SMOS Cal/Val Campaign 2010
in the Rur and Erft catchments

Carsten Montzka¹, Heye Bogena¹, Lutz Weihermueller¹, Francois Jonard¹, Marin Dimitrov¹, Catherine Bouzinac², Juha Kainulainen³, Jan E. Balling⁴, Erkka Rouhe³, Jan Vanderborght¹ and Harry Vereecken¹

(1)Research Centre Jülich, Agrosphere Institute (ICG 4), Leo-Brandt-Strasse, 52425 Jülich, GERMANY
(2)European Space Agency, ESTEC, Noordwijk, THE NETHERLANDS
(3)Helsinki University of Technology, Department of Radio Science and Engineering, Espoo, FINLAND
(4)Technical University of Denmark, DTU Space, Microwaves and Remote Sensing, DENMARK
Scales of SMOS Cal/Val

- Satellite data
- Long term measurements
- Regionalisation by modelling
- Airborne campaigns
  - Momentary imaging
- Test sites
  - Long term measurements
- Regional
- Local
- Global
TERENO test sites

Grassland test site „Rollesbroich“
- Eddy Correlation station
- Soil moisture measurements
- Soil temperature measurements
- Soil CO$_2$ flux measurements

Forest test site “Wüstebach”
- Eddy Correlation station
- Soil moisture sensor network
- Soil temperature measurements
- Groundwater monitoring
- Runoff and solute monitoring
- Soil CO$_2$ Flux measurements

Agricultural test site „Selhausen“
- Eddy Correlation station
- Soil moisture measurements
- Soil temperature measurements
- Soil CO$_2$ flux measurements
- Ground-based remote sensing
- LIDAR
- Microwave scintillometer
- Tethered balloon
- Automated small aircraft

26 November 2010
Instrumentation of the test site Wüstebach
Radiative transfer via modified L-MEB model

Modelled soil moisture

L-MEB input:
- Vegetation optical depth
- Surface roughness
- Soil surface temperature
- Canopy temperature
- ...

Modelled brightness temperature

Brightness temperature 04/02/2008 5:00
Radiative transfer via modified L-MEB model

Modelled soil moisture

Airborne brightness temperature

Modelled brightness temperature

Soil Moisture in top 5cm soil layer 04/02/20

Airborne Brightness Temperatures 04/02/20

Brightness temperature 04/02/2008 5:00
Mobile ground-based L-band radiometer
Mobile ground-based L-band radiometer
Airborne measurements with the Short Skyvan of Aalto University Helsinki
TIR camera

MPI Hamburg
(Alexander Löw)

Processing:
LMU Munich
(Johanna Dall’Amico)
EMIRAD Radiometer

Technical University of Denmark
HUT-2D Radiometer

Aalto University Helsinki
HUT-2D airborne Radiometer results
Soil moisture and JÜLBARA data at Selhausen
Radiometer
Radiometer + SMOS
Radio Frequency Interferences (RFI)
Outlook: Data assimilation for radiative transfer

- SMOS Level-2-Prozessor uses L-MEB
- Parameters like vegetation optical depth or surface roughness must be available area-wide
- In the L2-Processor at the moment just lump-sum values of these parameters are used with an insufficient accuracy

⇒ Data assimilation techniques are able to estimate parameters automatically during the processing
⇒ It is possible to implement a data assimilation procedure in the processing chain for operational estimations
Data assimilation system

Soil Moisture

Calibration/Validation

CLM
COMMUNITY LAND MODEL

Calibration/Validation

In situ measurement.

Brightness Temp.

L-MEB/
SMOS L2 Processor
=> N Realisations

Parameter Estimation/Evolution:
- Vegetation optical depth
- Surface roughness
- …

Agrosphere Institute (IBG 3)
Thanks for your attention!