

Splinter Group on Energy fluxes, evapotranspiration, precipitation: Summary

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chaired by M. Schröder

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T II: “Energy fluxes, evapotranspiration, precipitation” chaired by M. Schröder

10:30 Introduction: Scope & Objectives

M. Schröder DWD

10:45 Satellite remote sensing of precipitation: Ongoing challenges in the context of climate research

R. Bennartz *Vanderbilt University / University of Wisconsin*

11:00 Challenges in climate monitoring of latent heat flux and related parameters

A. Andersson DWD

11:15 Open Discussion

12:15 Wrap up

M. Schröder DWD

11:15 – ~11:30

- Open Discussion based on presentations

~11:30 – 12:00

- Provision of feedback at boards and charts – feel free to move around and discuss.

- Marloes, Sophie, William, Stephan and Marc will be around.

12:00 – 12:20

- Open discussion: clarification of open questions regarding feedback and related motivation

12:20 – 12:30

- Wrap-up



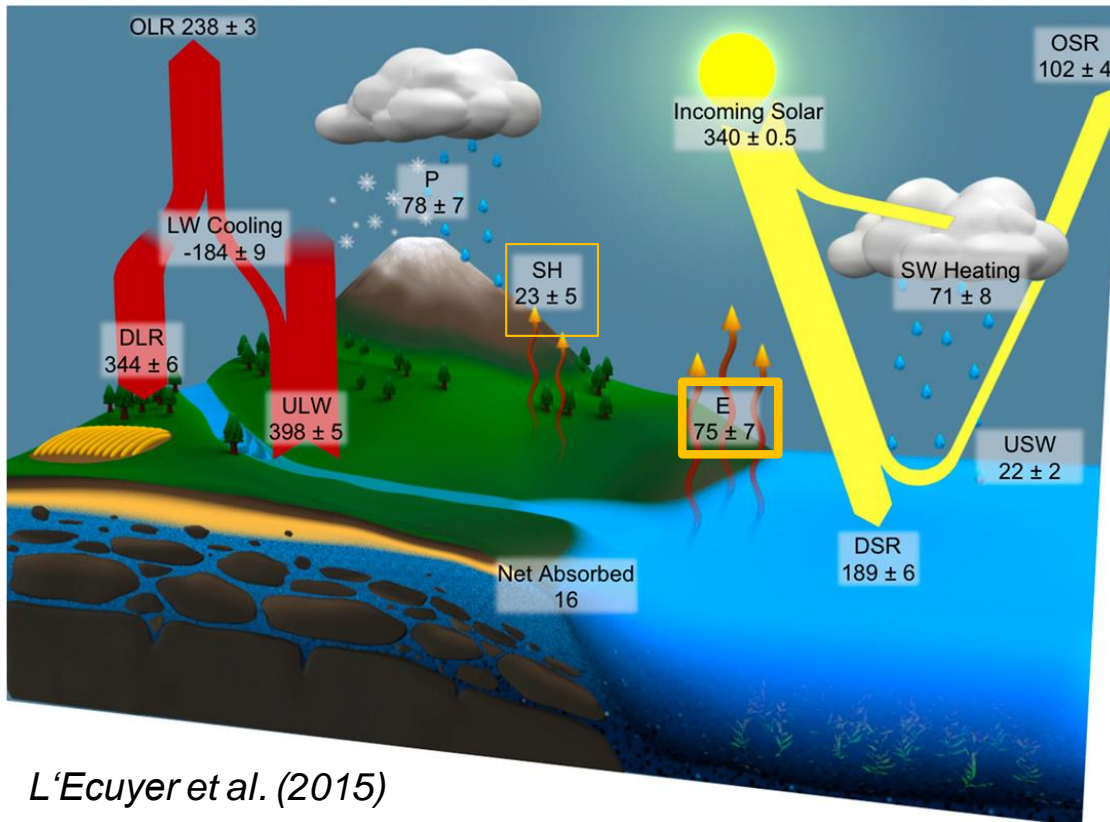
At three Flipchart there is also a list of seeding questions to consider and one Flipchart for general comments:

- **What is used in terms of products and services?**
- **What is missing in terms of products and services?**
- **What can be improved and how?**

- **General comments (here, users have a chance to add what they want, also what they dislike)**

One Flipchart contains the **CM SAF team ideas ideas on future plans. Please tickmark if you **support** the idea and you can add comments as well.**

- Provide sensible heat flux from HOAPS.
- Approach reduction in uncertainties in LHF, SHF, and E (and others).
- Approach geo-ring coverage for land-based flux and evapotranspiration products.
- Combine land-based and ocean-based products into a truly global product.
- Provide ICDR service, e.g., for global precipitation product.
- Extended temporal coverage, backward and forward in time.
- Enhance retrieval quality in high latitudes.

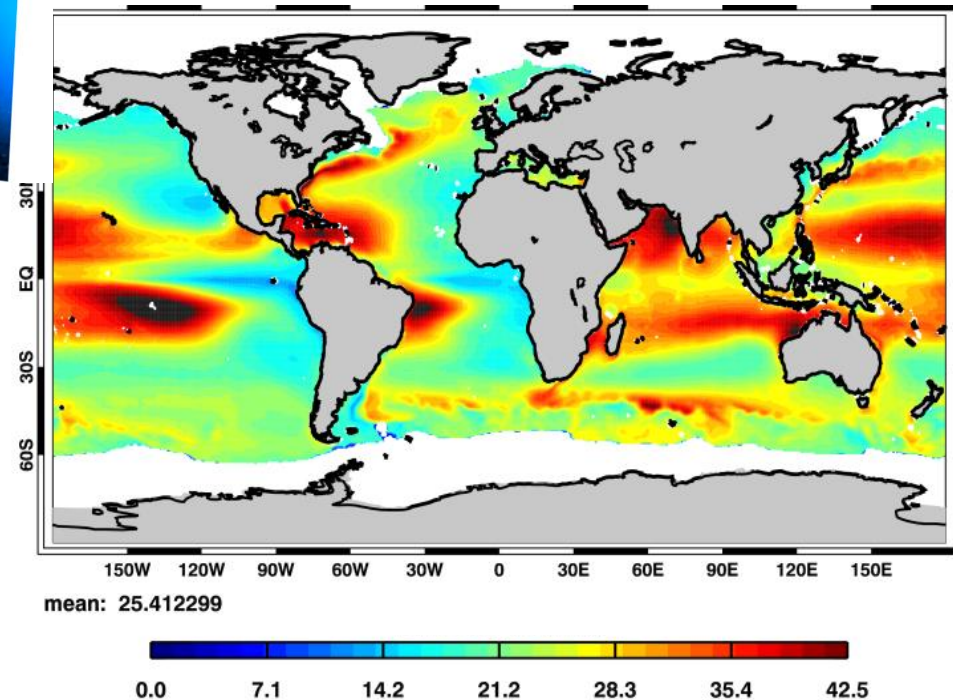
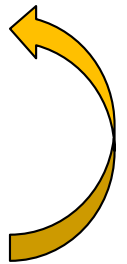


L'Ecuyer et al. (2015)

- Approach uncertainty evaluation.
- Reduce uncertainties.

Uncertainty:

1. Estimation,
2. Validation,
3. Reduction.



Liman et al. (2018)

Conclusions (Bennartz)

- We are dealing with a heavily under-constrained problem and indirect observations.
- Need to make sure we understand the physics of what we are observing. Process understanding must go along with advances in retrieval techniques.
- Statistical methods (e.g. machine learning) only get us so far. Simpler is often better.
- Inter-calibration (e.g. of passive microwave time series) is most crucial to successful long-term time series.
- Intercomparison/assessment efforts are of tremendous value even though there is no ultimate ground truth.

Summary (Andersson)

Satellite data records for turbulent heat fluxes over ocean cover 25+ years

- Still significant differences between data records, although derived from the same satellite instruments

- Uncertainty estimation
 - Methodology has been developed for HOAPS
 - Point to area problem (Satellite pixel vs. Point measurement)
 - Quality of in-situ data?
- How to use the uncertainty information?

- Long term stability? -> FCDRs required

What can be improved and how?

JOINT ASSESSMENTS
(TCWV, P, LWP)

Understanding of
physical processes
(eg cold air outbreaks)

INCLUDE ERRORS CAUSED
BY THE BULK FORMULAE

no $\frac{dP}{dt}$ over $\frac{dP}{dt}$ the derivative of water
vapor (no begin/registration)
also for moisture content
HCDR SERVICE

EXTREMES

BE ABLE TO DOWNLOAD DATA
FOR A LONG TIME SERIES AT
A SINGLE POINT OR LISTINGS
OF ONE POINT FOR TIME POINT

Direct access to
product images
@ homepage

Daily cycle of
precipitation

COMPARE PRECIP OVER
EUROPE WITH CALIBRATED
RADAR NETWORK

IMPROVE τ RETRIEVAL

E-P
closure

Extend HOAPS to
include AMSR-MSR-E
- AMSR-2

Include comparison of
Precip from satellite with
surface radar over Europe
(OPERA) and U.S.A.

HOW DO YOU BENEFIT
FROM GEWEX RAIN
ASSESSMENT FOR PRODUCT
DEVELOPMENT?

Relation with τ retrievals
Sea Surface
Temperature
in CM SAF

ONLINE VERSION OF
R-ToolBox

What can be improved and how?

- Extremes.
- Extend HOAPS to include AMSR, AMSR-E and AMSR-2.
- Relation with reliable sea surface temperature in CM SAF.
- “Joint” assessments (e.g., TCWV and LWP).
- Understanding of physical processes (e.g., cold air outbreaks), hand in hand with retrieval improvement.
- Comparison of precipitation product to ground-based radars over Europe and USA (2x)

What can be improved and how?

- How to benefit from the GEWEX precipitation assessment for product development?
- Daily (or higher) products at regional (WMO RA) resolution in an operational mode at reliable time.
- Resolve diurnal cycle of precipitation.
- Provide sub-daily product (e.g., for diurnal cycle and tracking lifecycle of P events).
- Improve near surface humidity retrieval.
- Include errors caused by bulk formulae (HOAPS).
- E-P closure.

What is missing in terms of product and services?

- Global (land+ocean) products (ET, E, LHF, SHF).
- ICDRs.
- Include uncertainty estimates with CDRs, maybe as ensembles. Correlated errors may be important.
- Product on extreme rainfall events. Are they becoming more frequent in a warming world?
- Light rain and drizzle.
- Early release of evapotranspiration over land.
- In-situ reference data sets.

What is used in terms of products and services?

- Assessments.
- FCDRs and intercalibration.
- Who is the customer for the precipitation product (climate modellers vs hydrologists)?

...related to CM SAF services

- Direct access to product images at homepage
- Add direct ftp link to make the download of data easier (no registration).
- Allow massive data access.
- Be able to download data for a long time series as a single netCDF file.
- Online version of R-Toolbox.

- Use GEWEX as neutral broker.
- Stay close to observation capabilities.
- Compare observations with models with observation simulator.
- Relation between cloud microphysics and precipitation.

Thanks for all the valuable feedback!

Thanks for listening!