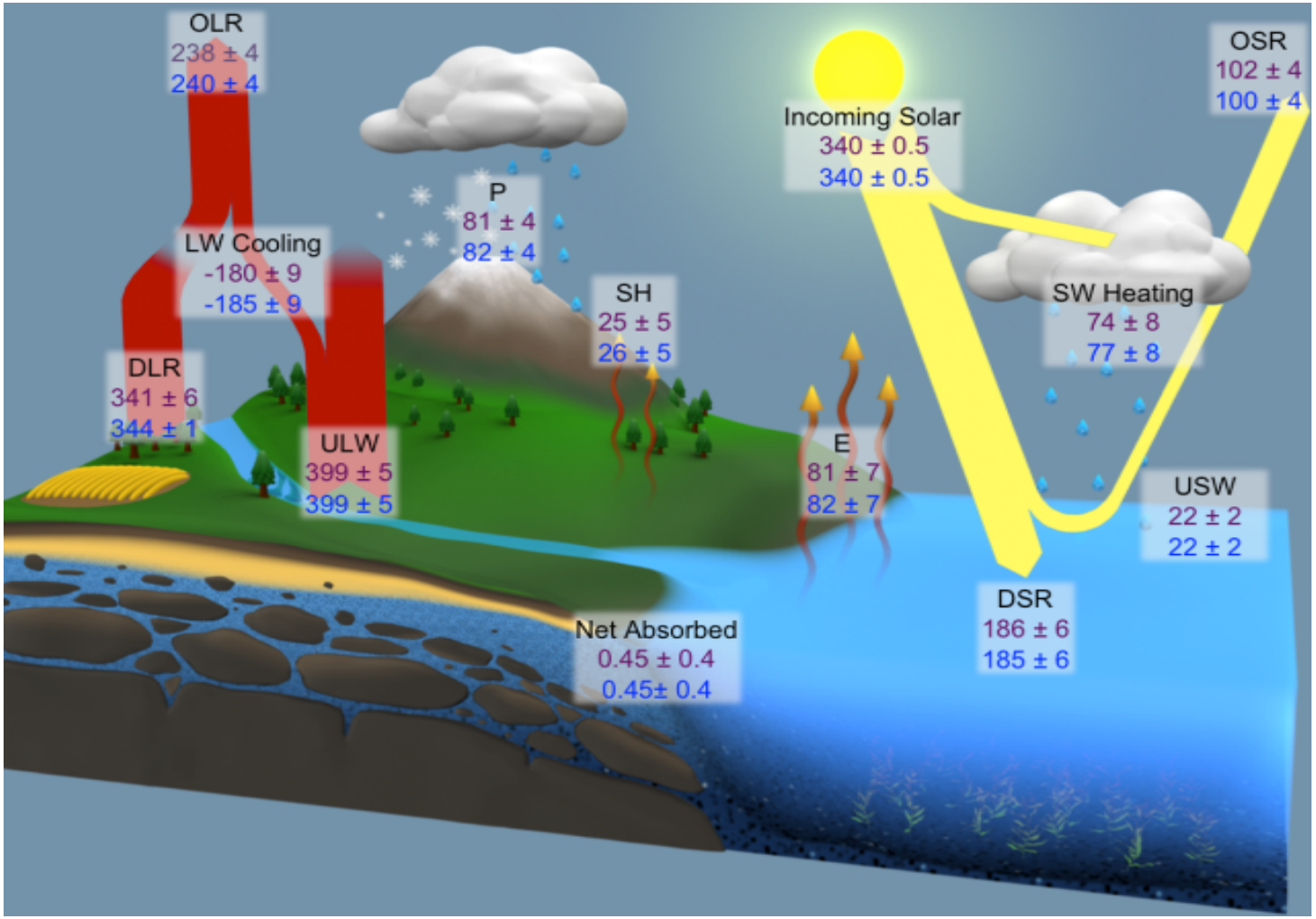
GDAP Objectives

- Data records
  - Guide production and analysis of global data sets with respect to GEWEX questions, e.g., energy and water budget closure;
  - Use new data sources in the data sets, e.g. GPM
  - Tailor data sets to needs of GCs, e.g., water availability, extremes and PROES activities and directly participate/interact with GCs and PROESs;
  - Evaluation of climate models – obs4mips connect;
- In situ networks
  - Guidance of surface networks such as BSRN and GPCC needed for assessments
  - Evaluation of satellite products
  - Evaluation and tuning of models
- Data quality assessments
  - To assure quality and knowledge about data sets including suitability for applications;
  - To improve uncertainty estimation for data records
  - Assess adequacy of observing system - Interact with CEOS/CGMS WG Climate

GEWEX Data Products and Integration of them

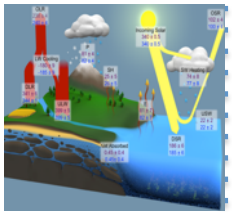
ISCCP (Bill Rossow and NOAA NCEI)
Aerocom MAC (Stefan Kinne)
SRB (Paul Stackhouse)
GPCP (Bob Adler et al.)
SEAFLUX (Carol Anne Clayson)
LandFlux (Matt Mc Cabe, Carlos Jimenez)
Soil Moisture (Wouter Dorigo

Energy Cycle



Tristan S. L'Ecuyer, H. K. Beaudoing, M. Rodell, W. Olson, B. Lin, S. Kato, C. A. Clayson, E. Wood, J. Sheffield, R. Adler, G. Huffman, M. Bosilovich, G. Gu, F. Robertson, P. R. Houser, D. Chambers, J. S. Famiglietti, E. Fetzer, W. T. Liu, X. Gao, C. A. Schlosser, E. Clark, D. P. Lettenmaier, and K. Hilburn, 2015: The Observed State of the Energy Budget in the Early Twenty-First Century. *J. Climate*, **28**, 8319–8346. doi: http://dx.doi.org/10.1175/JCLI-D-14-00556.1

GDAP product integration
Energy wiring diagram



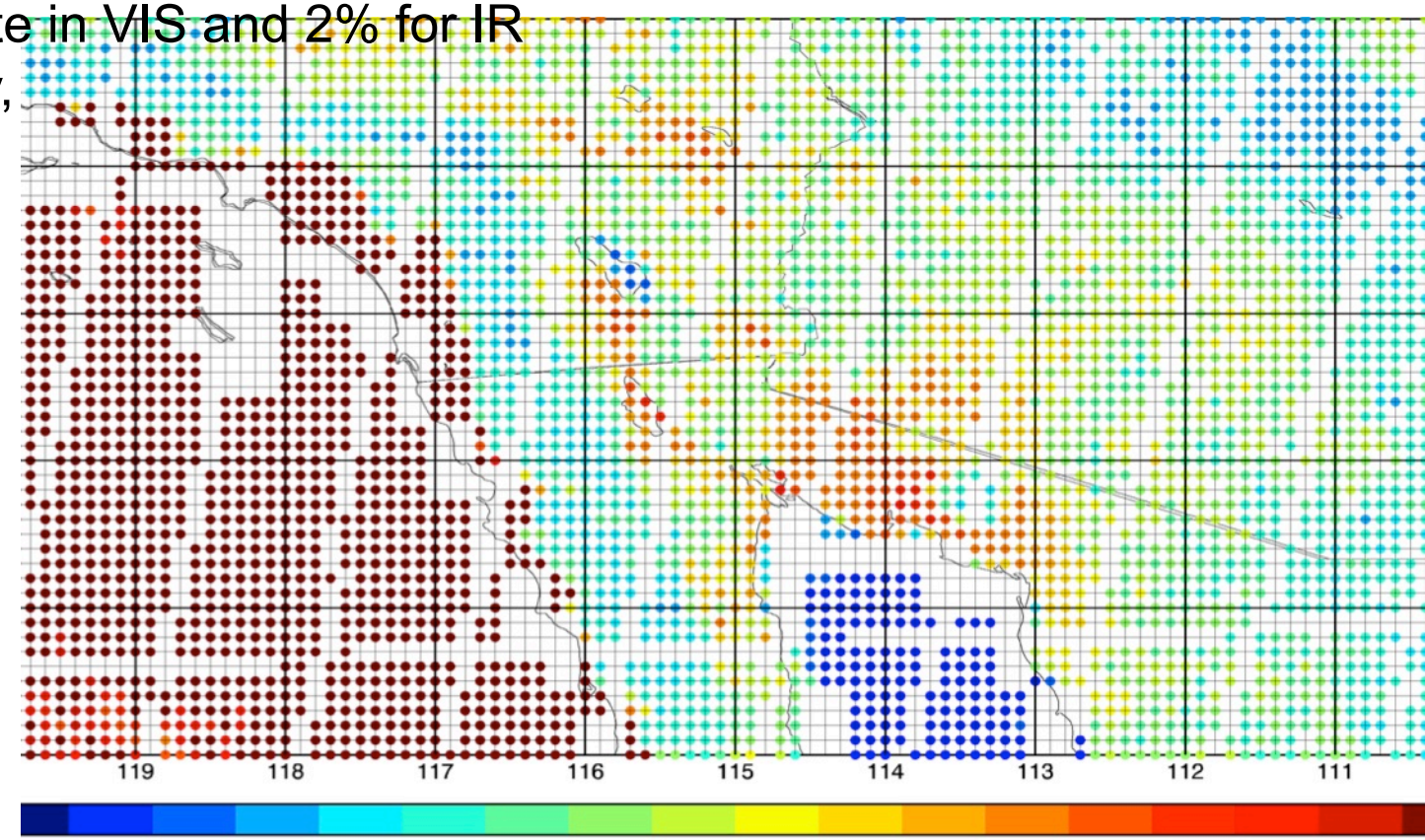
Additional COMMON ANCILLARY DATA PRODUCTS

- **MAP GRIDS** (equal-area for 0.1, 0.25, 0.5, 1.0, 2.0 & 2.5 deg)
- **LAND/WATER MASK & TOPOGRAPHY** (GTOPO30, AVHRR)
- **SURFACE TYPE** (MODIS IGBP, GLIMS, "shelf") & IR emiss
- **OZONE** (TOMS, OMI, TOVS, NOAA SMOBA)
- **MERGED SNOW & SEA ICE** (NOAA Snow & GLIMS, OSI-SAF sea ice & "shelf")
- **Integrated technical product specifications**
  - 1 Degree Equal-Area Mapping (0,0 is corner)
  - 3 hr → 1 day Time intervals (repeat 3hr value if daily only)
  - Monthly files with Month/Year file names
  - Fixed Variable Arrays
  - netCDF4 format

ISCCP H Series

ISCCP is being reprocessed (based at NCDC)

- Uses all 10 km pixels with no subsampling
- Revised calibration using MODIS and Heidinger (et al), claims accuracy of 3% absolute in VIS and 2% for IR
- Pixel 3-hourly, 1x1 3-hourly, and 1x1 monthly data products
- Algorithm Updates
- nnHIRS Gridded & filled data set using T, q retrieval (Shi et al.)
- New surface type maps



ISCPP Status

- The neural network HIRS (nnHIRS) product has been completed for 1980-2014 and is available to the processing of other GEWEX products.
- Issues were detected when using earlier versions of the nnHIRS product to compute longwave radiative fluxes, so the last version has been adjusted to improve agreement with surface station temperature and humidity;
- All other ancillary products needed for the provision of an integrated product are all finished for the whole time period (currently 1980-2014) and are online;
- The full re-processing to generate ISCCP V2 has not started yet (although we have a prototype data set for 2007-2009);
- Processing was transferred to NOAA NCEI with the consequence that quality control and quality improvement of the input data became major work lasting one full year;
- Once the processing begins (maybe in February 2016) NCEI should be able to process about 10 yr per month. A "final" version of ISCCP products for 2007-2009, referring to the cloud products, should be available very soon now.

The MAC AEROSOL climatology

Max-Planck Aerosol Climatology

Stefan Kinne, *MPI-Meteorology*

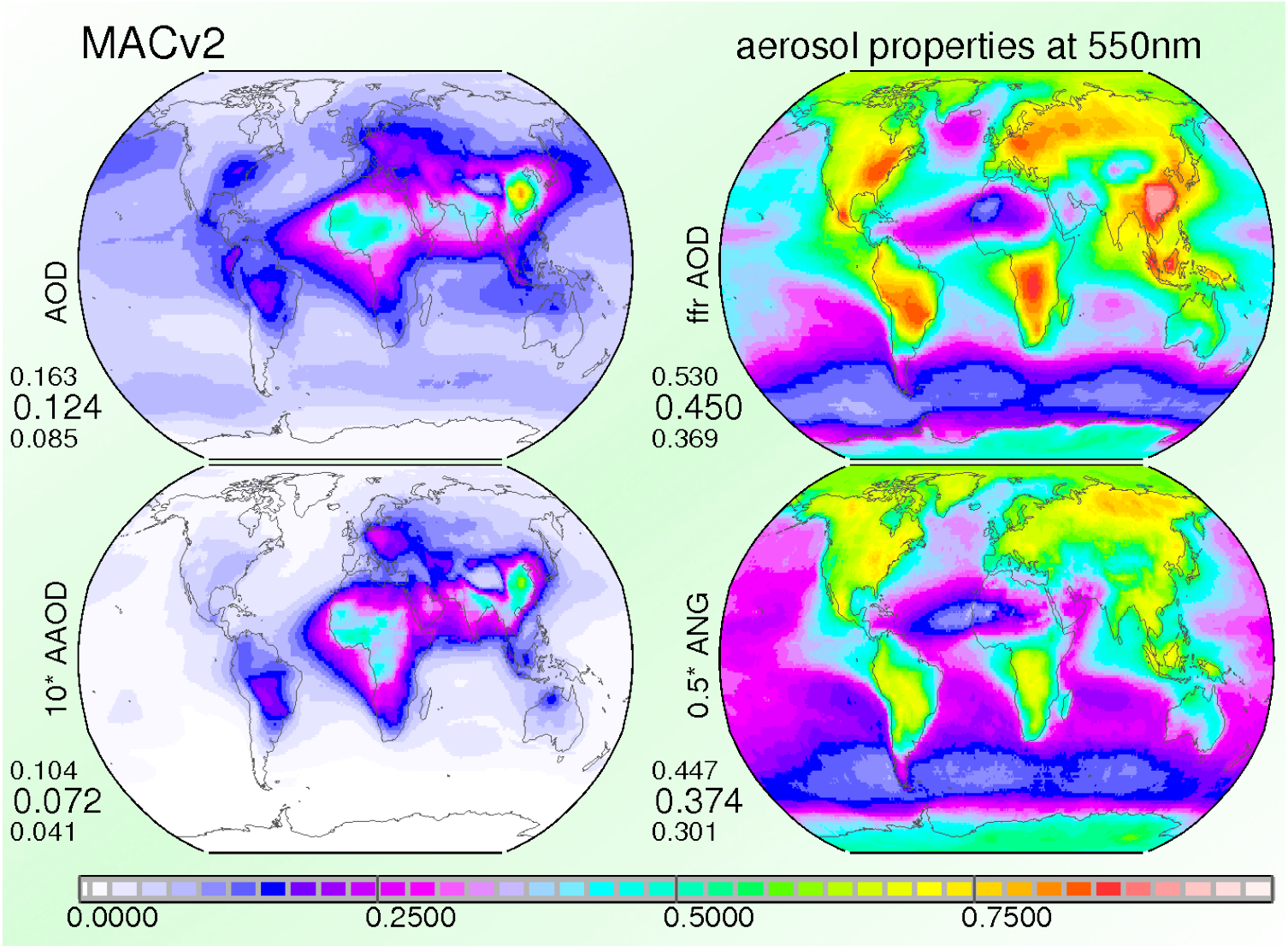
ftp ftp-projects.zmaw.de/aerocom/climatology/MACv2_2015

AeroCom by-products

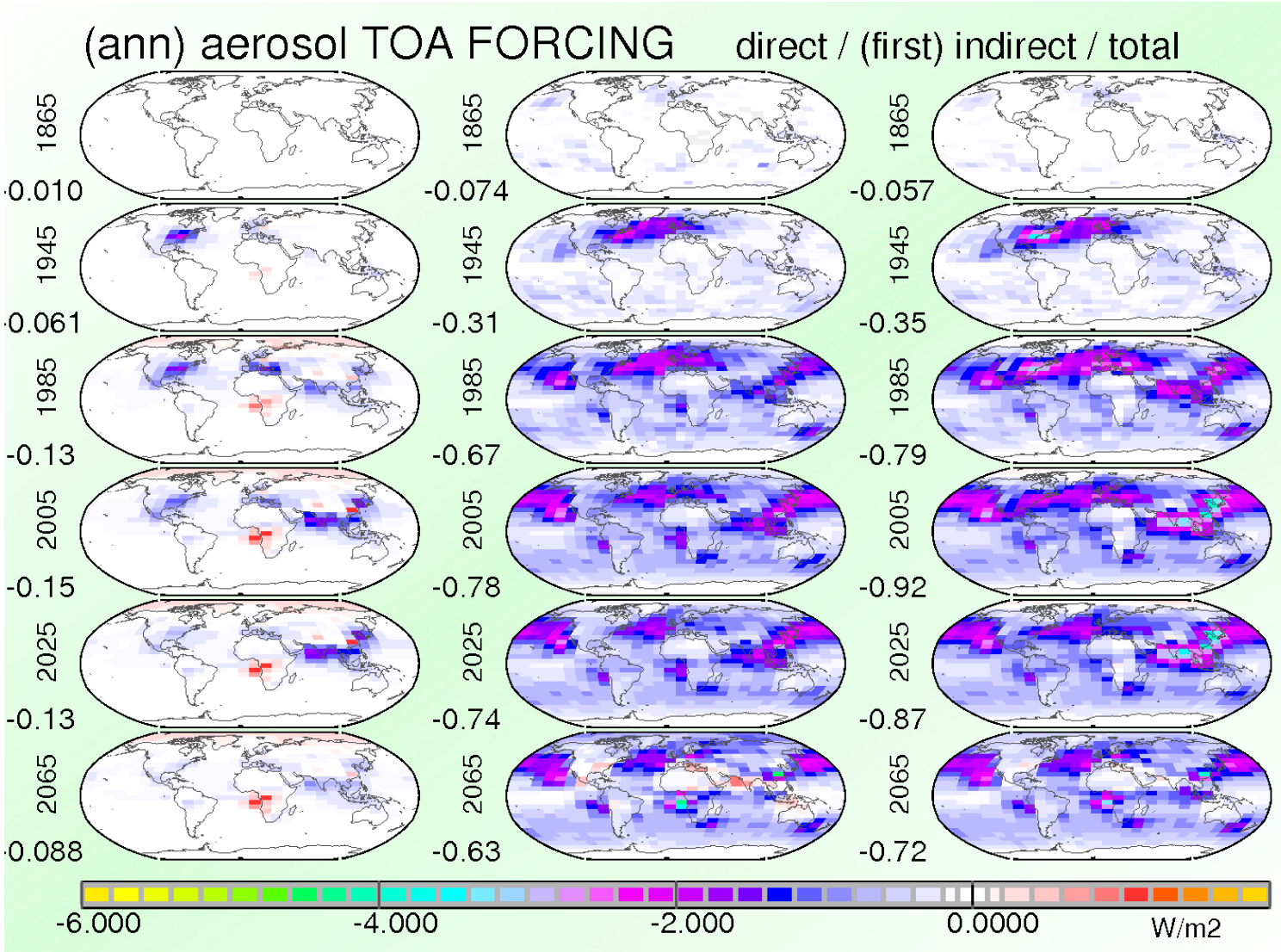
- **Model ensemble data (monthly, 1x1) maps for**
  - **optical column properties** → amount : **AOD**; absorption : **AAOD**; size : **FMF**, **Angstrom**
  - **vertical distribution**
  - **fine-mode anthropogenic fraction (time)**
  - **fine-mode composition** →for CCN estimates
- **MAC climatology** **M**PI **A**erosol **C**limatology
  - **improve today's ensemble column opt. properties via accurate sun-photometry**
  - **scale all other properties to those maps**
    - **MACv1 in 2013 MACv2 in 2015**

MACv2 – annual averages

ftp ftp-projects.zmaw.de/aerocom/climatology/MACv2_2015



application→ aerosol forcing



SRB Web Site and Data Sources

http://gewex-srb.larc.nasa.gov

1. **Atmospheric Science Data Center (main archive):**

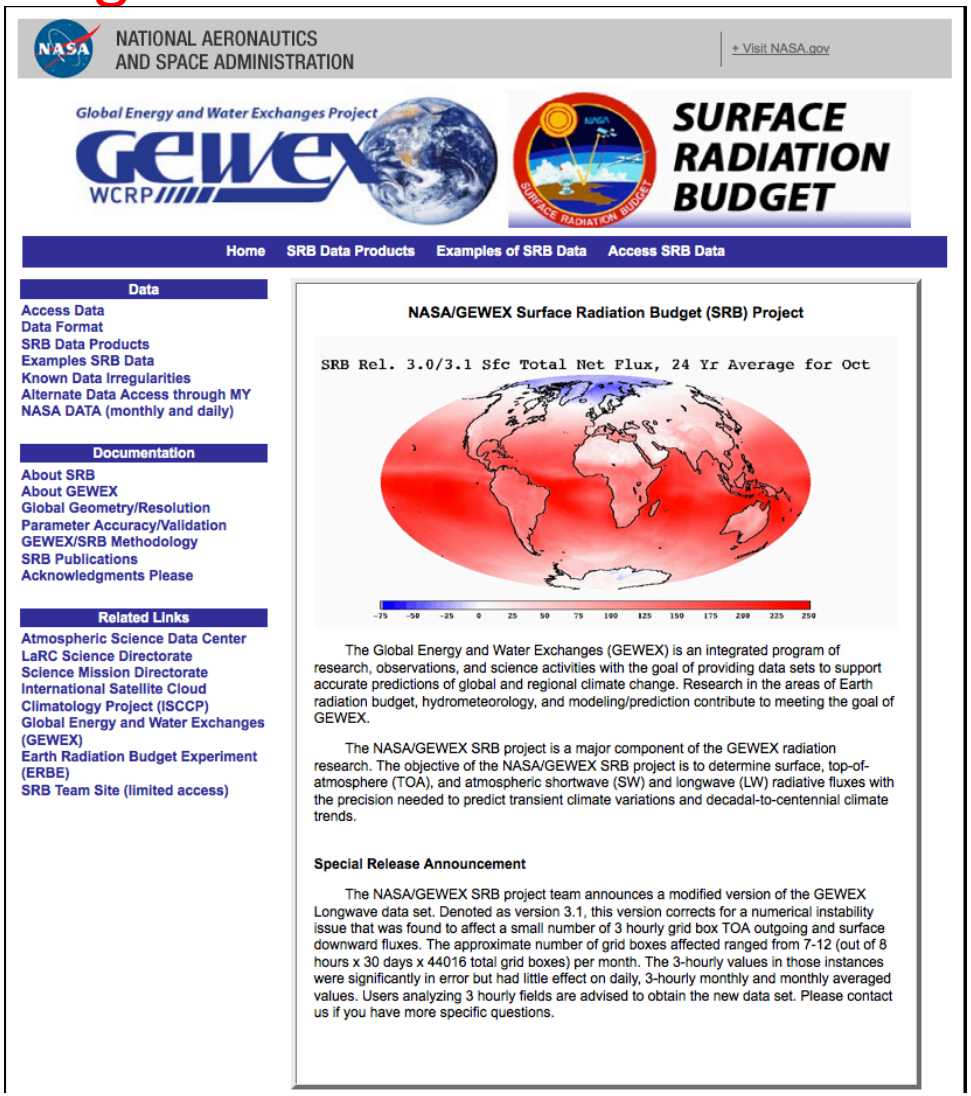
http://eosweb.larc.nasa.gov/project/srb/srb_table

2. **My NASA Data Live Access Server**

http://mynasadata.larc.nasa.gov

3. **NCDC THREDDS Server**

http://www.ncdc.noaa.gov/oa/rsad/netcdf-access/index.php?name=srb



Recent Examples of SRB Usage

Regional SRB Projects and Climatology

- Southern Ocean (Luo et al., '15)
- Specific geostationary satellites (Albarelo et al,. '15 ,Müller et al., '15, Posselt et al., '14, Zhang et al., '14)
- Specific continental-scale areas (Cattiaux et al. '15, Gianotti and Eltahir '14, Pessacg et al., '14, Gao et al., '15, Wang et al., '14, Zhang & Liang, '14)
- Mediterranean basin study (Pyrina et al., '15 Nabat et al, '14)
- Alaska (Ueyama et al., '14)

Global Earth Radiative Budget and Clouds

- Atmospheric energy budgets and variability (Ma et al., '15, Stephens et al., '15, Zhang et al., '15)
- CERES comparisons (Kato et al., '13, Rutan et al., '15, Pan et al., '15)
- Global surface albedo estimations: Qu et al., '15, He et al., '14)
- Ocean heat budget (Wong et al., '14)

Water and Energy Cycle

- Closure studies (Robertson et al., '14)
- Monsoon (Hu and Duan, '15, Kothe et al., '14)
- Global evapotranspiration (Long et al., '14, Yao et al., '14)
- North China drought (Zhang et al., '15)
- River basin water and energy balance (Tatsumi and Yamashiki, '15, Yang et al., '15)
- Tanzania (Armanios and Fisher '14)
- Global soil moisture/precipitation: Guillod et al., '15)
- Radiation/energy balance of snow (Lapo et al., '15)

Interdisciplinary Research Projects

- Solar cooking in Sahel (Newton et al., '14)
- Solar energy (Mazurek '14)
- Global gross primary production (Cai et al., '14)
- Global lake surface temperatures (Sharma et al., '15)
- Agricultural modeling (Ruane et al., '15)

GEWEX SRB: Summary Status

- GEWEX SRB Rel 3: 24 year TOA and surface radiation at 1^{o}x1^{o}.
  - Documentation improved; analysis paper submissions
  - Validation, analysis and collaborative activities crucial to assessing and improving the data set are continuing
- GEWEX SRB Release 4-IP:
  - New inputs from ISCCP nnHIRS and HXS processed and being assessed through various sensitivity studies and product intercomparison and surface measurements
  - Improvement of SW fluxes with new inputs and algorithms relative to surface measurements and CERES EBAF v2.8 observed
    - Ocean fluxes reduced; land fluxes increased
    - TOA reflectance reduced
  - LW flux assessment still being performed
    - nnHIRS appears too dry over lands; too moist over water relative to surface measurements and CERES EBAF v2.8
    - Large uncertainties in skin temperature being assessed
- Next Steps:
  - Awaiting reprocessed ISCCP products like nnHIRS with new calibration
  - SW is ready for a IP v4 production
  - LW is NOT ready for IP v4 production and release; but will work to produce current best to move forward.
  - MERRA2 case shows improved variability, but larger bias over BSRN sites (very small bias over ocean buoys).

SW Case Studies and Validation

Most significant case studies to date

Version	Inputs
V3.0	GMAO GEOS-4 with ISCCP DX; climatological aerosols based upon MATCH 2000-2005; older RT
Rel. 4.0-gamma (processed 1998-2007)	ISCCP DX clouds and radiances; GEOS 4 water vapor; MAC-v1 monthly aerosol; Blended ozone; Rel. 4.0 algorithm.
Rel. 4.0_zeta (process 2007)	ISCCP HXS (Build 5) clouds and radiances; nnHIRS(new) water vapor; MAC-v1 daily aerosol; Blended ozone; Rel. 4.0 algorithm.
Rel. 4.0_eta (processed 2007)	ISCCP HXS (Build 5) clouds and radiances; MERRA-2 water vapor; MAC-v1 daily aerosol; Blended ozone; Rel. 4.0 algorithm.

SW Case Studies and Validation

Monthly Mean Surface Downward Flux Validation

Surface Measurement Network	Version	Bias (Wm^{-2})	RMS (Wm^{-2})	Correl-ation	σ (Wm^{-2})	μ_{GLW} (Wm^{-2})	N measure-ments
GSW - BSRN (mostly land based; exclude SMS)	V3.0	-8.45	24.05	0.9717	22.54	164.78	460
	Rel. 4.0-gamma (DX, GEOS-4 wv)	-8.52	22.90	0.9749	21.28	164.71	460
	Rel. 4.0_zeta (all new ISCCP)	-6.10	21.42	0.9766	20.55	167.13	460
	Rel. 4.0_eta (MERRA-2 WV)	-7.47	22.15	0.9759	20.87	165.76	460
GSW - PMEL (ocean buoy network)	V3.0	11.48	23.94	0.8443	21.07	249.25	169
	Rel. 4.0-gamma (DX, GEOS-4 wv)	0.24	20.44	0.8518	20.50	238.00	169
	Rel. 4.0_zeta (all new ISCCP)	3.97	18.34	0.8874	17.96	241.74	169
	Rel. 4.0_eta (MERRA-2 WV)	5.40	18.99	0.8837	18.25	243.17	169
GSW - GEBA	V3.0	1.79	22.77	0.9580	22.70	161.00	3518
	Rel. 4.0-gamma (DX, GEOS-4 wv)	1.70	21.67	0.9620	21.60	160.91	3518
	Rel. 4.0_zeta (all new ISCCP)	6.46	22.55	0.9623	21.61	165.67	3518
	Rel. 4.0_eta (MERRA-2 WV)	4.82	22.03	0.9627	21.49	164.03	3518

Green indicates best agreement with network values; Red indicates worst agreement.

LW Case Studies & Validation

Most significant case studies to date (processed mid-seasonal months 2007)

Version	Inputs
V3.1	GMAO GEOS-4 with ISCCP DX; blended Tskin using GEOS-4 and DX; no aerosols
V4.0_septhirs_combskin_build5cld	Sept. 2015 nnHIRS meteorology, Build 5 Clouds, combined skin temperature field, daily mean aerosols (MAC v1)
V4.0_m2_combskin_build5cld	MERRA 2 meteorology, Build 5 Clouds, combined skin temperature field, daily mean aerosols (MAC v1)

3-hourly Surface Downward Flux Validation

Surface Measurement Network	Version	Bias (Wm^{-2})	RMS (Wm^{-2})	Correl-ation	σ (Wm^{-2})	μ_{GLW} (Wm^{-2})	N measure-ments
BSRN (mostly land based; exclude SMS)	V3.1	2.19	31.00	0.9341	30.92	309.22	36261
	V4.0_septhirs_combskin_build 5cld	3.21	38.61	0.8993	38.48	310.24	36261
	V4.0_m2_combskin_build5cld	5.18	30.44	0.9382	30.00	312.20	36261
PMEL (ocean buoy network)	V3.1	0.93	16.86	0.7282	16.84	408.54	3674
	V4.0_septhirs_combskin_build 5cld	7.64	18.19	0.6281	16.50	415.25	3674
	V4.0_m2_combskin_build5cld	0.04	16.88	0.7565	16.89	407.65	3674

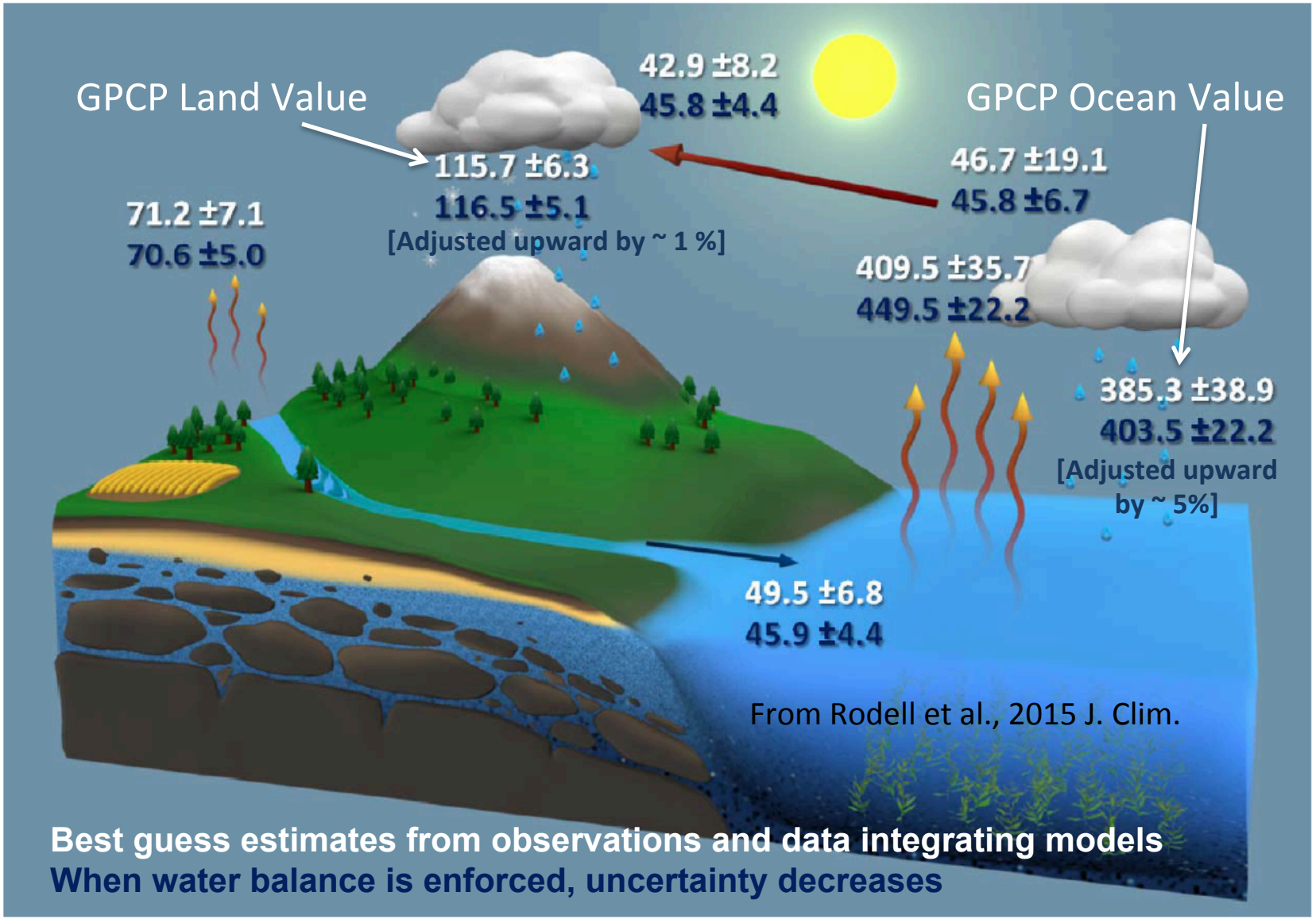
Green indicates best agreement with network values; Red indicates worst agreement.

GPCP Summary

- NOAA is supporting transfer of GPCP Version 2 set of products for operational processing at NOAA/NCEI. ICDR in "routine" production.
- Integrated product sample based on current V2 completed. Can be expanded back until 1998.
- GPCP V3 development in mid-stream; production still a few years away (not before 2018).
- Issue with SSMI/SSMIS and TOVS/AIRS transitions near solution; will be implemented in Version 2.3 using new GPCC analysis in early 2016.

Global Mean Annual Water Cycle

Global mean water fluxes (1,000 km^3/yr) at the start of the 21st century



GPCP land value above is nearly identical with GPCC gauge-based climatology (Schneider et al., 2014, Theor. Appl. Climatology)

GEWEX

GPM First Year Precipitation from Composite of GMI, DPR and Combined Algorithms

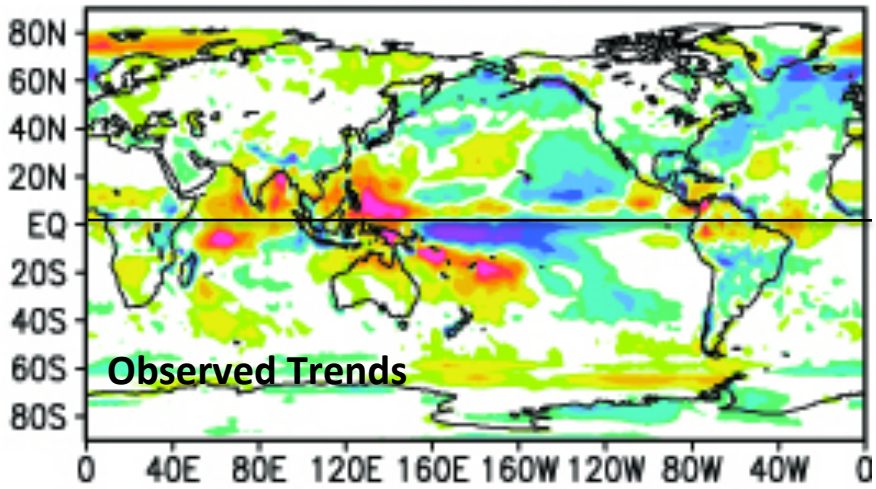
March 2014 – February 2015

mm/day	All				Ocean				Land			
	GPCP	GMI	DPR	CMB	GPCP	GMI	DPR	CMB	GPCP	GMI	DPR	CMB
25S-25N	3.25	3.24	3.21	2.69	3.22	3.31	3.36	2.69	3.31	3.00	2.78	2.69
65S-65N	2.83	2.56	2.49	2.25	2.99	2.84	2.70	2.36	2.42	1.84	1.93	1.96

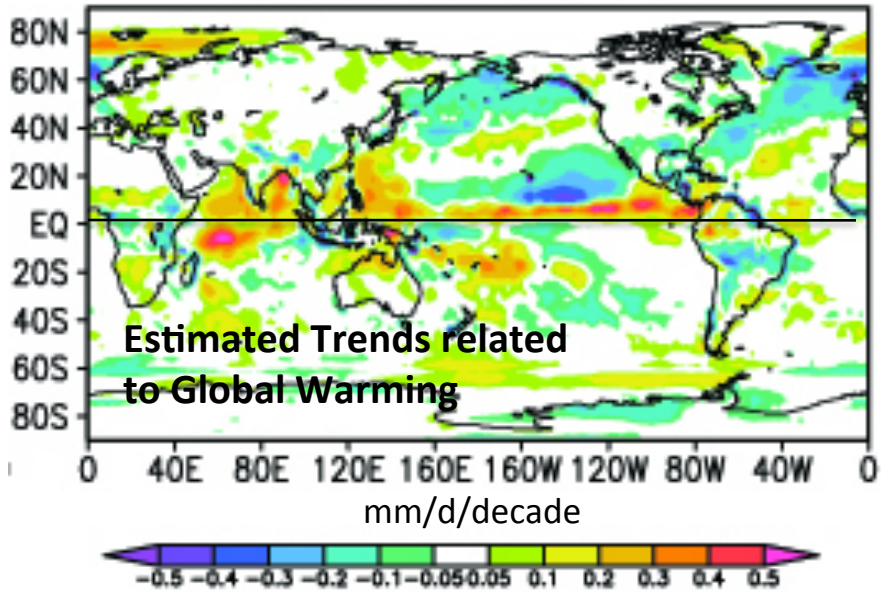
1) *Table indicates that over ocean in deep tropics GMI and DPR agree and are close to GPCP. The Combined product is significantly lower there.*
2) *When latitude bounds are extended to 65N-65S over ocean, GPM differences increase and are lower than GPCP estimates, driven by differences in middle and high latitudes (see latitudinal profiles).*
3) *Over land the GPM mean values are lower than the GPCP analyses, which contain gauge observations.*
4) *For the TRMM/GPM overlap period in 2014 the GMI and DPR estimates over ocean (25N-25S) were higher than TRMM counterpart estimates (see later slide).*
5) *GPM estimates are based on initial algorithms, subject to significant change in the future.*

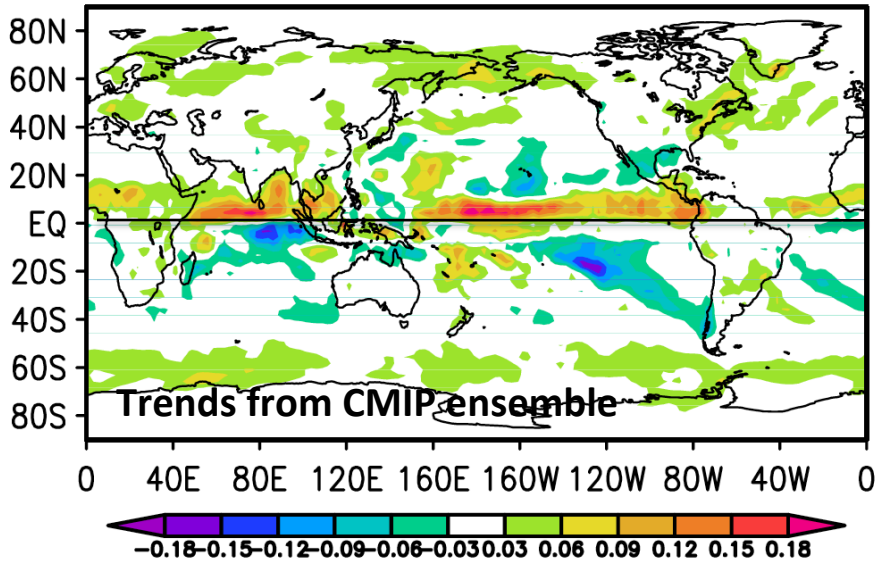
Adler/Wang U. of Maryland

Trends in Global Precipitation During Satellite Era (1979-2013)



Although the trend in global total precipitation is near zero (in GPCP analysis), the pattern of observed regional trends (left panel) is related to Global Warming (GW) plus inter-decadal signals such as PDO and AMO (ENSO impact is small). Bottom left panel shows trend pattern after PDO effect is removed, a better estimate of GW impact on precipitation regional trends and also a pattern closer to that predicted by CMIP climate models (bottom right), but with smaller magnitudes—by factor of 2-3.





Gu, Adler and Huffman (2015) Climate Dynamics

Data Usages (Tianjun Zhou)

1. Data for climate model evaluation
2. Data for climate model tuning
3. Data for Earth System Model evaluation
4. Data for climate change study

Convection Suppression Criterion

➢Threshold of Relative Humidity

Convection is suppressed when the RH averaged between the top and bottom of cloud is less than the threshold value:

$$\overline{RH} = \int_{z_B}^{z_T} q\, dz \Big/ \int_{z_B}^{z_T} q^{*}\, dz$$

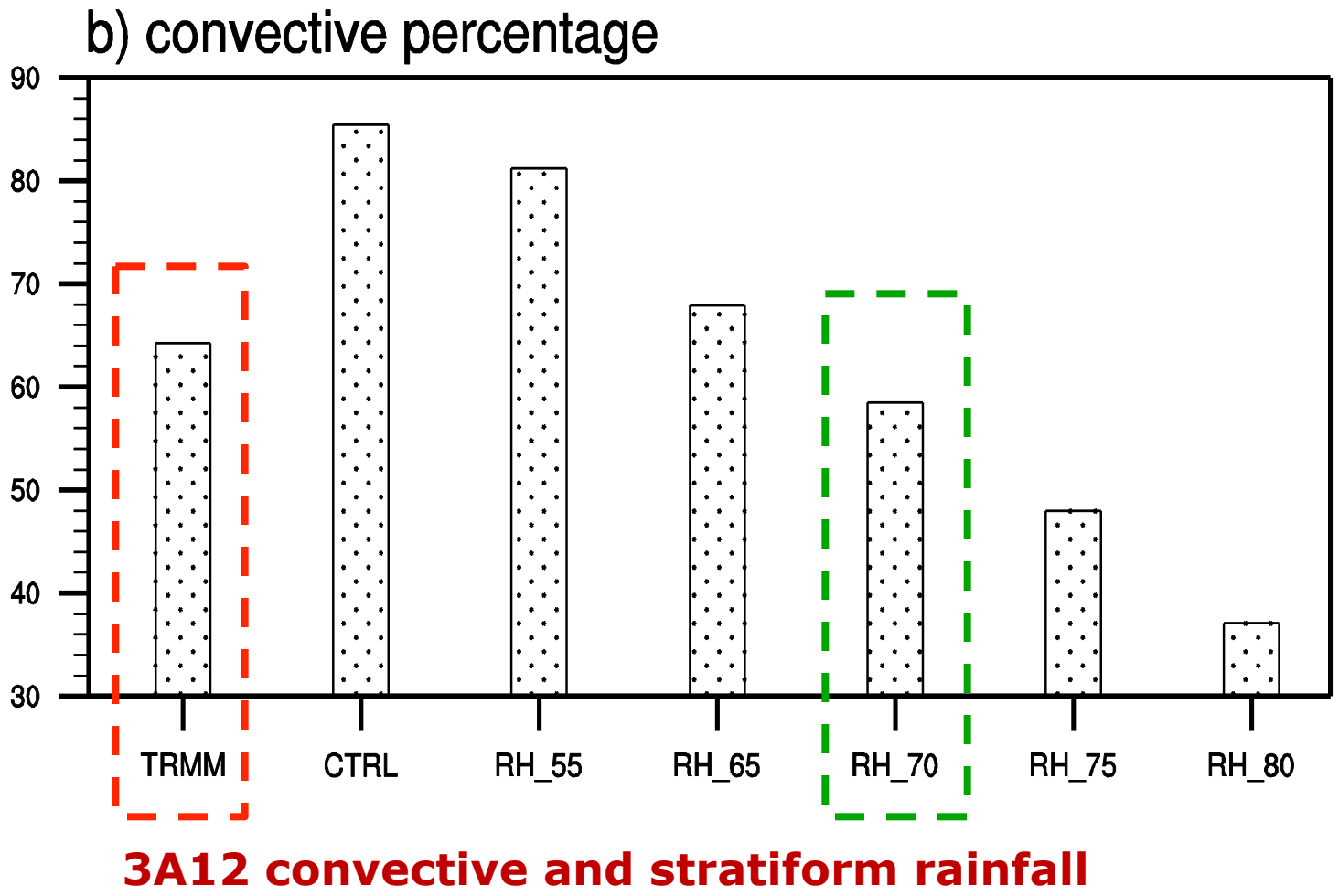
Threshold values：

0.55 in Chow et al.(2006) for Emanuel

0.80 in Emori et al.(2001) for Arakawa-Shubert

Zou L. and **T. Zhou**, 2011: Sensitivity of a Regional Ocean-Atmosphere Coupled Model to Convection Parameterization over Western North Pacific, ***JGR***, 116, D18106, doi:10.1029/2011JD015844.

Convective rainfall percentages over Western Pacific



Zou L. and **T. Zhou**, 2011: Sensitivity of a Regional Ocean-Atmosphere Coupled Model to Convection Parameterization over Western North Pacific, ***J. Geophysical Research***, 116, D18106, doi:10.1029/2011JD015844.

Parametric sensitivity and calibration for the EMANUEL convective parameterization scheme in RegCM3

Parameter	Default	Minimum	Maximum	Description
RHC	------	0.4	0.9	Convection is activated when the RH averaged from the cloud top to the cloud base is larger than a critical value (RHC). In the default setting, the convection is driven by the buoyancy, and effects of the large-scale environment are not considered.
C_{asc_land}	0.4	0.2	0.8	Autoconversion scale factor over ocean
C_{asc_ocean}	0.4	0.2	0.8	Autoconversion scale factor over ocean
RH_{min_land}	0.8	0.6	1.0	Grid-box RH threshold for cloudiness over land
RH_{min_ocean}	0.9	0.6	1.0	Grid-box RH threshold for cloudiness over ocean
Alpha	0.2	0.0002	0.8	Rate at which the cloud-base upward mass flux is relaxed to steady state
L_0	0.0011	0.0001	0.05	Amount of cloud water available for precipitation conversion

The 'multiple very fast simulated annealing' (MVFSA) algorithm is applied to optimize these seven selected parameters

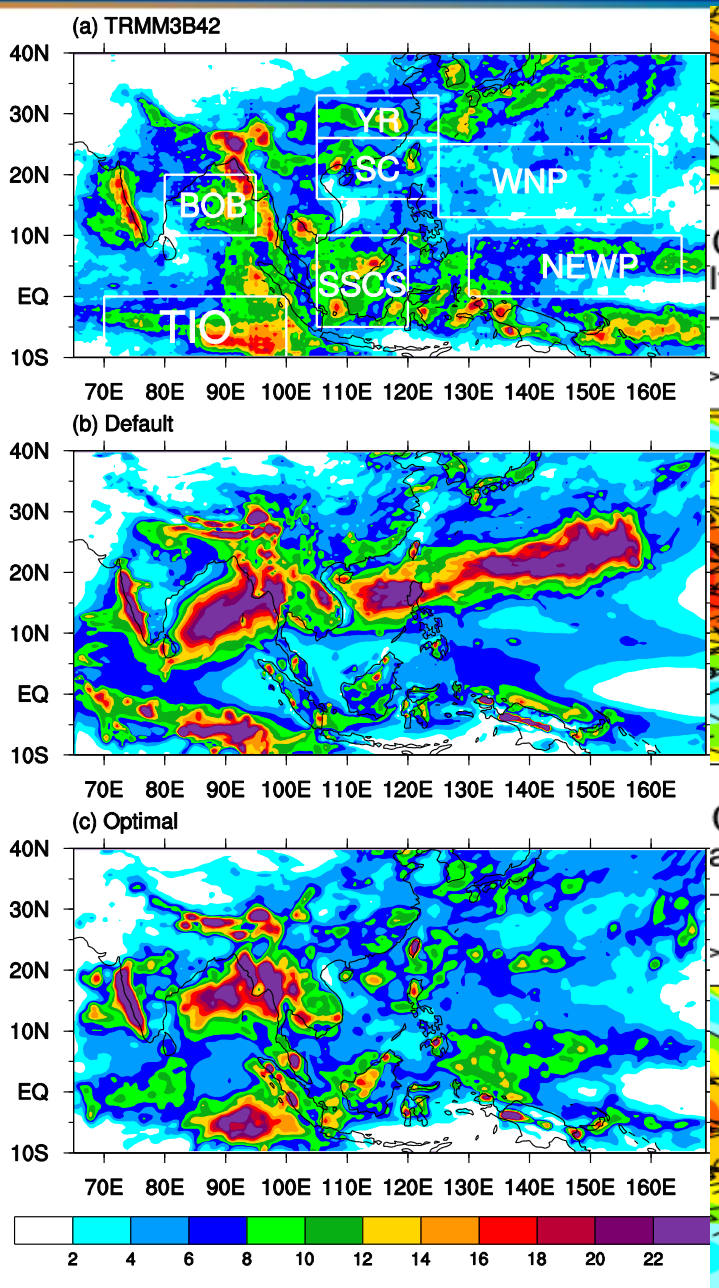
Zou L., Y. Qian, **T. Zhou**, B. Yang, 2014: Parameter tuning and calibration of RegCM3 with MIT-Emanuel cumulus parameterization scheme over CORDEX East Asia domain. ***Journal of Climate***, 27, 7687-7701

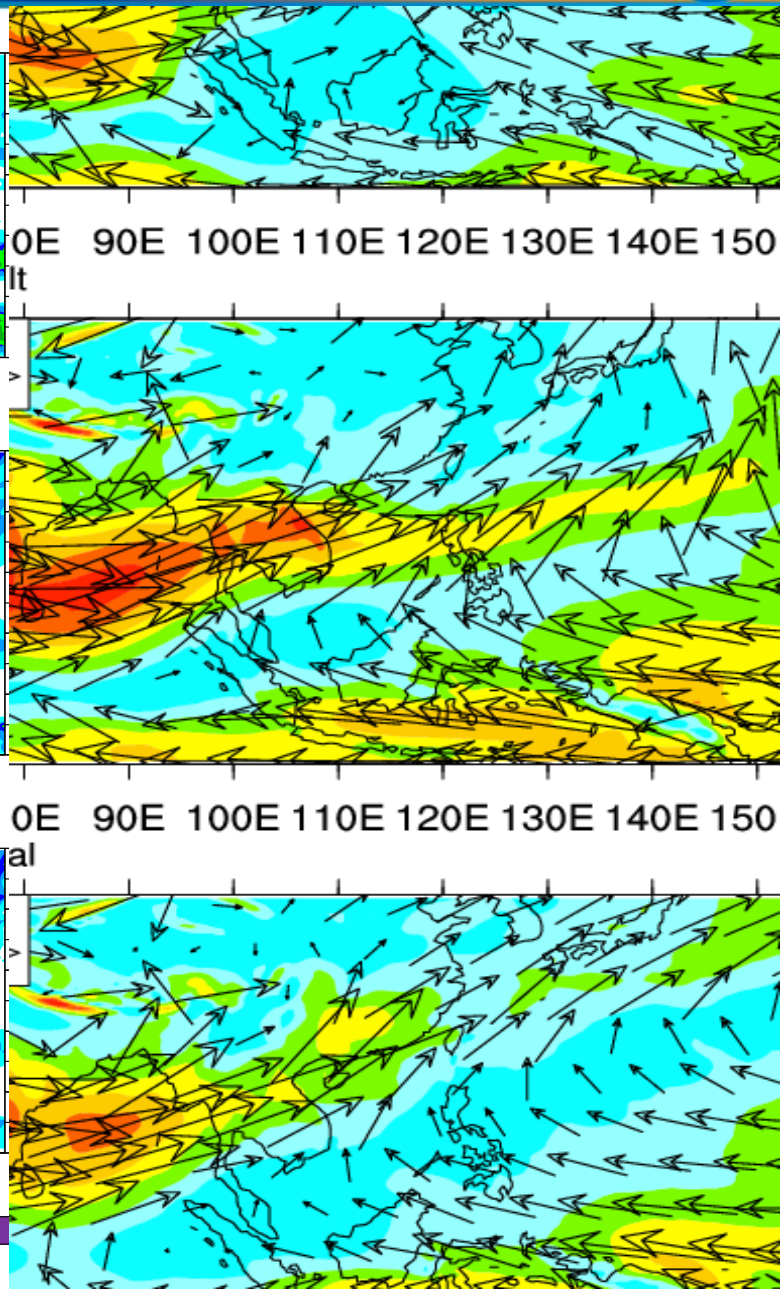
Rainfall and monsoon circulation are significantly improved when identified optimal parameters are applied

TRMM &NCEP2

Exp with default parameters

Exp with optimal parameters

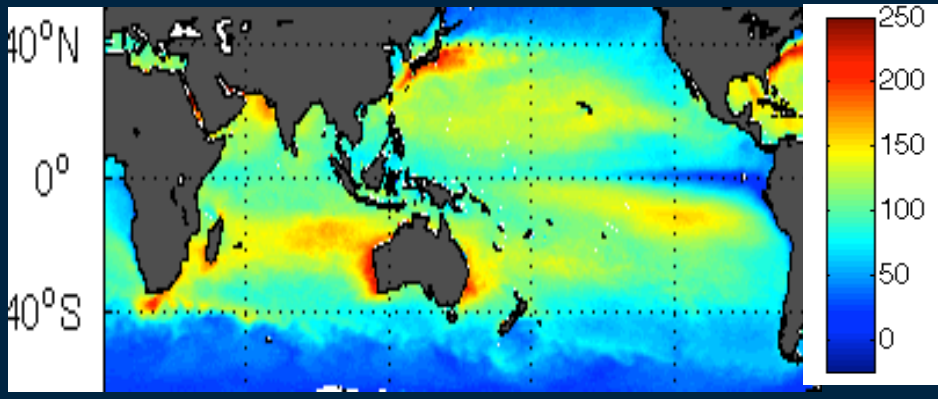




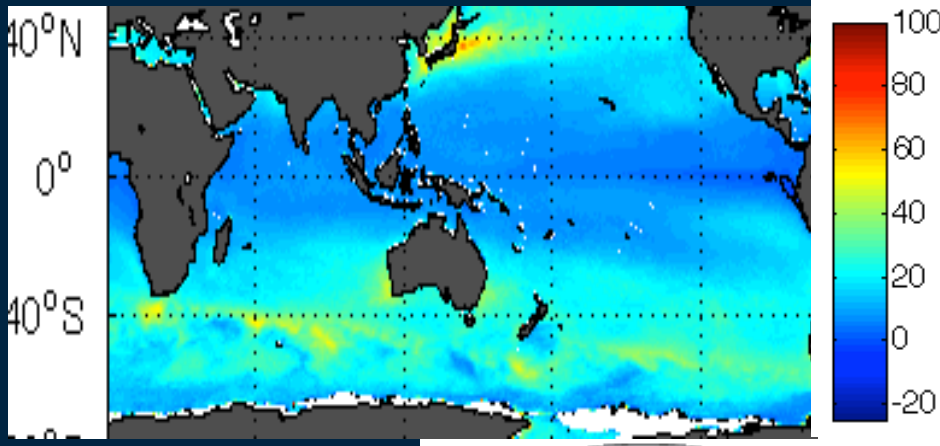
SeaFlux Version 1.0 – still the one used for the GDAP combined product

- No updates to this particular version, but see next page
- Near-surface air temperature and humidity
  - Roberts et al. (2010) neural net technique
  - SSM/I only from CSU brightness temperatures (thus only covers 1997 - 2006 in Version 1.0)
  - Gap-filling methodology -- use of MERRA variability – 3 hour
- Winds
  - Uses CCMP winds (cross-calibrated SSM/I, AMSR-E, TMI, QuikSCAT, SeaWinds)
  - Gap-filling methodology -- use of MERRA variability – 3 hour
- SST
  - Pre-dawn based on Reynolds OISST
  - Diurnal curve from new parameterization
  - Needs peak solar radiation, precipitation
- Uses neural net version of COARE
- Available at http://seaflux.org

1999 Latent Heat Flux



1999 Sensible Heat Flux

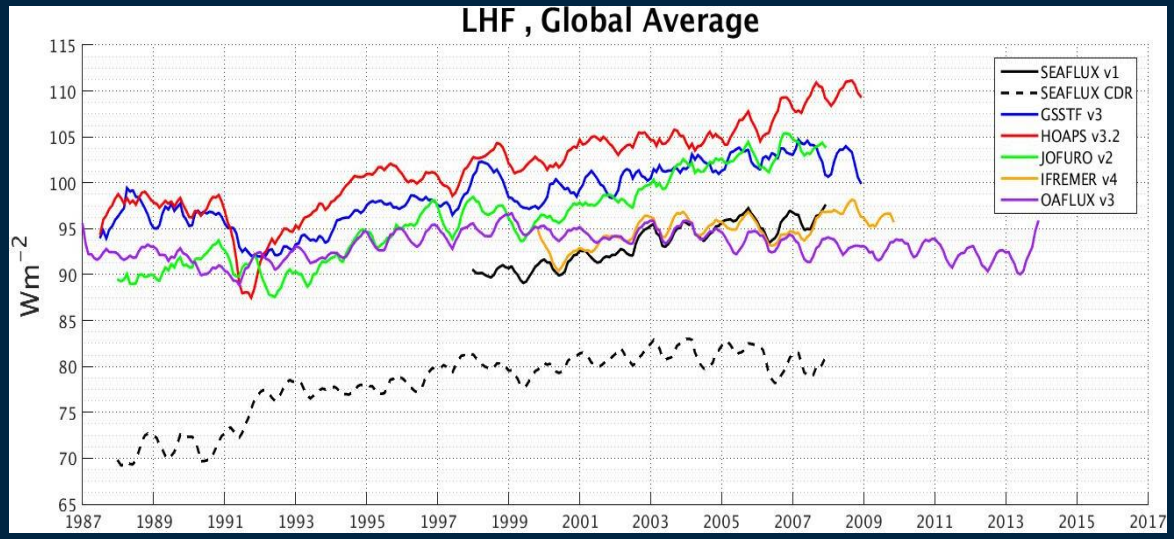


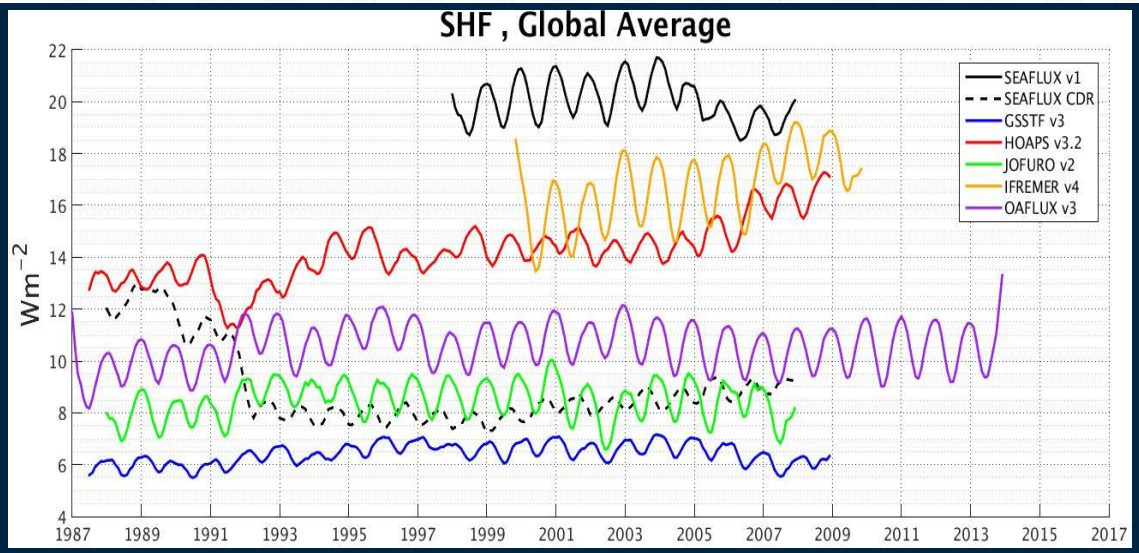
SEAFLUX

SeaFlux CDR product

- Similar to version 1.0. Major exceptions:
  - covers 1988 – 2007 ** this year we have also worked with SSMIS, bringing product to near-real-time
  - Using our neural net winds, rather than CCMP (which has reduced trend in global wind speed)
  - In order to pre-1998, used a ship-of-opportunity-based reference data set. Not as high-quality as the SeaFlux research vessel only data set, higher noisiness.
  - Include Earth Incidence Angle as a factor

CDR needs revision (and F08 not our friend)

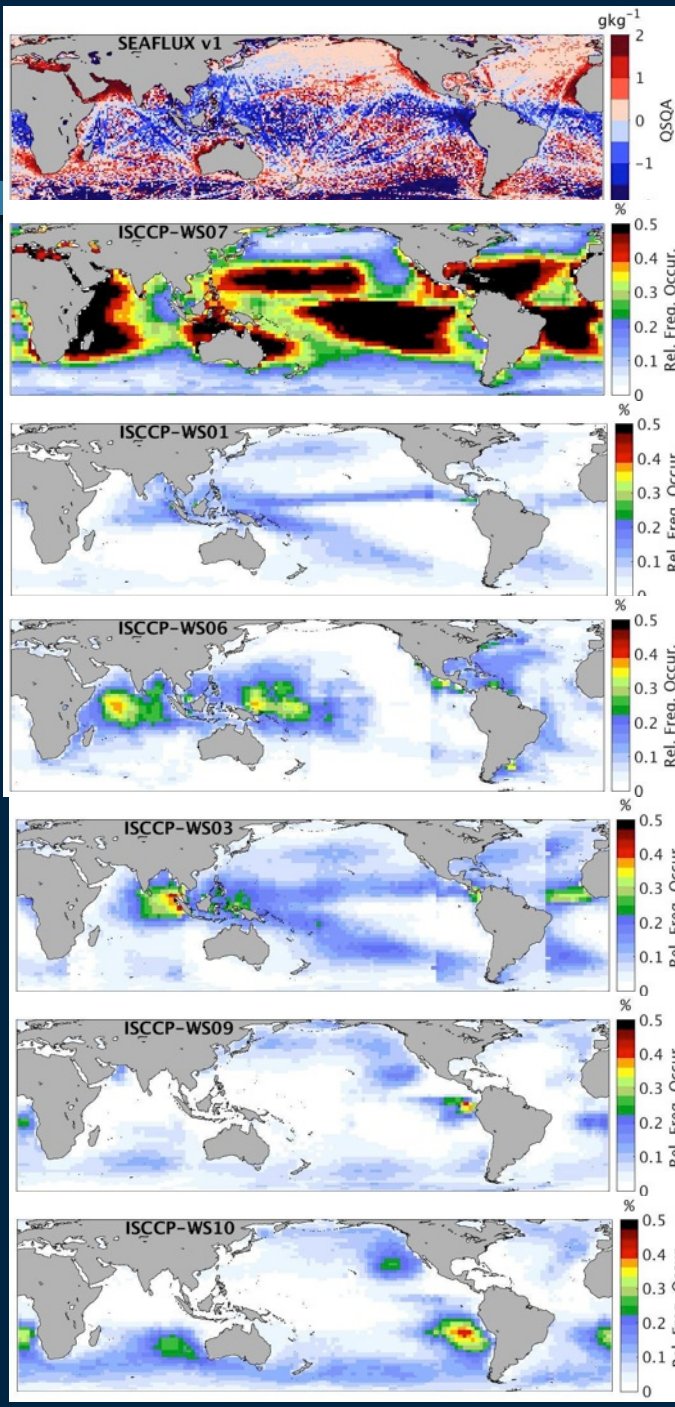




- Both latent heat and sensible heat fluxes show inter-product differences of 5-10 Wm^{-2} globally.
- Several of the products show a moderate trend from the early 1990's, in contrast to OAFlux and some reanalysis products
- At the global scale, both QSQA/TSTA differences and WSPD differences appear to be important, and offsetting in some cases

Next steps

- The structure in the retrieval (Qa, top) biases appear to be co-aligned with patterns of cloud weather states
  - WS are defined using ISCCP cloud-top histograms
- The largest biases in several of the Qa retrievals are aligned best with Global WS 7 (Tselioudis et al. 2012)
  - Mostly clear, w/ thin boundary layer cloudy



The LandFlux Product

Specifications: conform to GDAP guidelines.

- 4 process-based models (GLEAM, PT-JPL, PM-Mu, SEBS)
- Long term product spanning 1984-2007
- 1° spatial detail over all continents (but not ice surfaces[#])
- 3-hourly temporal resolution (new for all models)
- Model forcing derived from a range of data-sources
  - **No** clear choice for "best" forcing data needs
  - meteorology based largely on a Princeton dataset
  - aimed for consistency with other GEWEX products

Assessing Tower-to-Grid Scale Runs

- P-P plots at towers
- 1 to 99th percentiles with 25th, 50th, 75th

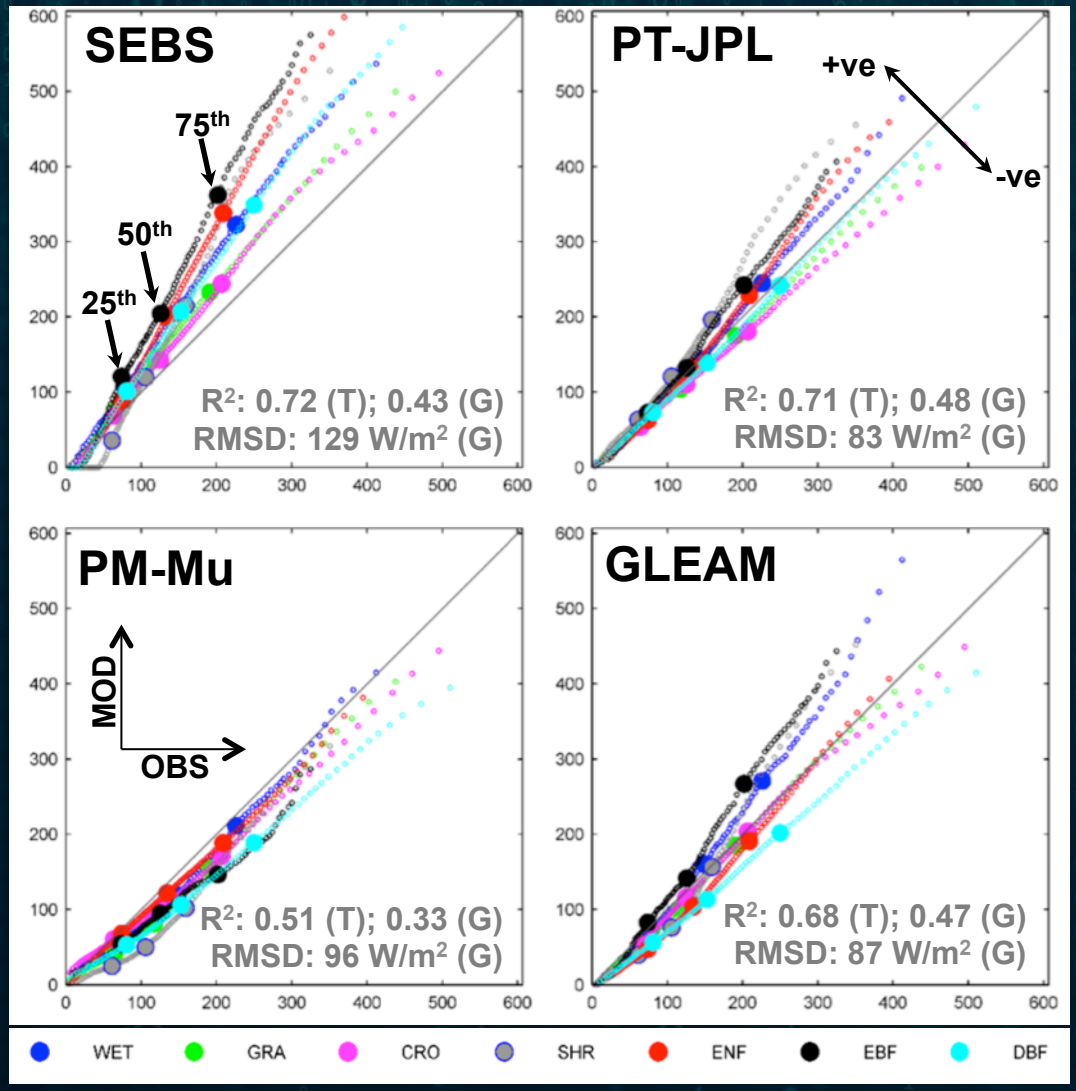
SEBS: over-predicts

PT-JPL: good response

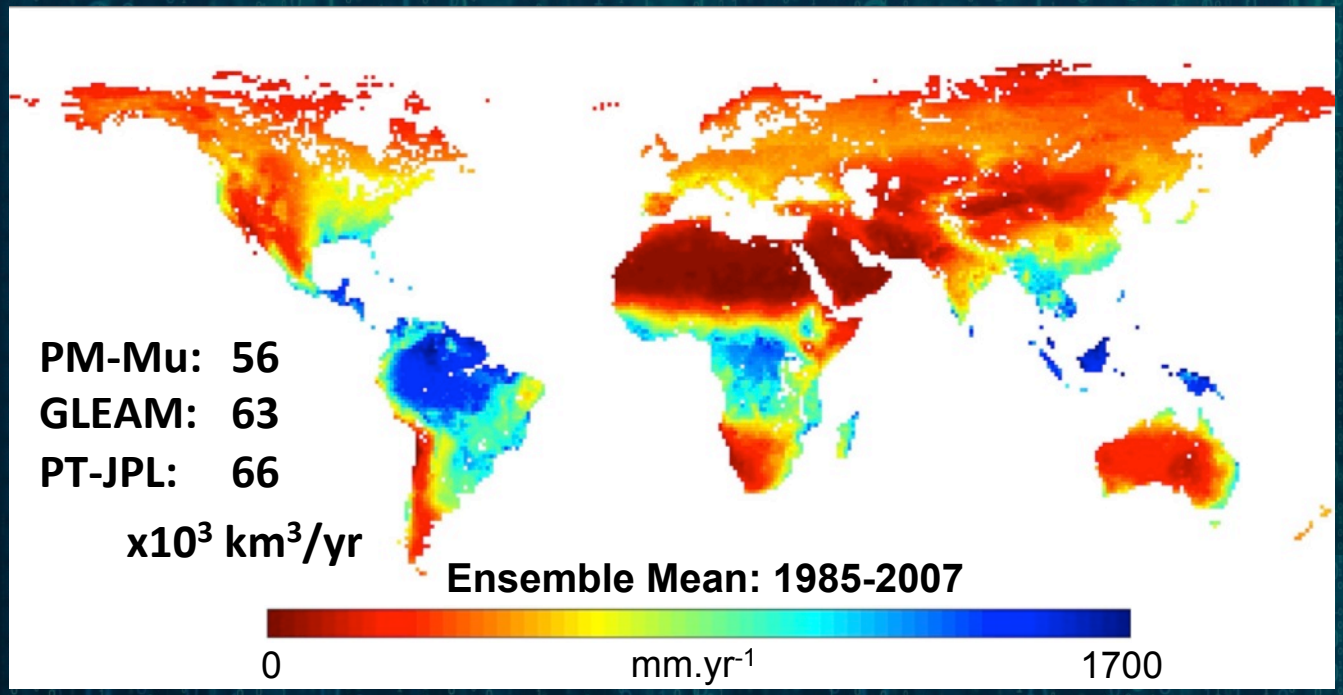
PM-Mu: under-predict

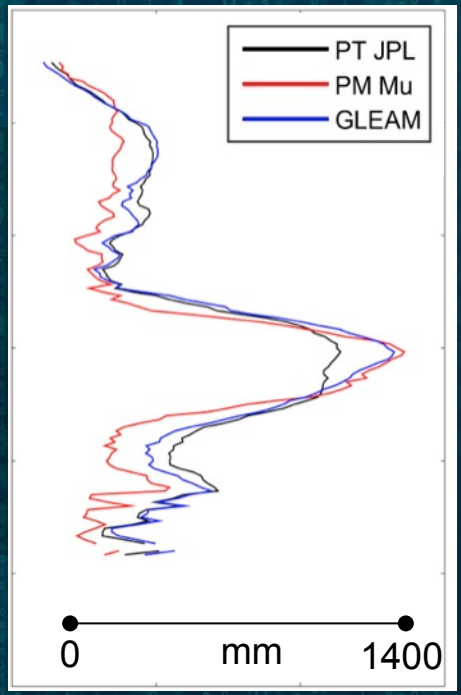
GLEAM: similar to JPL

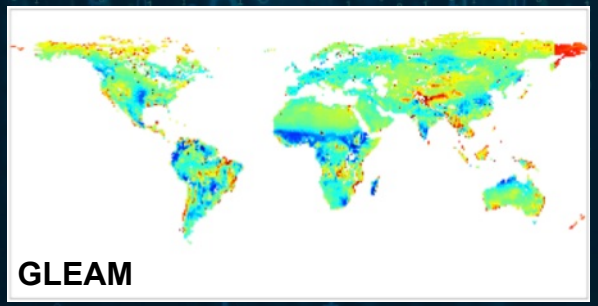
Grid-based runs degrade performance relative to towers

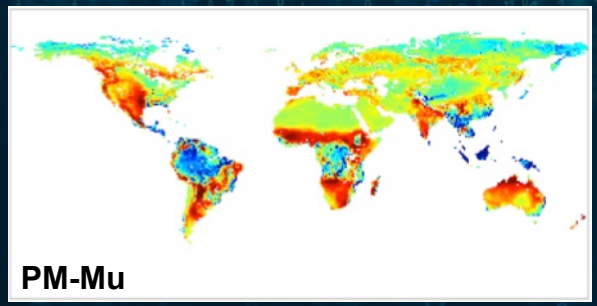


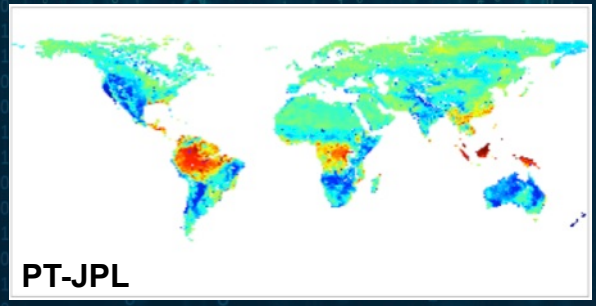
Global LandFlux Simulations



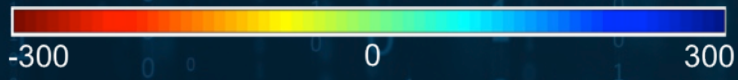








Model Mean - Ensemble Mean: 1985-2007

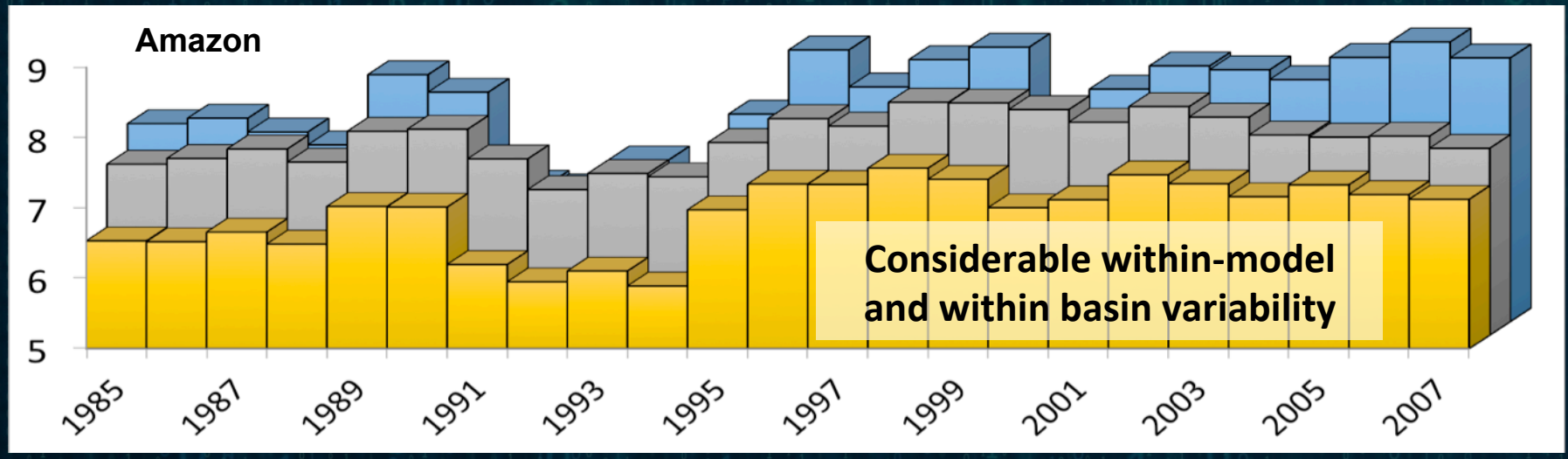


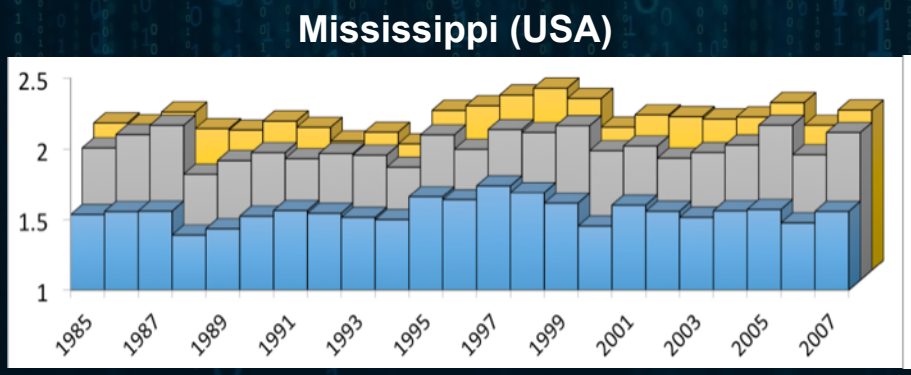
Global Analysis: Basin Response

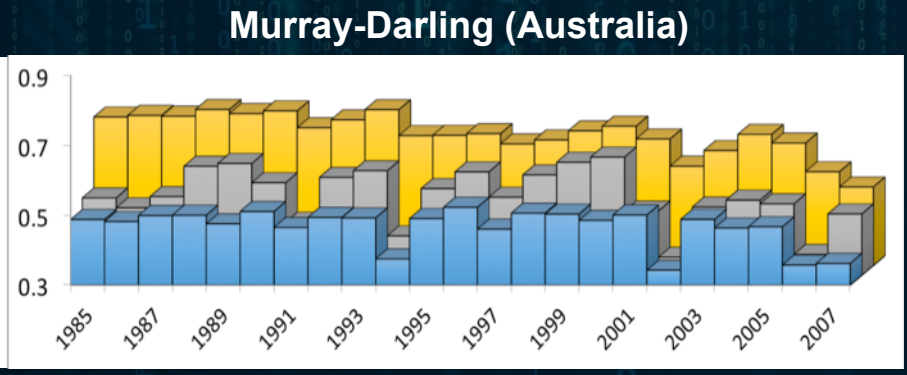
Inter-product variability at basin and continent scale

PM-Mu | GLEAM | PT-JPL

- Marked model variability within basins





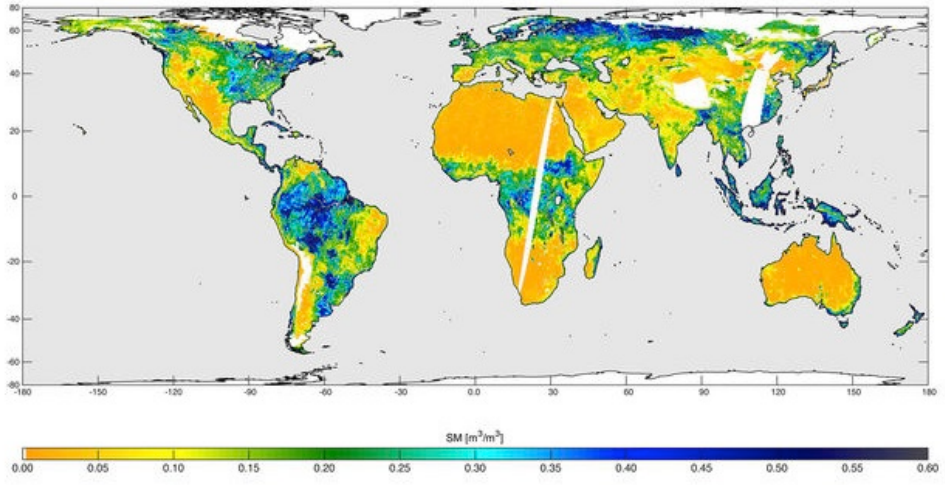


Summary and Conclusions

LandFlux provides a long term global ET product

- Quality of forcing is a constraint on model accuracy
  - further issue of consistency in forcing data!
- Considerable variability – no model works everywhere
- Multi-spatial (tower, basin, continental) & multi-temporal (3-hour, diurnal, annual) evaluation is required. But how?
- Need consistency checks against other long-term datasets
- Spatial resolution misses key process (*i.e. agriculture*)
  - how to include smaller scale heterogeneities
- Global averages are *somewhat* useful…need to map the spatial and temporal variability to scales of relevance!

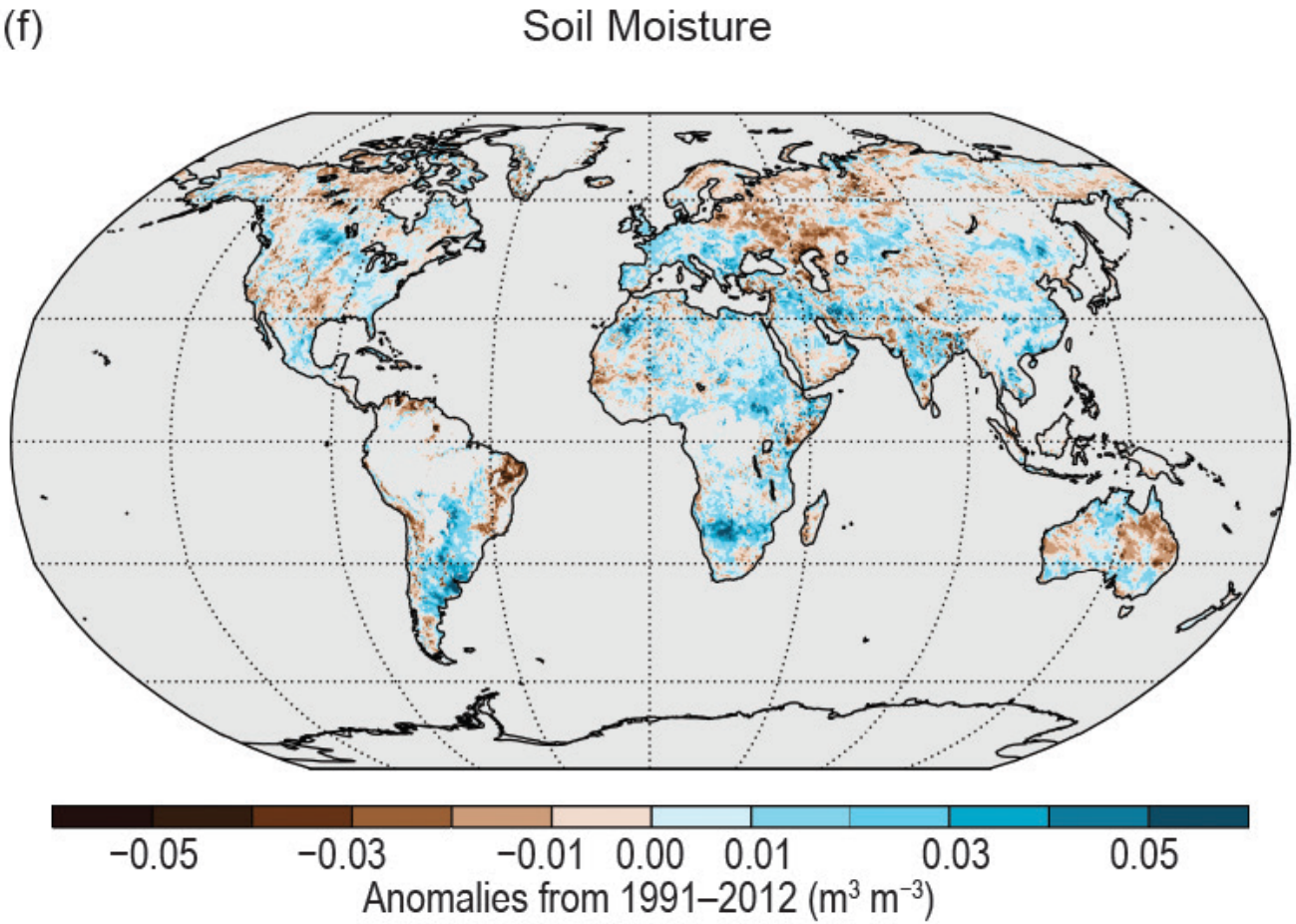
Soil moisture remote sensing: recent highlights



- **SMAP** launched on Jan 31, 2015
  - L-band Radiometer works very well
  - Radar failed in July, so no high resolution (3, 9 km^2) products possible
- Soil moisture from highres **Sentinel-1** increasingly in the focus
- New, quasi-operational soil moisture products for **SMOS (LPRM)**
- New, quasi-operational soil moisture products from **AMSR2**, **Feng-Yun 1B**
- **Metop-SG** planned for launch in 2021/22, providing continuation of MetOp **ASCAT** after 2025)
- **ESA CCI multi-satellite soil moisture** product has been updated and serves over 1800 registered users: currently THE state-of-the art multi-satellite SM product and “precursor GEWEX benchmark dataset”

Global soil moisture from CCI observations: yearly BAMS State-of-Climate contribution

- Anomalies for 2014



[Dorigo, W.A., 2015, BAMS]

GEWEX Data Quality Assessments

Water Vapor (Marc Schröder, Lei Shi)

Aerosol (Jeff Reid, Stefan Kinne, et al.)

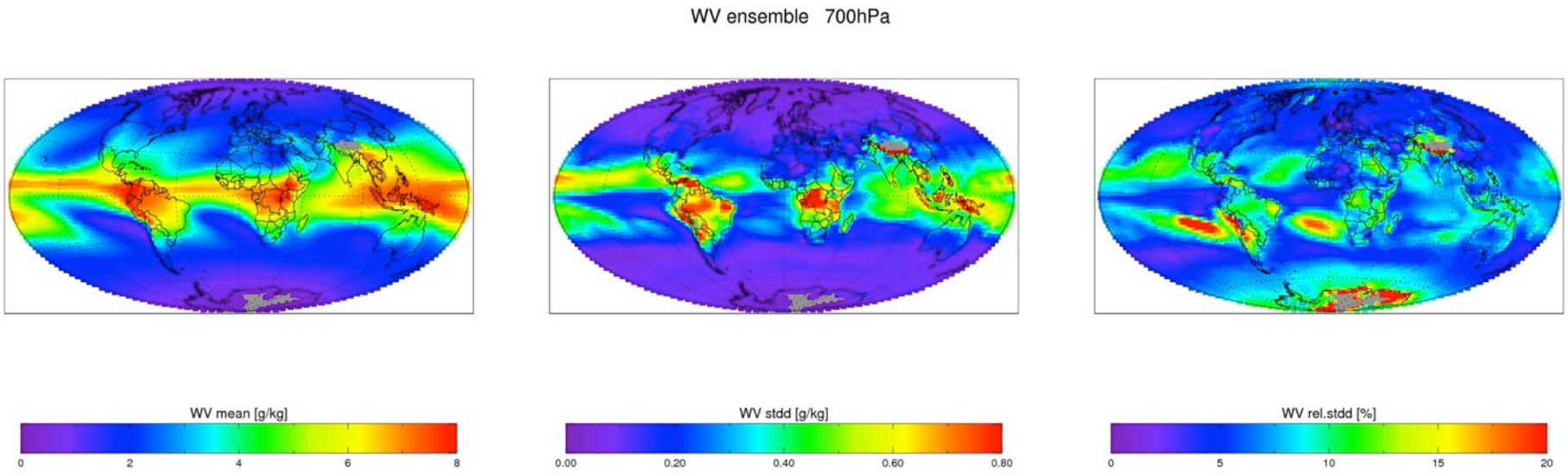
Precipitation (Hiro Masunaga, Chris Kummerow)

Soil Moisture (Wouter Dorigo)

Objectives of G-VAP

- The major purpose of GEWEX water vapor assessment (G-VAP) is to quantify the state of the art in water vapour products being constructed for climate applications;
- Support the selection process of suitable water vapour products by the GEWEX Data and Assessments Panel (GDAP) for its production of globally consistent water and energy cycle products.
- Further details, in particular the assessment plan with a description of the scope and the Science Questions and an overview of available water vapour records, are available on the G-VAP webpage, http://gewex-vap.org.

Global profile comparison



CFSR, ERA-Interim, JRA55, MERRA, and nnHIRS at 700 hPA: ensemble mean (left) as well as standard deviation (middle) and relative standard deviation (right) relative to the ensemble mean.

Maximum differences found in stratus/subsidence regions – points to differences in boundary layer height

Water Vapour related to Extreme Precipitation

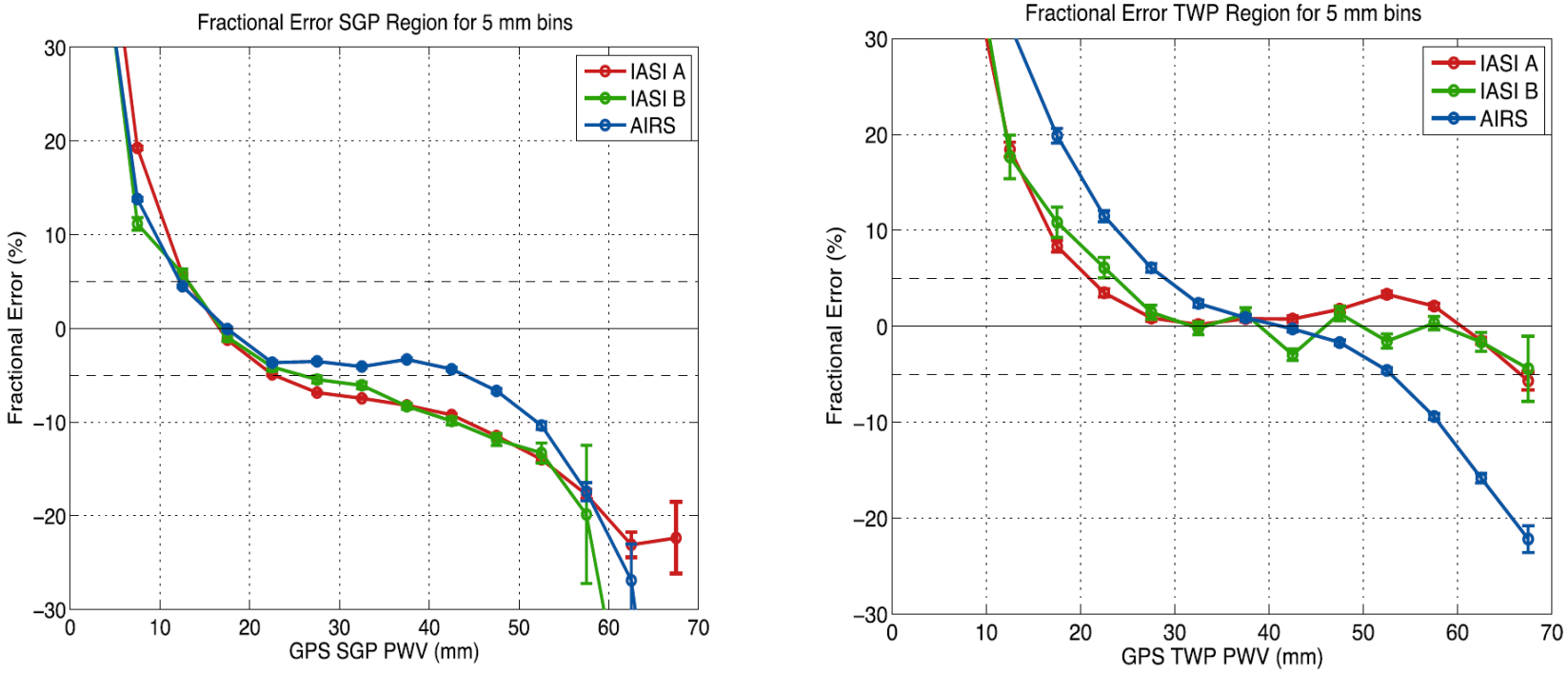


Figure 2: Fractional error in % as a function of precipitable water vapour observations with GPS at the ARM Southern Great Plains (left) and Tropical Western Pacific-Darwin (right) stations. Results are shown for NASA AIRS version 6 as well as EUMETSAT IASI version 6 applied to METOP-A and METOP-B. The dashed horizonal line marks 5% fractional error.

Outcomes of 5th G-VAP workshop

- Space Science and Engineering Center (SSEC), University of Wisconsin, Madison, WI, USA 4-5 November 2015, 25 participants;
- Updated plan for drafting the WCRP report on G-VAP, the freezing of the data archive and the time line to finalise G-VAP have been confirmed by the workshop:
  - Finalisation of sectional reports until March 2016,
  - Preliminary draft to GDAP in April 2016,
  - Final draft to GDAP in August 2016
- The release of collocated data and data on common grid by G-VAP was endorsed under specific circumstances.
- The proposal to continue G-VAP beyond the acceptance of the WCRP report on G-VAP was well received and the participants are willing to support G-VAP in the future.
- Recommendations, in particular on the provision of uncertainty information as function of total amount and on enhanced quality analysis in stratus regions, are provided in the minutes of meeting, see http://gewex-vap.org.
- The 6th meeting will tentatively take place at EUMETSAT headquarters on 22-23 September 2016.

AOT (AEROSOL) assessment

AOT – Aerosol Optical Thickness

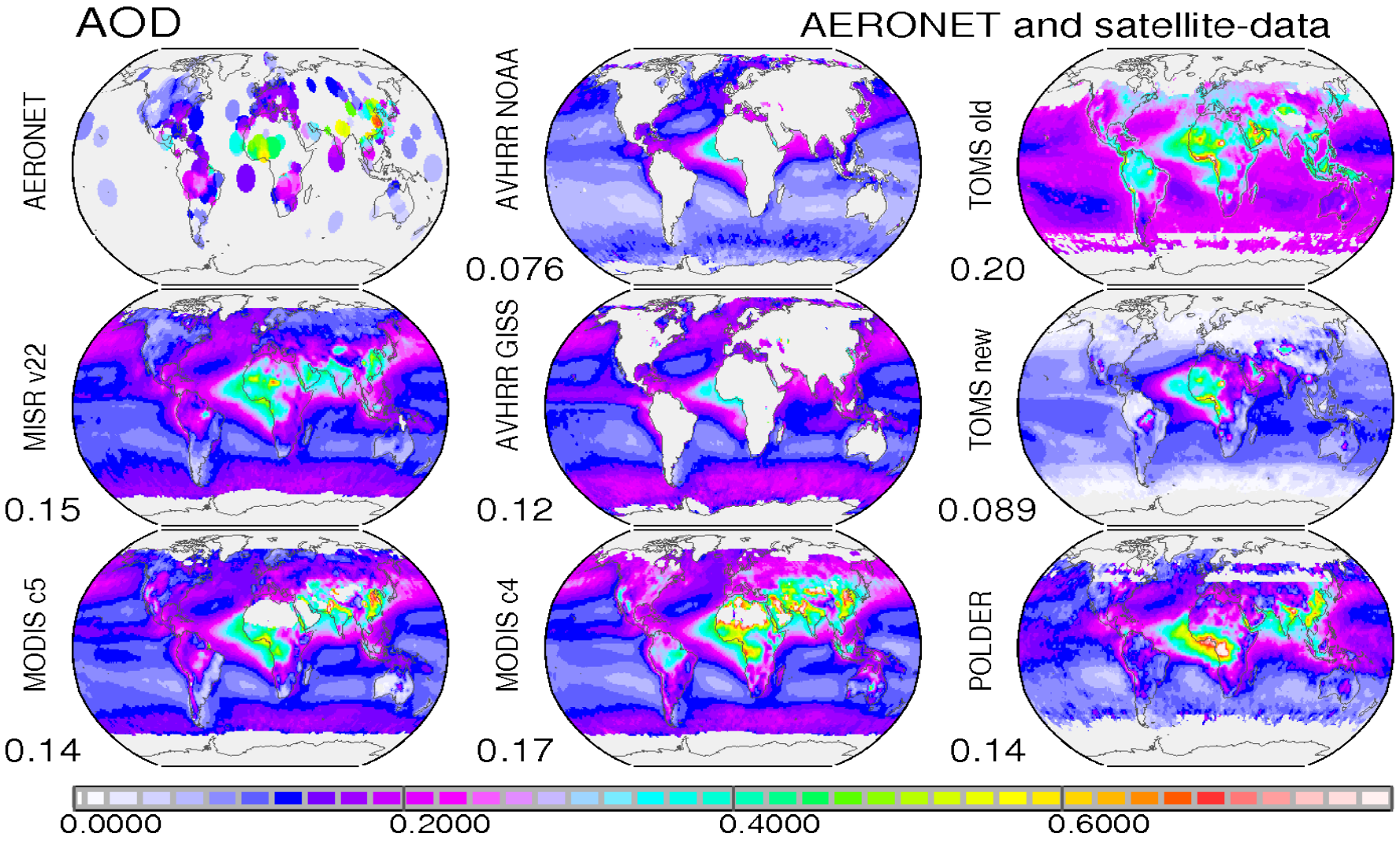
Sundar Christopher
Richard Ferrare
Paul Ginoux
Stefan Kinne
Jeffrey Reid
Paul Stackhouse
Charles Ichoku

Hal Maring

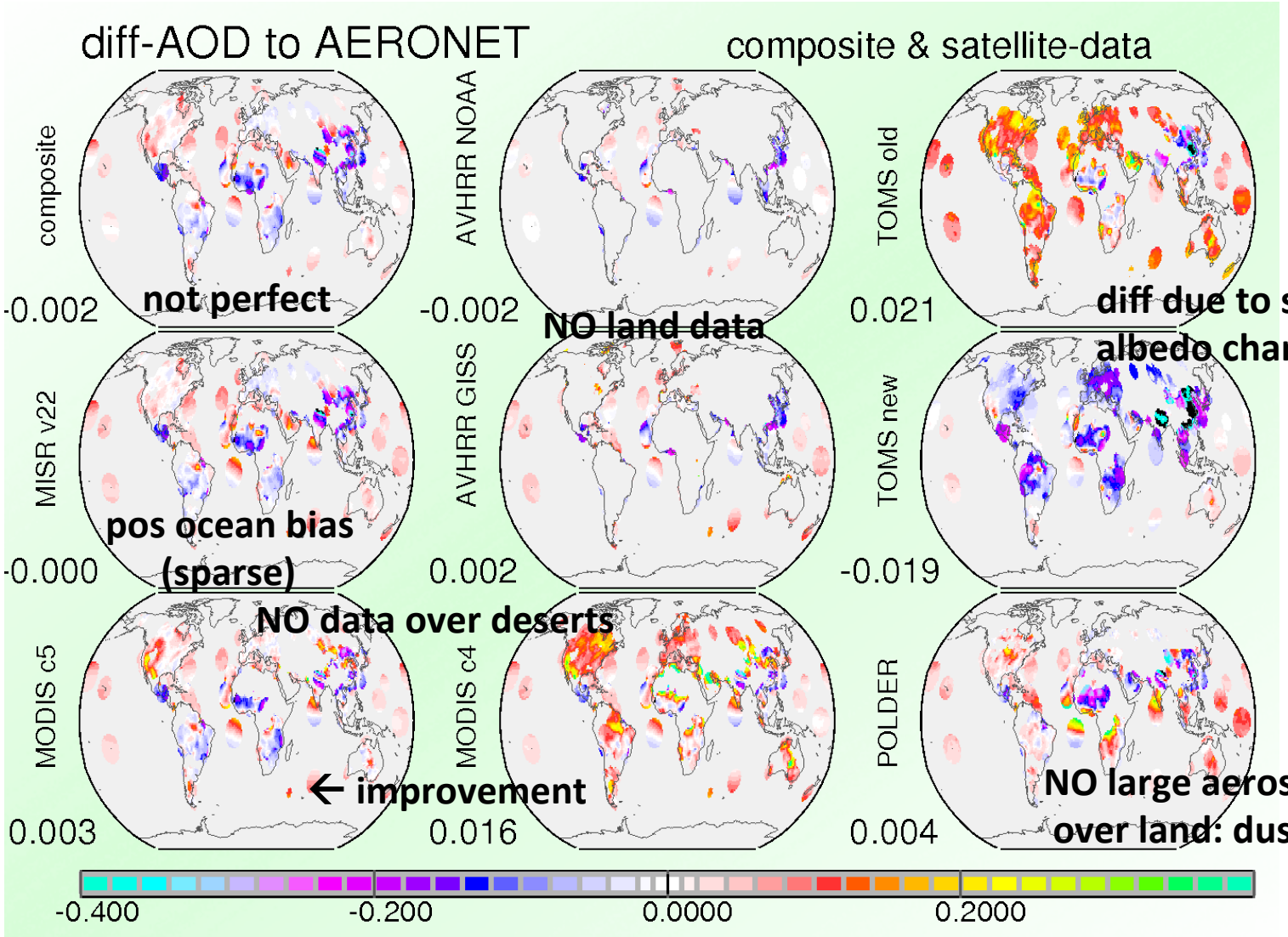
the report

- **“ a critical review of the efficiacy of commonly used Aerosol Optical Thickness retrievals: Literature assessment “** (160 pages … w/o ref.)
  - **fundamentals**
    - **methods, limitations, error sources**
  - **assessed products**
    - **AVHRR, MISR, MODIS, OMI, POLDER**
  - **evaluations**
    - **vs sunphoto., vs other retrievals, vs modeling**
  - **applications**
    - **climatology, trend, assimil., process underst..**

assessed products



evaluations – some background



evaluation – to remember

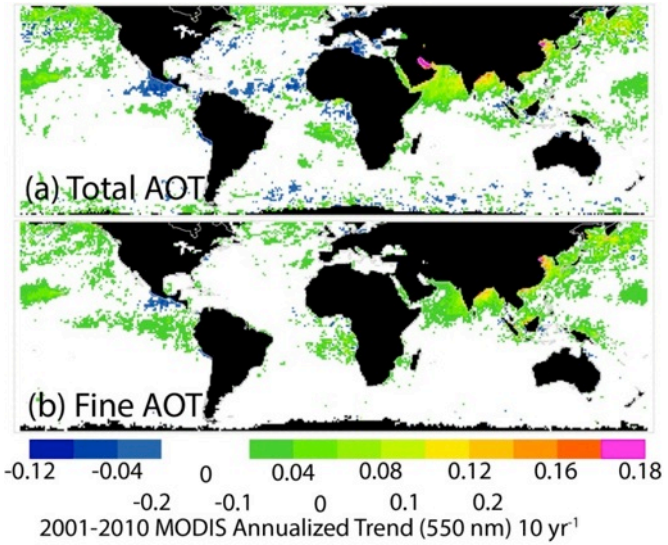
- **a good surface (reflectance) characterization is a key (MISR** and GRASP, MAIAC, METEOSAT**)**
- **simple is not always bad** (AVHRR-NOAA)
- **continual evaluation/retrieval update efforts pay out (cont. improvement MODIS 4 →5 →6)**
- **data combination can combine strength/ close gaps (MODIS deep blue and dark target)**
- **but even a composite** (combining regional retrieval strength) **is far from close to perfect**

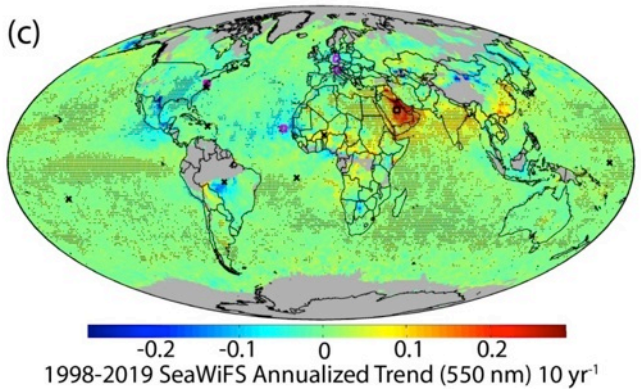
usefulness – it is not just quality

- **the usefulness depends on the application** (relative change may not require highest accuracy)
- **aside quality also repeated coverage matters** (2MODIS offer 10times more data than 1MISR and GEO offers 10*times more than MODIS)
- **near-real-time (NRT) provision may be needed**
- **data assimilation require NRT and a data associated ERROR** (direction for future efforts)
- **observed links** (e.g. cloud, precip) **would be nice**

trends

- global AOT has not significantly changed over the last decade
  - there are regional changes though
- regional shifts in fine-mode AOT agree with anthropogenic emission
- regional shifts in coarse-mode AOT linked to MET





executive highlights

- Important elements
  - verification networks (AERONET, MPL-net)
  - communication with users (ICAP, AeroCom)
  - continued support for retrieval efforts pays off
- future directions
  - AOT (pixel) retrievals have to be associated with an uncertainty and assumptions made
  - AOT is only 1 of many relevant aerosol properties … combine temporal variability and advanced sensor (polariz, multi-angle, -spectr)

AeroSAT

- A discussion forum for aerosol remote sensing as part of AeroCom annual meetings
- Current topics are:
  - Aerosol data combination
  - Aerosol type (from optical data)
  - Aerosol error characterization
  - Aerosol long-term records
  - panel discussion with representatives from global modeling on data needs (e.g. indirect)
- There is interest from ESA (Simon Pinnock) to further support comparison activities, e.g., intentions to follow up the AOT level 3 assessment with a level 2 assessments (more detailed and more direct link to errors)

T. Popp
R. Kahn

GDAP Precipitation Assessment

HIRO MASUNAGA *(Nagoya University)*
Chris Kummerow (CSU) and Jörg Schulz (EUMETSAT)

GDAP Precipitation Assessment Plan

- Need for a new precipitation assessment
  - Increasing availability of precipitation products
  - Recent satellite programs such as GPM
- Lessons learned from previous assessments
  - Past GRP/GDAP Assessment Reports, while thorough and detailed, took nearly a decade to complete.
  - It is desired, however, to address the urgent needs of broad science community in a timely manner.
- Strategies for timely delivery of assessment reports
  - **1)** *Publish a series of concise interim reports.*
  - **2)** *Identify the foci of assessment in advance.*

Interim reports

- Expected reporting cycle
  - Concise interim reports are planned to be published at an interval of **approximately 2 years**.
    - Interim reports will be built around prioritized foci.
  - Outstanding issues are identified in each report so as to be considered with priority in the subsequent volume.
  - Meanwhile, a full assessment report will be documented as the published interim reports as a whole have achieved a satisfactory level of completeness.
    - The interim articles would remain useful even after the full report comes out in that a concise report may allow the reader to more quickly digest individual points.

Assessment foci

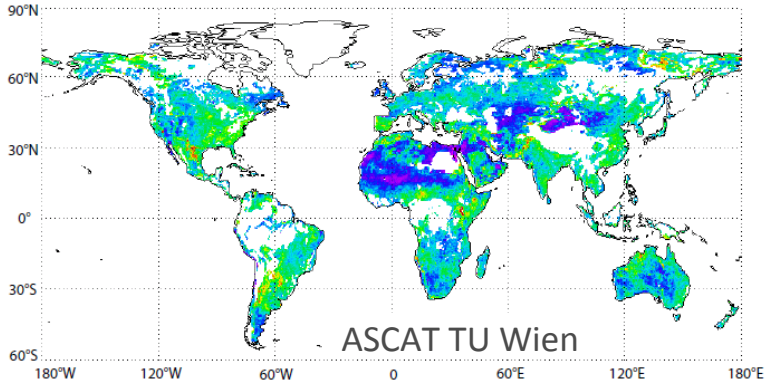
- The list of prioritized foci for the assessment
  - **1)** *Global and Regional Climatology (long-term mean and trend)*
    - with focus on the regionally dependent sources of uncertainty.
  - **2)** *Time series analysis in the context of different modes of climate variability*
    - Diurnal, intra-seasonal, seasonal, inter-annual, etc.
  - **3)** *Extremes*
  - **4)** *Frozen precipitation*
    - Snow and mixed-phase precipitation
  - **5)** *Structural Errors*
    - Errors that are not eliminated by temporal/spatial averaging.

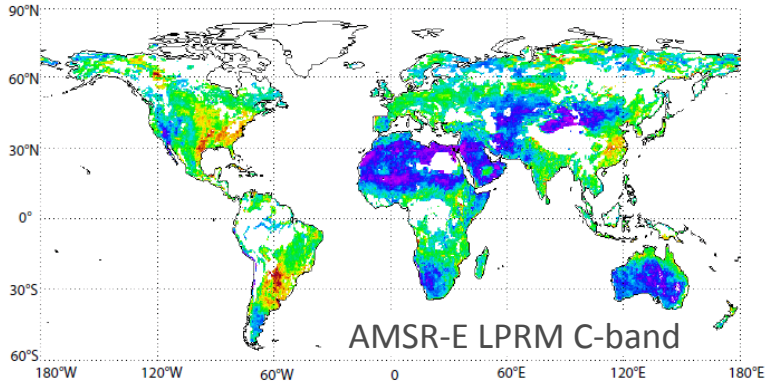
Discussion by GDAP and Timeline

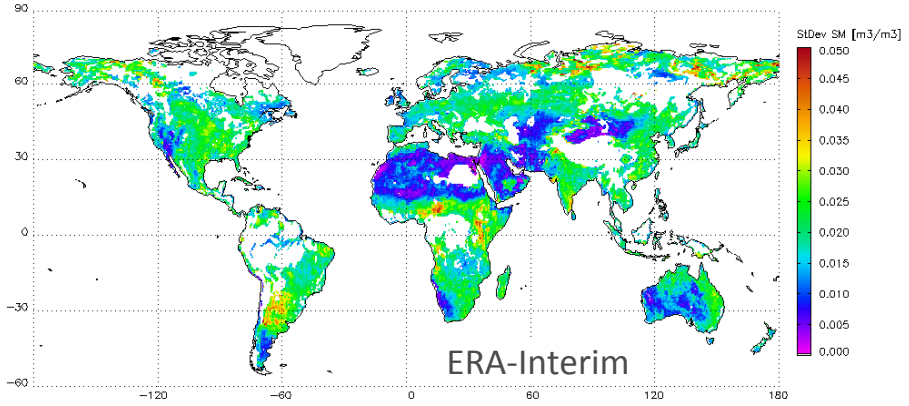
- Discussion at GDAP:
  - Considered data should contain measurements to constrain precipitation such as GRACE in polar areas, surface salinity for long term freshwater budget, soil moisture as potential rain gauge, and moisture transport derived from re-analysis.
  - Connect to GHP Mounterrain project needs to be established by assessment lead;
  - Suggested to shorten own analysis and take benefit from literature but comparisons have been done in an inhomogeneous way.
  - GEWEX assessment can connect to CLIVAR through the use of climate model metrics to be applied to satellite data record.
  - The topic frozen precipitation shall be linked with CliC.
- By mid of 2016: Selection of datasets to assess
  - The selection is made by GDAP;
  - We will then contact each product provider to see if they are interested.
- Autumn 2016: Kick off meeting connected with GDAP annual meeting
- 2018: 1st interim report on first focus area

No single dataset = truth
-> Assessment needed towards applications

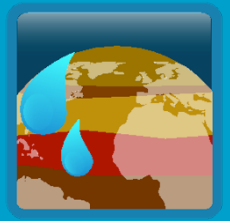
- Estimating error variances using the triple collocation: three independent datasets to estimate the error in each of them, while none of them is regarded as the absolute, **error-free** truth (unlike e.g. RMSE).
  - E.g. active MW, passive MW, LSM soil moisture
  - In its most established form the error depends on the magnitude and variability of the reference







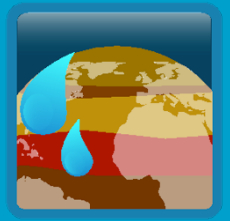
[Dorigo, W.A. et al., 2010, HESS]



Towards SM dataset assessment

- Error characterisation has many flavours, allowing everyone to cherry pick according to one‘s needs.
- Therefore, agreements on specific set out is needed:
  - What shall be evaluated? *Absolute soill moisture? Anomalies? Spatial patterns?*
  - Which metrics? *Correlation, (unbiased) RMSD, signal-to-noise ratio, error variance, trends, range, mean, bias etc.*
  - Which reference data? *In situ, reanalysis, ancillary (e.g. Precipitation?)*
  - At which spatial scales? *Native pixel, land surface model, climate model resolution?*
  - At which temporal scales? *Native, daily, monthly, yearly, etc.?*
  - How to deal with systematic differences? *Use scaling? If so, how?*

esa



Towards SM dataset benchmarking

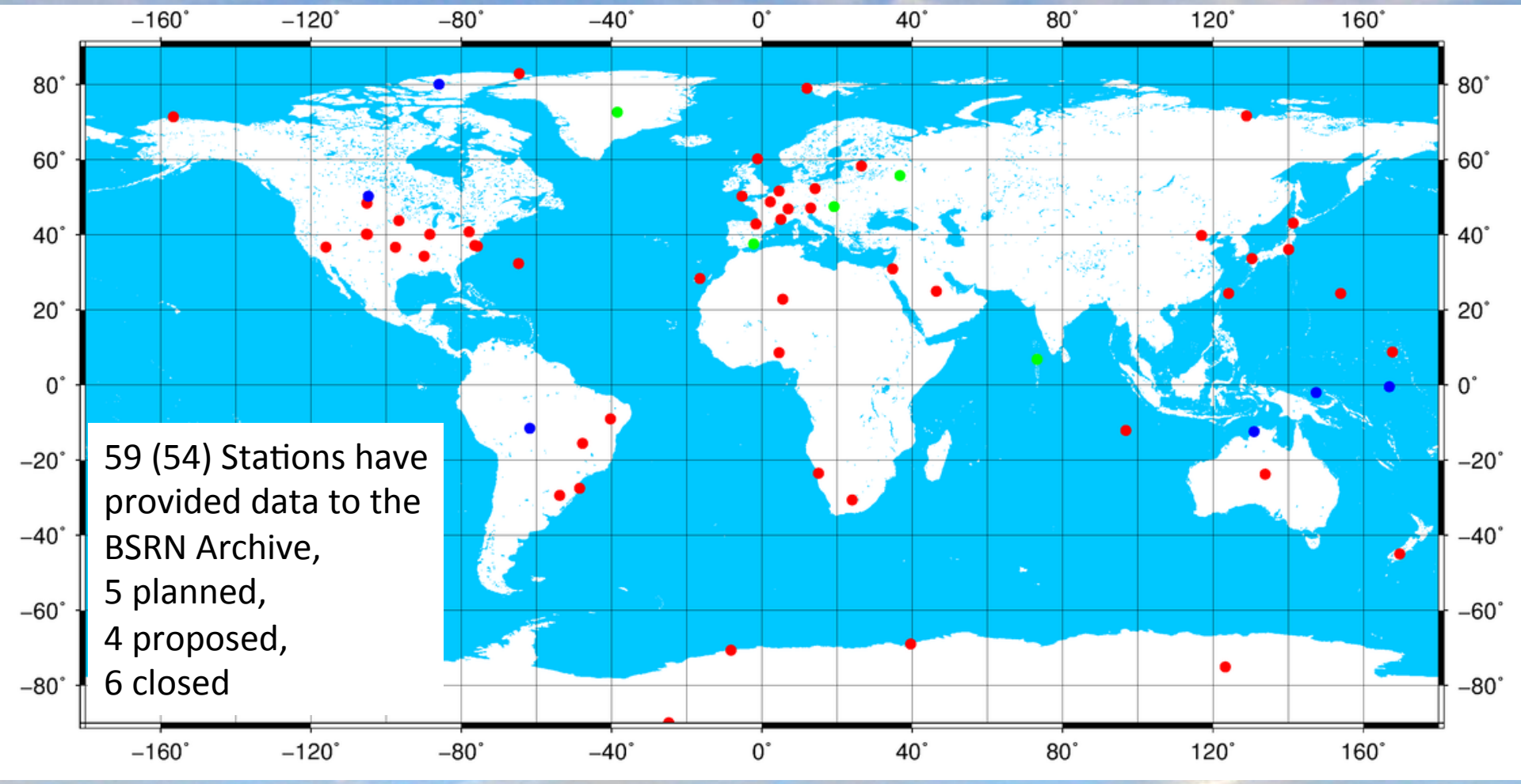
- To achieve general consensus Wouter Dorigo initiated the ISSI International Team “Adding value to soil moisture information for climate studies”
  - First meeting in November 2014
  - Second meeting in November 2015
- Group planned to draft a **validation whitebook** with a selected group scientists (2015) which will be discussed and iterated with the soil moisture community at large next year (e.g SMAP cal/val + SM workshop in Feb. 2016);
- The consented whitebook will be used as the **official guideline for a soil moisture assessment activity** to be kicked off in autumn 2016;
- Whitebook will be reviewed by GDAP for 2016 annual meeting.

esa

BSRN Summary http://bsrn.awi.de

- New project manager Chuck Long (Chuck.long@noaa.gov) was appointed and started in 2015;
- Potential issue with maintaining the BSRN Archive at the World Radiation Monitoring Center (Gert König-Langlo);
- BSRN includes 59 stations with contributed data
  - ~ 700 station-years of observations
  - Dispersed from 90^{O} S through 82^{O} N
- Has devised specifications for accurate long-term surface radiation observations
  - International collaboration of radiative expertise
- Increasing recognition, use, and scientific impact
- 14^{th} BSRN Science and Review Workshop, 26-29 April, 2016, Bureau of Meteorology, Canberra, Australia;

Current Stations: 2014 (2012)



Ground-based observations

BSRN (Chuck Long)

ISMN (Wouter Dorigo)

GPCC (Andreas Becker, Udo Schneider)

ARM (Jim Mather)

Scientific Impact

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Cited almost 1500 times without self-citations
In almost 1200 articles
Producing an h-index of 19…
And climbing!

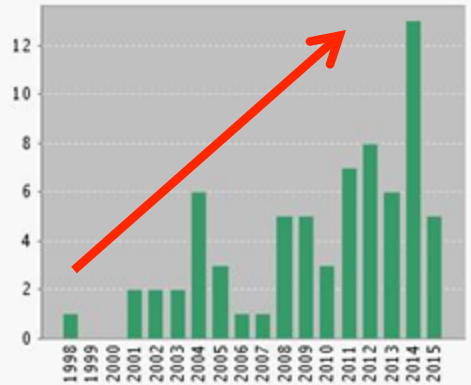
Citation Report: 107

(from All Databases)

You searched for: TOPIC: (BSRN) ...More

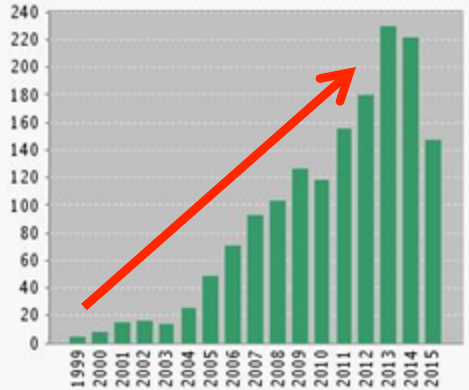
This report reflects citations to source items indexed within All Da

Published Items in Each Year



The latest 20 years are displayed.

Citations in Each Year



The latest 20 years are displayed.

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Average Citations per Item [?] :	[illegible]
h-index [?]	19

Sort by: Times Cited -- highest to lowest

Page 1 of 11

BSRN Working Groups (Active)

- Infrared Working Group (Julian Gröbner)
- Long-Term Data Sets Working Group (Martial Haeffelin)
- Archive Working Group (Gert König-Langlo)
- Cold Climate Issues Working Group (Chuck Long)
- Oceanic Working Group (Gary Hodges)
- Uncertainties Working Group (Nicole Hyett)

Cold Climate Interactions

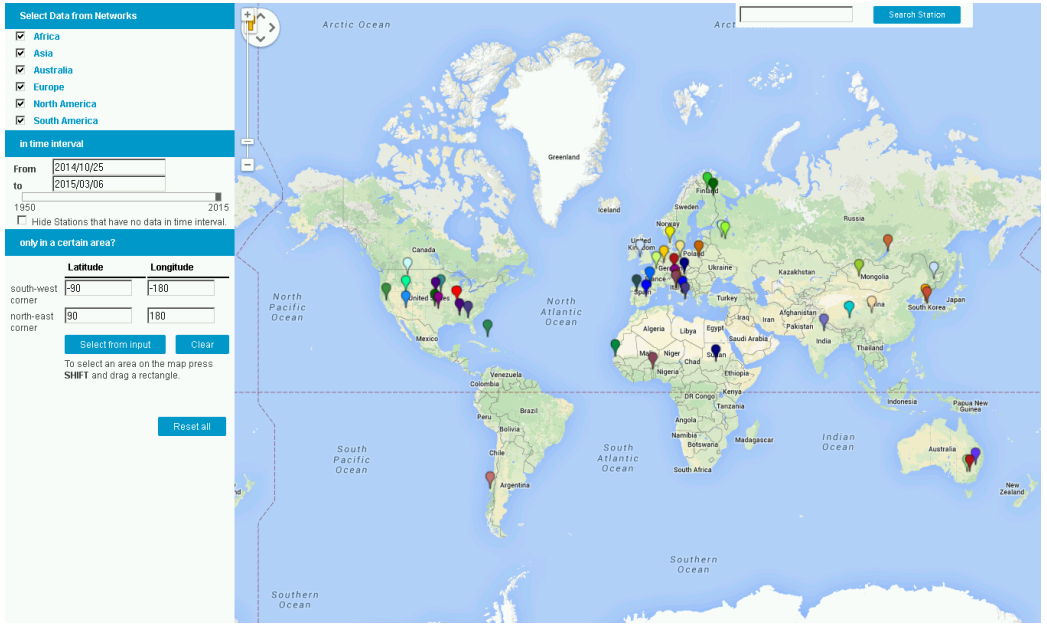
Several BSRN stations in the International Arctic Systems for Observing the Atmosphere (IASOA) Radiation Working Group

BSRN will participate in the polar prediction project (WWRP) (http://www.polarprediction.net/yopp.html)

The International Soil Moisture Network (ISMN)

A centralized data hosting facility, a „network of networks“, endorsed by GEWEX (thanks Peter!) and sponsored by ESA EOP SMOS.

http://ismn.geo.tuwien.ac.at/



TU WIEN GEO

esa International Soil Moisture Network

The International Soil Moisture Network (ISMN)
Data Availability

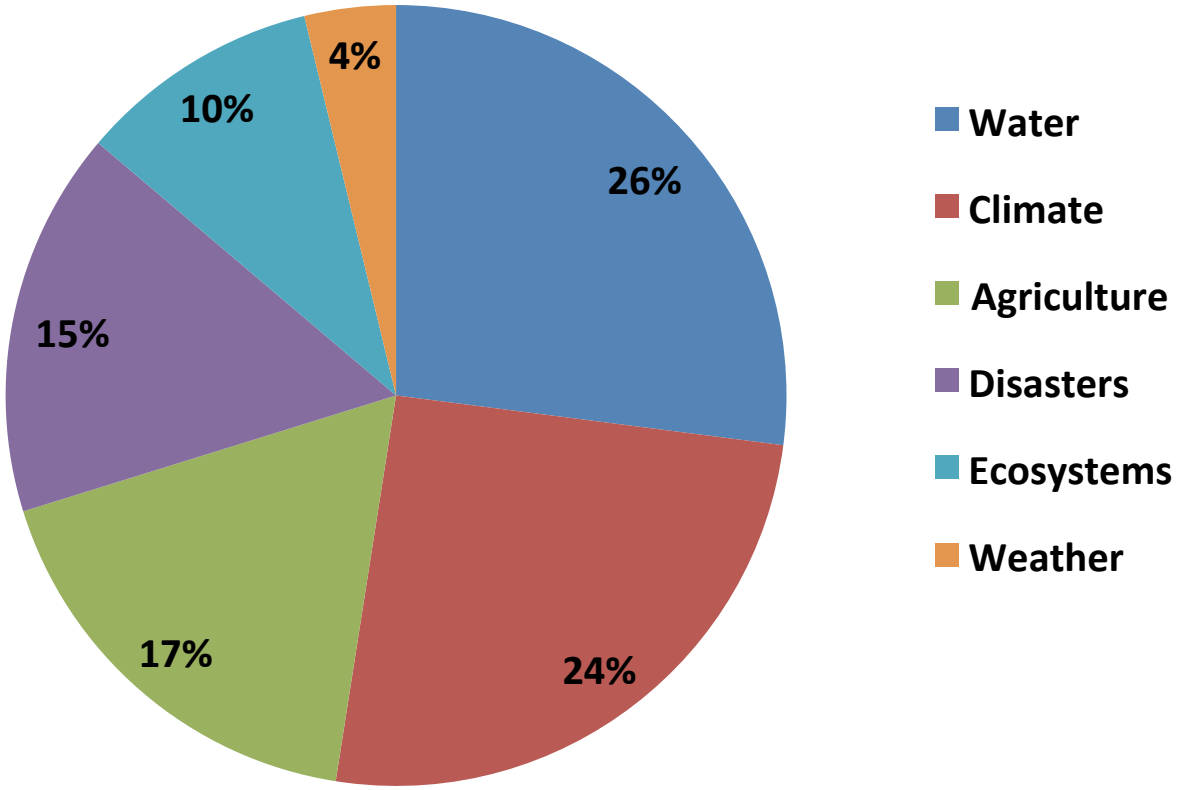
- A centralized data hosting facility, a „network of networks“, endorsed by GEWEX (thanks Peter!) and sponsored by ESA EOP SMOS.
- **Currently available at the ISMN:**

http://ismn.geo.tuwien.ac.at/

  - **49 networks** (42 meeting last year))
  - **~ 2050 Stations** (1600 last year)
  - ~ 8000 soil moisture datasets (6500 last year)
  - historical datasets
    (**since 1952**)
  - operational datasets with
    near-real time update
  - **Additional variables**:
    - Soil temperature
    - Air temperature
    - Precipitation
    - Snow depth
    - Snow water equivalent
    - „Static“ variables (soil texture, saturation point,..)

Data Usage

- use of data as indicated by users at subscription



What's next? – near future

- The ISMN is a **GEWEX success story**, serving a large international scientific community and having **large implications well beyond science**, e.g. through
  - Improvement of weather and climate models (ESMs)
  - Improvement of remote sensing products
  - Support to agriculture
- ISMN still rapidly growing, several new networks and datasets will be integrated in near future: (e.g. China (Wuhan University), Korea, Romania)
- Still large grow potential, e.g.
  - Chinese meteorogical service operates 100s of SM stations, which would have large scientific impact (most registered ISMN users come from China)
- Good-value (costs ~50-100kEUR/y)
- Financial support for 2009-**June 2016** has come from ESA EOP SMOS.
  - ESA's mandate is not operations, therefore a new mechanism needs to be found (soon!)
  - No concrete alternatives so far

GPCC User Requirements

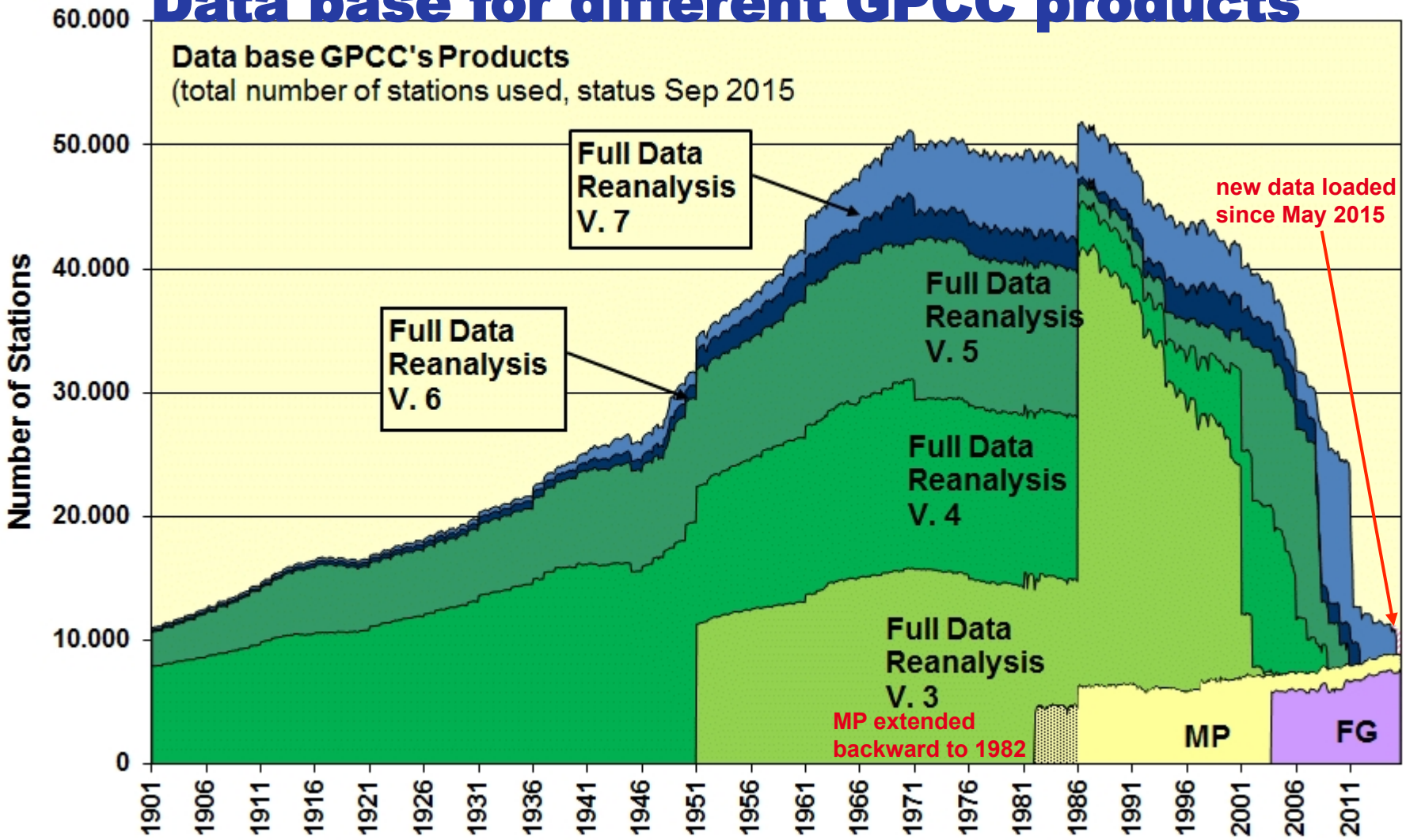
- **Features of gridded precipitation data as required by the users:**
  - **Timeliness** (for drought monitoring)
  - **High resolution** (for regional structures in global maps)
  - **High accuracy** (for verification of model results)
  - **Homogeneity** (for climate change and variability analysis)

All of these requirements cannot be met by one single gridded data set

==>

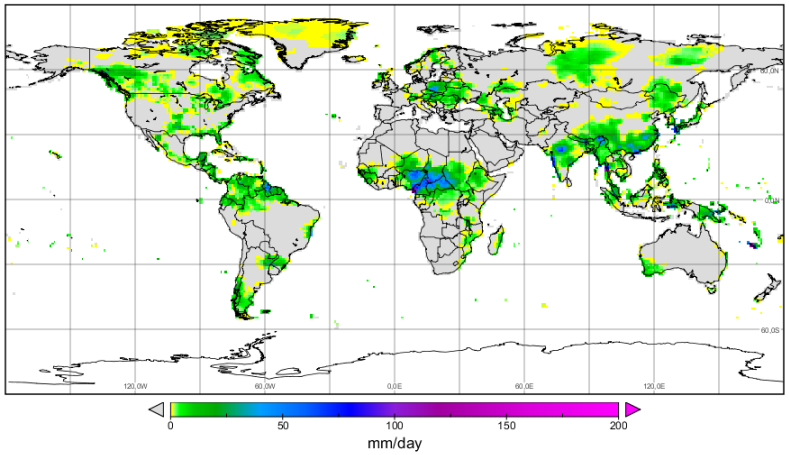
A portfolio of different analysis products has been designed and optimized with respect to the application purposes

Data base for different GPCC products

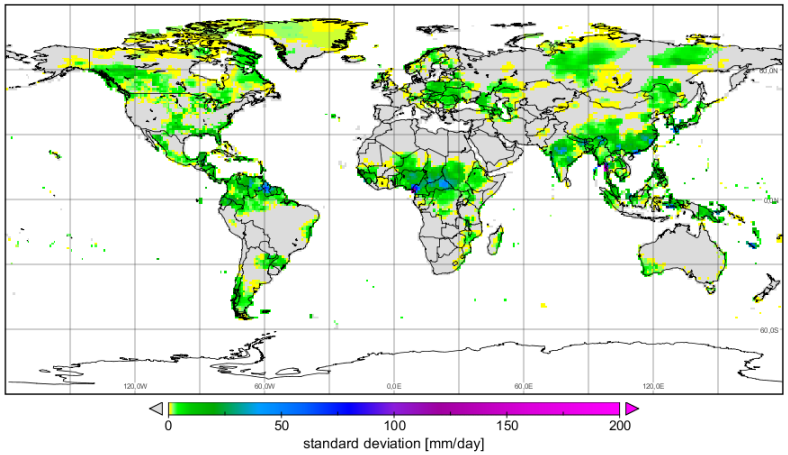


Example: GPCC Full Data Daily: 06 July 1997

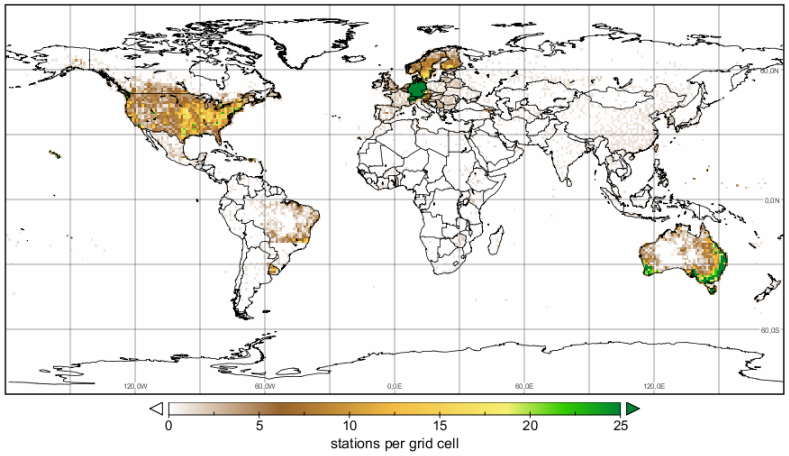
Total Precipitation



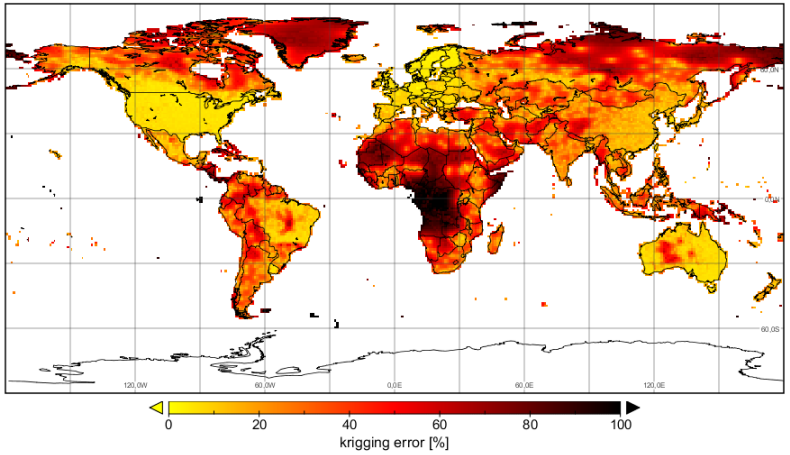
Standard Deviation



Number of Stations per grid cell



Kriging Error



ARM

CLIMATE RESEARCH FACILITY

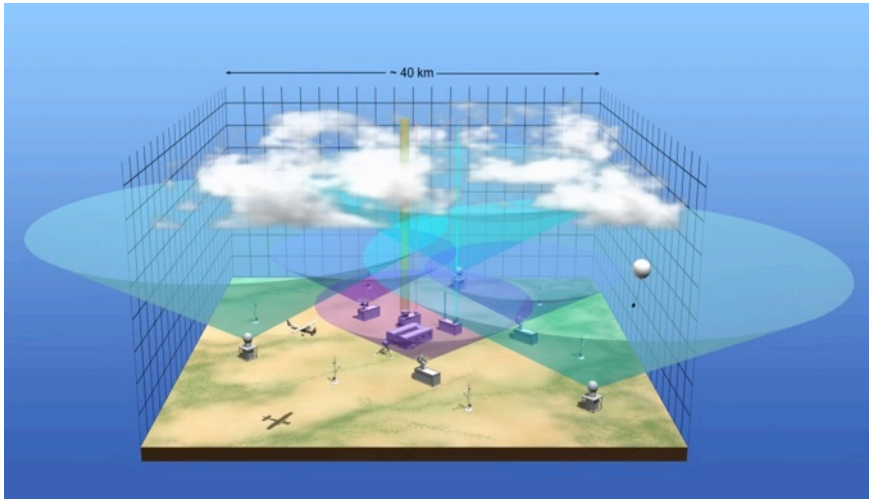
ARM Updates for GDAP
October 2015

Jim Mather
ARM Technical Director

U.S. DEPARTMENT OF ENERGY | Office of Science

Strengthening the link to models

ARM is undergoing a reconfiguration to better integrate observations and high-resolution modeling with the continued goal of improving climate models. The reconfiguration has three main facets:



- Optimization of the ARM measurement facilities at two megasites to better support high-resolution modeling
- Development of a routine modeling strategy for process studies and to provide a link to Global-scale models
- Development of a data processing strategy to bridge measurements and models

While continuing to provide observations from the mobile facilities, aerial platforms, and the new long-term site on Graciosa Island in the Azores.

Consolidated Data Products

For some time, ARM has provided consolidated data products that merge parameters from multiple sources. In particular – a set of "ARM Best Estimate" or "ARMBE" products provide hourly averages of a wide range of parameters include thermodynamic profiles, cloud fraction profiles, radiative fluxes, etc.

ARM has now developed a framework called the ARM Data Integrator (ADI) that is used to combine inputs from multiple data sources in a more generic way. This framework is used routinely to develop "Value Added Products". It will soon be available at the ARM Data Archive to support custom data files, drawing parameters from multiple sources. In principle this can be done for arbitrary time resolutions.

ADI Applied to GDAP

Just as ADI can be used to merge parameters onto an arbitrary time-base, it could be used to generate a custom set of data files with parameter mapped to parameters generated by GDAP products, at an appropriate time resolution (provided the parameters are already available in existing data products).

Similarly, parameters from GDAP products could be extracted for ARM sites. In this way – joint parameter sets could be generated over multiple locations.

The first step toward exploring this would be defining a set of core parameters that would constitute the joint set.

GEWEX New Activities

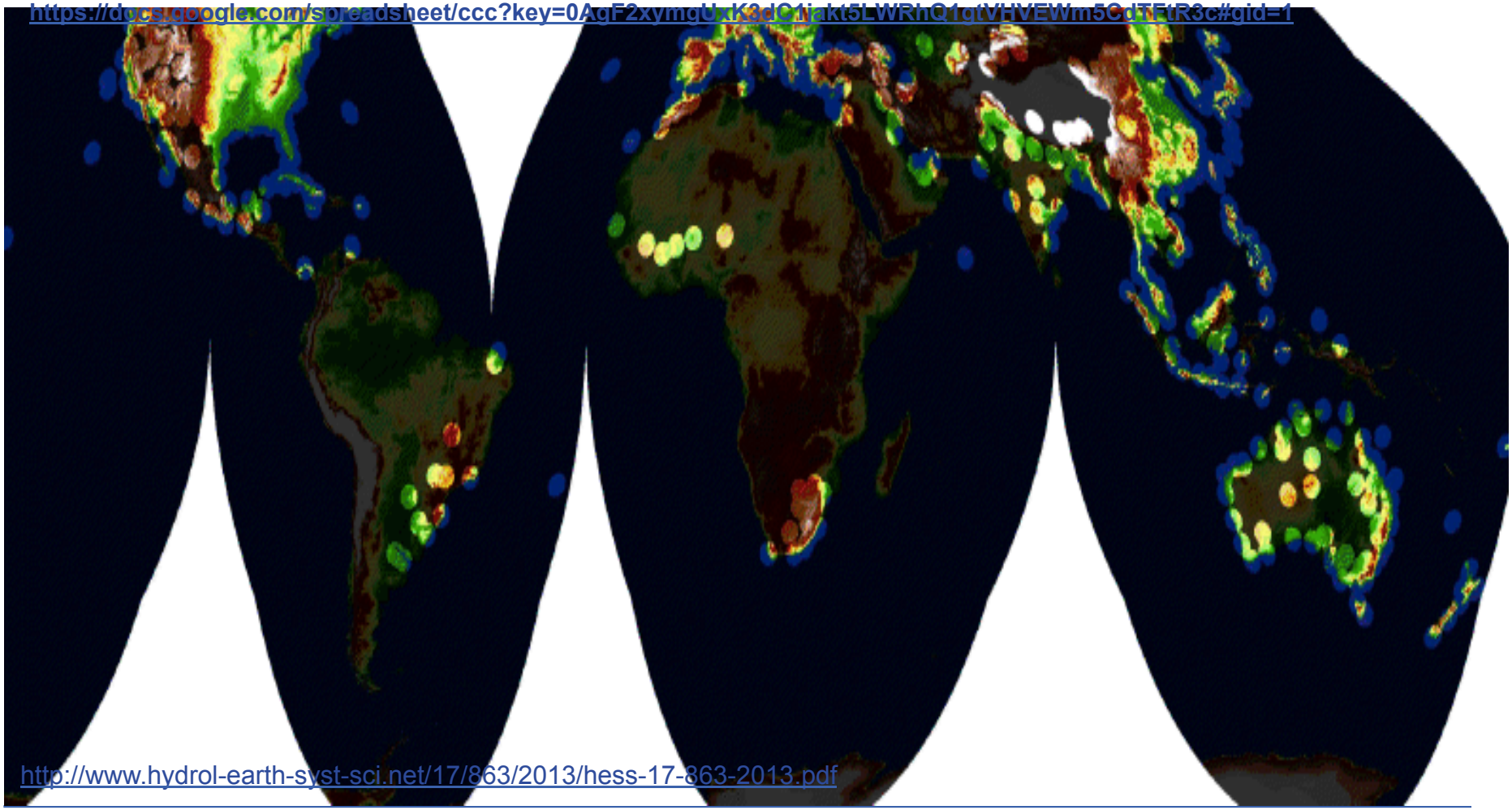
Precipitation from surface radar

UTTC PROES

Uncertainty Analysis

World wide weather radar coverage
> 800 systems listed by Heistermann et al., 2013

https://docs.google.com/spreadsheet/ccc?key=0AgF2xymgUxK3dC1jakt5LWRhQ1gtVHVEWm5CdTFtR3c#gid=1

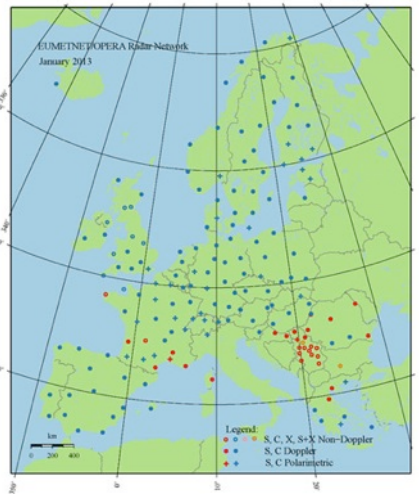


http://www.hydrol-earth-syst-sci.net/17/863/2013/hess-17-863-2013.pdf

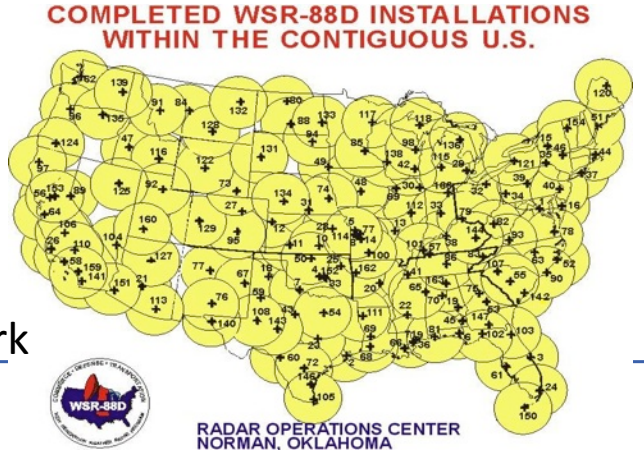
Radar Data

US: National Mosaic Multi-sensor QPE, multi-radar / multi-sensor, http://nmq.ou.edu/
Europe, UK: Nimrod, 5 km, 15 min composite for UK, Ireland, France, Germany, Netherlands, Belgium, http://badc.nerc.ac.uk/home/
Europe: OPERA, EUMETNET : 184 Doppler radars and 48 dual-polarization radars, 17 countries, http://www.eumetnet.eu/radar-network
US: Natl. Stage IV QPE Product, radar/gauge, dBZ → Z-R, for each radar mean-field bias correction using gauges, mosaicking the radar umbrellas, local bias correction via kriging with gauges, http://www.emc.ncep.noaa.gov/mmb/ylin/pcpanl/stage4/
Northern Germany: Precipitation and Attenuation Estimates from a High Resolution Weather Radar Network (PATTERN) , rain radars and MRR, http://pattern.zmaw.de/
US: Eureka, CA, NEXRAD radar/gauge site for AMSR-E validation, http://nsidc.org/data/amsr_validation/rainfall/eureka/index.html
US: NEXRAD (**Nex**t-Generation **Rad**ar), network of 160 high-resolution S-band Doppler weather radars

Courtesy Christian Klepp



Opera network
232 radars

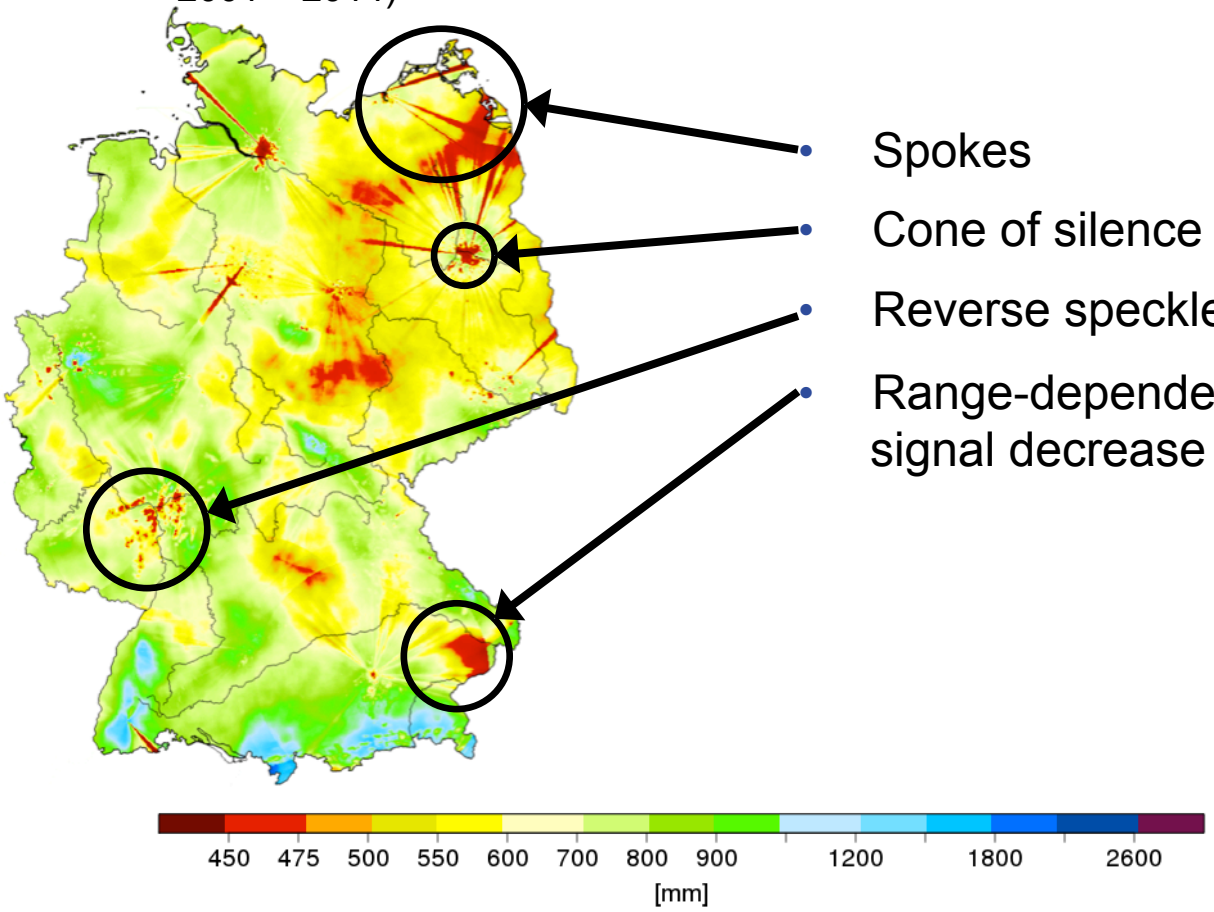


NEXRAD network
160 radars

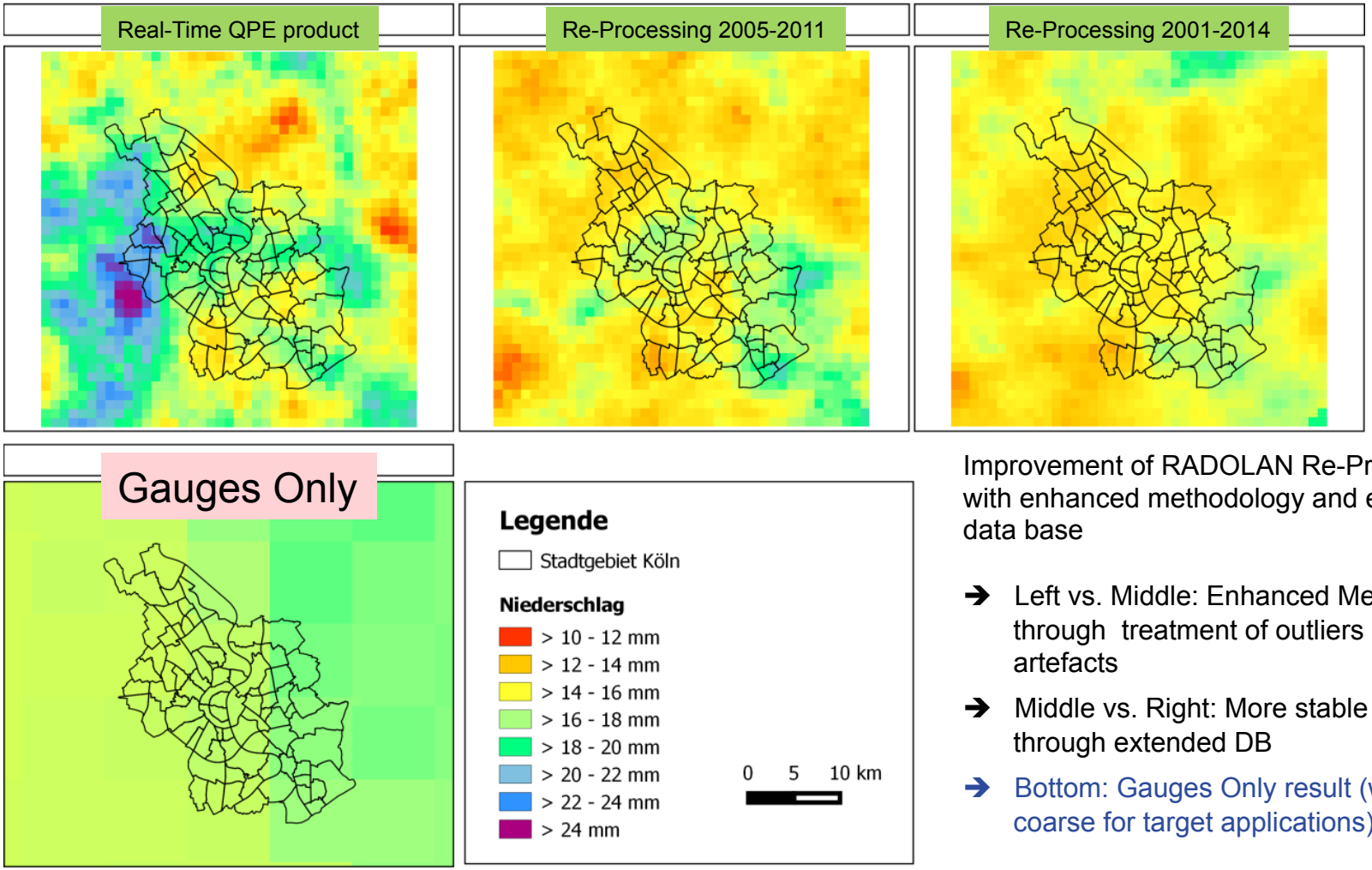
First Results

Mean Annual Precipitation
(radar climatology
2001 – 2014)

(without correction)



Extreme precipitation across Cologne for duration 1h and return period 1yr



Improvement of RADOLAN Re-Processing with enhanced methodology and extended data base

- ➔ Left vs. Middle: Enhanced Methodology through treatment of outliers and radar artefacts
- ➔ Middle vs. Right: More stable statistics through extended DB
- ➔ Bottom: Gauges Only result (ways too coarse for target applications)

Starting Point

- New high space time resolved precipitation product would be very beneficial for analysis of extreme precipitation;
- Awareness about the value of radar data is maybe at a stage where we were with satellite data 30 years ago;
- Currently, radar data reprocessing or climatological evaluation of radar data is performed or under consideration by different weather services or institutes, e.g. DWD, Météo France, FMI, KNMI, KMI, Meteo Swiss, and NOAA;
- Within Europe some approaches to combine and unify radar data on an international scale by OPERA and BALTRAD are existing but concentrate mostly on real time applications;
- NOAA has completed a reprocessing of NEXRAD for the period covering from 2001 to 2012;
- Deutscher Wetterdienst (DWD) has completed reprocessing of DWD radar data since 2001 (for Germany).

Needs and plan

- Archiving of raw and processed radar data by institutions that operate radar networks is needed;
- Could attempt ESGF like distributed solution of such observation databases. However, it is more difficult with observations which present many dimensions (temporal frequency, type of variable, vertical sampling, technique of measurement, etc...);
- Defining a minimum set of standards for observations, without duplicating the years of work in this area, would help create observations to be discoverable and searchable by everyone;
- Consistent reprocessing in terms of methodology of various types of radars starting with common precipitation radars (C, S-band radars) needs to be achieved;
- Initial workshop that considers the existing approaches and initializes a process that may lead to a baseline similar to what is achieved for satellite data;
- Potential leaders of such a project could be Andreas Becker, DWD and Brian Nelson (NOAA). Need to get producers and users (from GC extremes) to the table. Try to do a first workshop 2017.

UTCC PROES

Claudia Stubenrauch

- The goal of the GEWEX PROES activities is to provide observational based metrics for a better understanding of climate related physical processes.
- GC role of convection on cloud feedbacks: GEWEX UTCC PROES tackles two questions:
  - interconnection between the convection and the heating induced by the outflowing anvils.
  - how large are the relative cirrus contributions, in occurrence and in radiative heating, originating from convection and from in situ freezing driven by large-scale forcing? (Link to SPARC);
- Has about 30 scientists, first workshop was held on 16 Nov 2015 in Paris.
- The analysis of large-scale convective cloud systems shows that the size of these systems is strongly linked to their convective strength.
- First step,
  - build a synergetic data base of high-altitude cloud systems;
  - build a simulator of high-altitude cloud systems for the evaluation of different formation schemes in climate models.
  - second official workshop is planned in fall 2016 in New York (travel support request sent after GDAP meeting 2015).

Uncertainty characterisation

A bias in observations in the 183GHz line: some clues to understand it

Hélène Brogniez, Stephen English & Jean-François Mahfouf

GEWEX GDAP

Highlights from a workshop held in Paris on the 29th & 30th June 2015

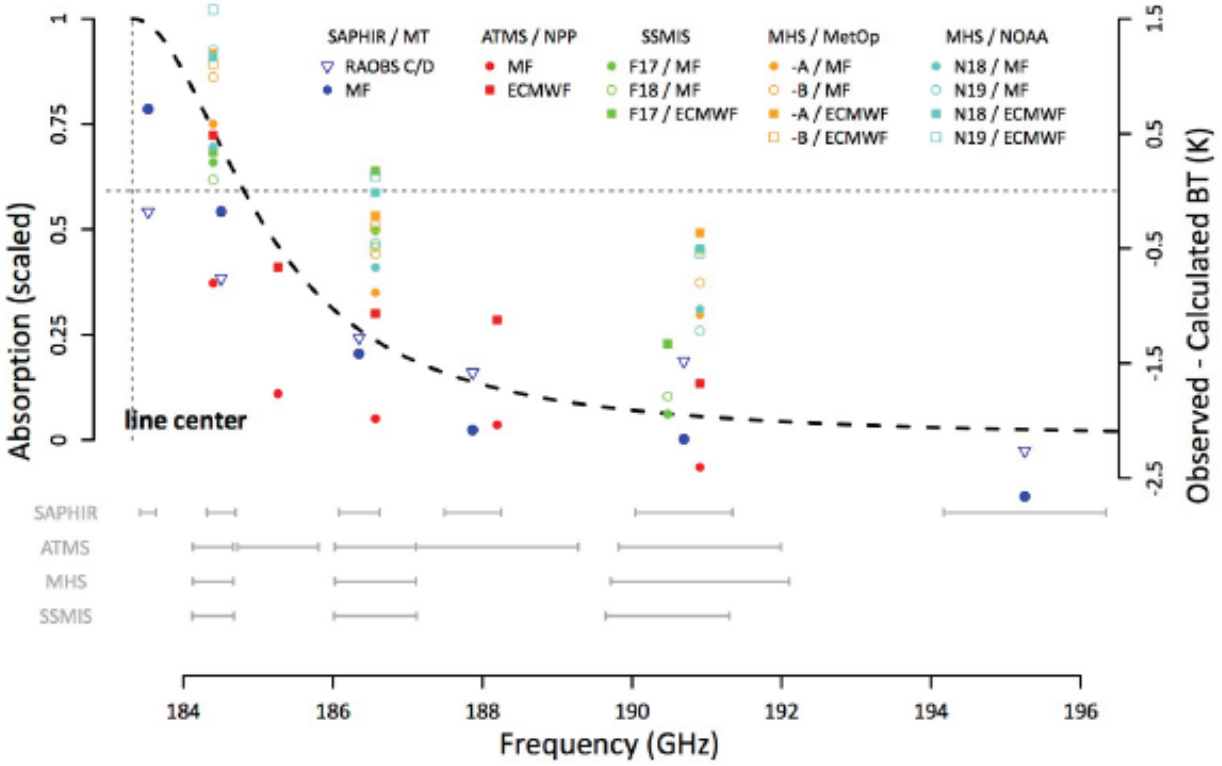
Many thanks to all the participants from: Eumetsat, Météo-France, NOAA, JPL, ECMWF, MetOffice, CNRM, CNR-ISA, CNES, CSU, Univ of Hohenheim, Univ. at Albany, Maynooth Univ., NASA, Inst. of Applied Physics (Russia)

1. Background of the workshop

Background: Recent comparisons between observed BTs in the 183GHz line and calculated BTs exhibit a pattern that is enhanced by the spectral sampling of SAPHIR (Megha-Tropiques) and ATMS (Suomi-NPP) :

- wrt RAOBs
- wrt to short-range NWP forecasts

This feature is also visible for the fleet of operational sounders:



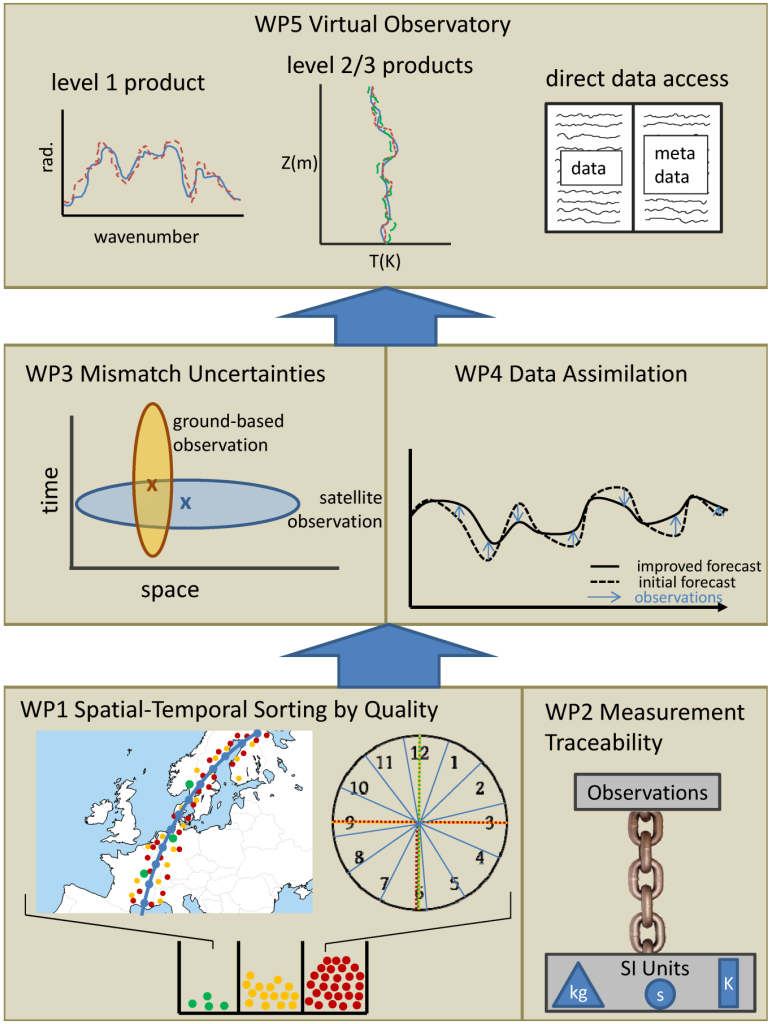
FIDUCEO has received funding from the European Union's Horizon 2020 Programme for Research and Innovation, under Grant Agreement no. 638822

Two European Union Horizon 2020 Research Projects addressing the characterisation of uncertainty for:

1. Historic satellite data records: **FIDelity and Uncertainty in Climate data records from Earth Observations (FIDUCEO)**
2. Ground-based reference networks: **Gap Analysis for Integrated Atmospheric ECV CLImate Monitoring (GAIA-CLIM)**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 640276.

www.gaia-clim.eu



- Define data quality attributes and map by capabilities
- Improve metrological quantification of in-situ ground-based and sub-orbital measurements
- Robustly quantify the impacts of inevitable measurement mismatches
- Use Data Assimilation to improve the usefulness of high quality measurements
- Provide useable and actionable information to end users to improve the value of both satellite and non-satellite data

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 640276.

www.gaia-clim.eu

FIDUCEO Objectives

- Derive methods and best practice for Fundamental Climate Data Records (Level 1) for a range of instruments;
- Derive methods and best practice for Climate Data Records (Level 2+) for a range of ECVs;
- Create traceable uncertainties that provide evidence of all processes involved in deriving the data;
- Provide data in easy to use formats including pixel level uncertainties;
- Provide cookbooks and toolkits on best practice methods.

FCDR Data Available by 2017

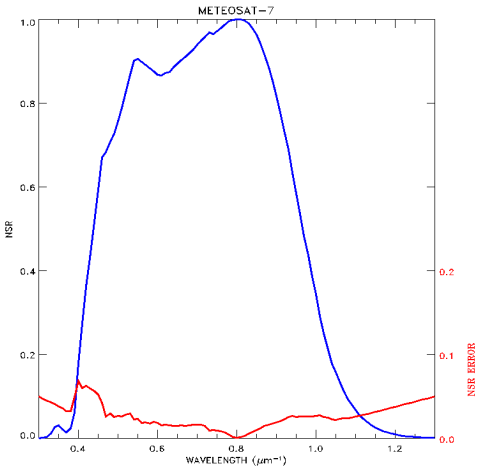
DATASET	NATURE	USE
AVHRR FCDR	Harmonised infra-red radiances and best available reflectance radiances, 1982 - 2016	SST, LSWT, aerosol, LST, phenology, cloud properties, surface reflectance …
HIRS FCDR	Harmonised infra-red radiances, 1982 - 2016	Atmospheric humidity, NWP re-analysis, stratospheric aerosol …
MW Sounder FCDR	Harmonised microwave BTs for AMSU-B and equivalent channels, 1992 – 2016	Atmospheric humidity, NWP re-analysis …
Meteosat VIS FCDR	Improved visible spectral response functions and radiance 1982 to 2016	Albedo, aerosol, NWP re-analysis, cloud, wind motion vectors,…

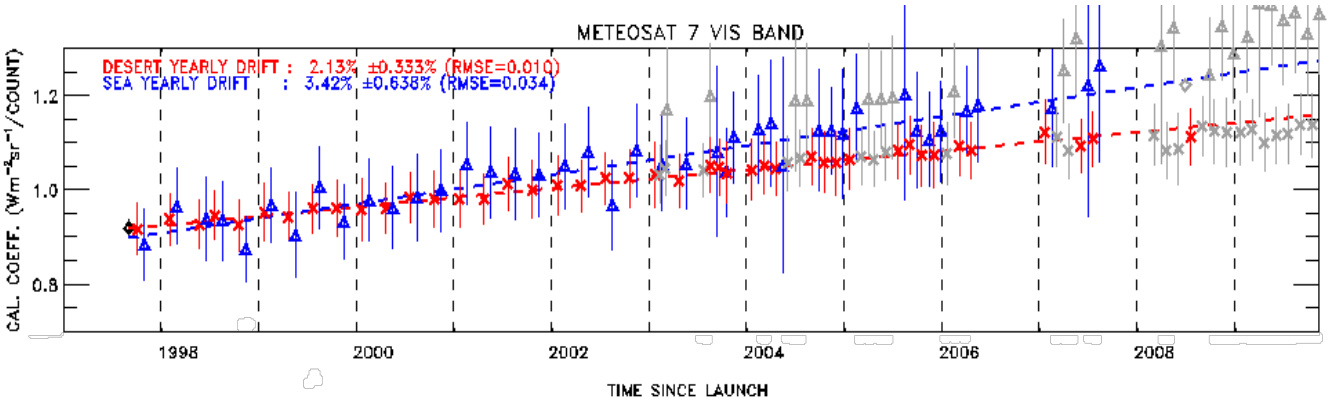
- The FCDRs are very relevant for future realisations of GEWEX data products.

University of Reading

Fiduceo

Example of the Meteosat MVIRI VIS





$$K = \gamma \int_{\lambda} \xi(\lambda) R(\lambda)\, d\lambda + K_0$$

where γ is the instrument gain, $\xi(\lambda)$ is the normalized sensor spectral response, $R(\lambda)$ is the spectral radiance at the telescope entrance and K_0 the instrument offset

GDAP contributions to WCRP GCs and GEWEX Science Questions

GEWEX Science Questions Y = yes, n=no, c=contribute, u=unknown, p=potential		GDAP Projects and Products										
		GPCP/GPCC Assessment	ISCCP	GVAP	GACP AEROCOM	SRB	EBAF	Landflux	Seaflux	Soil Moisture	Groundwater Storage	Integrated Product
Observation and Prediction of Precipitation	How well can precipitation be described	y	y	y	y	n	n	n	y	y	y	y
	How do changes in climate affect the characteristics	y	c	c	c	c	n	c	c	y	y	y
	How much confidence do we have in predictions	y	c	c	c	n	n	n	n	y	y	y
Global Water Resources	How do changes in the land surface and hydrology influence water resources?	n	n	n	n	c	n	c	n	c	c	c
	How does climate change impact water resource systems?	n	n	n	n	n	n	n	n	n	n	n
	How can new observations lead to improvement in management?	p	n	n	n	n	n	n	n	p	n	p
Climate Extremes	Observing system requirements?	y	y	y	y	y	y	y	y	y	y	y
	Modelling capabilities?	u	u	u	u	u	u	u	u	u	u	u
	Modelling processes involved in extremes?	y	y	y	n	n	n	n	n	n	n	n
	Improved early warning systems?	y	c	y	u	y	n	n	n	n	n	n
Energy and water Cycles	Can we balance the budget at TOA?	n	c	c	c	c	y	n	c	n	n	c
	Can we balance the budget at surface?	y	y	y	y	y	y	y	y	y	y	y
	Can we track the changes over time?	y	y	y	y	y	y	y	y	y	y	y
	Can we relate changes and processes?	p	y	y	p	p	p	p	p	p	p	y
	Cloud-aerosol-precipitation feedback	y	y	y	y	y	y	n	n	n	n	n

GEWEX links to other WCRP or ex WCRP activities

CLIVAR

WDAC

CLIVAR Connect - CONCEPT HEAT Workshop

- CONCEPT-HEAT (cross workshop between CLIVAR and GEWEX) in Exeter
- Key questions they are addressing:
  - "What are the magnitude and the uncertainties of our estimates of Earth's energy imbalance (EEI), and how does it vary over time?
  - "How can we improve validation requirements for and from climate models and reanalysis systems to improve estimates of EEI?"
  - "How can we better constrain the surface energy fluxes and their spatio-temporal variations at regional scale?"
  - "How are TOA net radiation and ocean heating rate distributed in space and time?"

CLIVAR Connect - Key air-sea flux points relevant to GDAP

- Complement GSOP inventory of surface flux products "assessment"-type **information regarding strengths and weaknesses** of the various flux products, in an effort analogous to the "Climate Data Guide" (NCAR/UCAR, USA)
- **Quantify different types of uncertainties** of surface fluxes, their correlation structure, sensitivity to uncertain parameters and satellite retrieval schemes to improve the usefulness of global flux products;
- **Develop an innovative ensemble approach** to generate multiple realizations of flux surface products, combining the individual strengths of existing data sets, the latest knowledge in bulk formulations and associated input data, and the most recent efforts in re-processing flux data sets of climate quality;
- **Exploit integral constraints** along with statistical approaches using reconstruction of probability density functions for surface fluxes to check consistency of Net Heat Flux product components on a series of regional "Cages" (ESA-OHF)
- **Develop a community-led flux platform** to share, access and inter-compare easily 6 different sets of flux climatologies, and their input data (e.g. different SSM/I data streams), thereby fostering close collaboration between different communities, as well as new ways of combining in situ measurements and flux data

WCRP Data Advisory Council (WDAC) Surface Flux Task Team

- Discussion of need for coordination and highlighting surface flux issues
  - Land, ocean, ice
  - Biogeochemical, heat, moisture, momentum
  - Turbulent, radiative
  - In situ, remote
- Formation of a Surface Flux Task Team (**C. A. Clayson**, chair, B. Ward co-chair)
  - Cuts across GEWEX, CLIVAR, other WCRP groups
  - Members: (plus 1 candidate from China)
    - **Carlos Jimenez (Observatoire de Paris, turbulent flux land, satellite);**
    - Jim Edson (U. Conn, ocean, obs);
    - Pierre-Philippe Mathieu (ESRIN, satellite);
    - Peter Gleckler (LLNL, modeling);
    - **Paul Stackhouse (NASA Langley, radiative fluxes, satellite);**
    - Hans Peter Schmid (Karlsruhe Inst. Tech., biosphere, obs);
    - Anton Beljaars (ECMWF, land, modeling);
    - Saigusa Nobuko (Japan, National Inst. for Env. Studies, land, obs);
    - Petra Heil (University of Tasmania, sea ice, obs, remote sensing, modeling);
    - Ronald Buss de Souza (National Institute for Space Research, Brazil, ocean, obs)

WDAC - Obs4mips Task Team

- GDAP chair engaged in WDAC obs4mips task team;
- Task team will review proposals and decide on uptake in collaboration with MIP leaders;
- Data call is open until end of March 2016 to submit proposals not the data;
- GEWEX products are encouraged to be included:
  - GPCP is, ISCCP is via CFMIP, LANDFLUX and the ESA soil moisture intended, some G-VAP water vapor products ,
  - Others (SRB, SEAFLUX) may have issues to easily conform with the rules;
- Data needs for some CMIP experiments are still not well known -> More communication between CMIP and obs4mips is initiated via the CMIP panel chair (Veronika Eyring) to create more contacts of individual MIP leaders and obs4mips task team members.
- Actual question is on surface albedo which is not listed as variable of MIPs. Need to find agreement what parameter should be produced from satellite data.

Establishing best practise for assessment in WCRP

- **Compiled "Data Set Quality Assessments: Needs, Benefits, Best Practices and Governance"**
- This paper shall provide guidance towards a more homogeneous approach towards assessments of data set quality;
- Jörg Schulz, EUMETSAT, Chair GEWEX Data and Assessment Panel, Peter Gleckler, Lawrence Livermore National Laboratory, and many WCRP contributors hereby deeply acknowledged;
- It is expected that it will be endorsed at next WDAC in April 2016.

Meetings done

- Joint workshop on uncertainties at 183GHz 29 - 30 June 2015, Paris, France
- GDAP Annual meeting, 29 Sep – 1 Oct 2015, Xiamen, China;
- Workshop CONCEPT-HEAT, 28 Sep – 1 Oct 2015, Exeter, UK
- 5th GEWEX Water Vapor Assessment Workshop, 4-5 November 2015, University of Wisconsin, Madison, USA
- ISSI Workshop on soil moisture, November 2015, Bern, Switzerland;
- 1st GEWEX UTCC PROES Workshop 16 Nov 2015 in Paris, France.

Meetings planned

- Participation in 6th session of WDAC, 7 and 8 April 2016, NOAA NCEI, Asheville, USA;
- 14th BSRN Science and Review Workshop, 26-29 April, 2016, Bureau of Meteorology, Canberra, Australia;
- ESA CCI soil moisture user workshop, 28-29 April 2016 at ESA ESTEC;
- 2nd GEWEX UTCC PROES Workshop, planned for fall 2016,New York, USA;
- 6th GVAP water vapor assessment workshop, EUMETSAT headquarters, 22-23 September 2016;
- GDAP Annual meeting, GEWEX Office, Washington D.C, October/ November 2016;
- Kickoff workshop for precipitation assessment, combination with GDAP meeting in DC area, October/November 2016;
- A first workshop bringing together experts in the field of radar reprocessing is anticipated for 2017, time is still open, location will be Europe or USA;
- ESA-EUMETSAT workshop on uncertainty characterisation in satellite data records, 2017.

Issues for the SSG

GDAP Membership

Jörg Schulz, Chair	EUMETSAT	2017
Matthew McCabe , Vice-Chair	King Abdulla University	2017
Wouter Dorigo	Technical University Vienna	2016
Andrew Heidinger	NOAA/NESDIS	2016
Carlos Jimenez	Estellus, S.A.S., Paris	2017
Christian D. Kummerow	Colorado State University	2017
Felix Landerer	Jet Propulsion Laboratory	2015
Norman G. Loeb	NASA LaRC	2015
Hirohiko Masunaga	Nagoya University	2017
Axel Schweiger	U. of Washington	2015
Sonia I. Seneviratne	ETH Zurich	2013
B.J. Sohn	Seoul National University	2015
Claudia Stubenrauch	Lab. de Meteorol. Dynamique	2016
Sue Van Den Heever	Colorado State University	2015
Tianjun Zhou	LASG/IAP/CAS, Beijing, China	2017

New potential GDAP Members

- Ali Behrangi (NASA JPL, USA), precipitation, link to extremes GC
- Annette Eicker (Institut für Geodäsie und Geoinformation, U. Bonn, Germany), GRACE, ground water
- Myoung Hwan Ahn (Ehwa University, Korea), remote sensing expert
- Shinya Kobayashi (JMA, Japan) reanalysis, data assimilation
- Diego Miralles (University Gent, Belgium) land surface fluxes, GLEAM model
- Rémy Roca (LEGOS, France) energy and water cycle science
- Mathew Rodell (NASA GSFC, USA) water budget, water storage
- Philip Stier (Univ. Oxford, UK) global modeling, radiative transfer, aerosol-cloud physics
- Nick Schutgens (Univ. Oxford, UK) data assimilation, data, modeling, radiative transfer
- Christopher Taylor (Centre for Ecology & Hydrology, UK) land surface modeller with increasing interest in observations
- May need to add more USA and women to this mix – SSG is invited to make proposals

BSRN Archive at the World Radiation Monitoring Center

- BSRN Director of the World Radiation Monitoring Center (WRMC, http://www.bsrn.awi.de/), Dr. Gert König-Langlo is retiring as of May, 2017;
- The WMRC is the central archive of the Baseline Surface Radiation Network (BSRN) data;
- WRMC and BSRN Archive have been hosted at the Alfred Wegener Institute following the endorsement of an agreement of (and attendant funding from) the AWI Director, Dr. Peter Lemke in 2007;
- Gert König-Lango reported to GDAP that so far he has not received any promise from the current AWI Director, Prof. Dr. Karin Lochte;
- A well-trained and excellent person ready to take over is available: Dr. Amelie Driemel;
- Gert König-Langlo is asking for a letter of support to convince the director of AWI Prof. Dr. H.C. Karin Lochte to host the WRMC of BSRN beyond his retirement in May 2017.