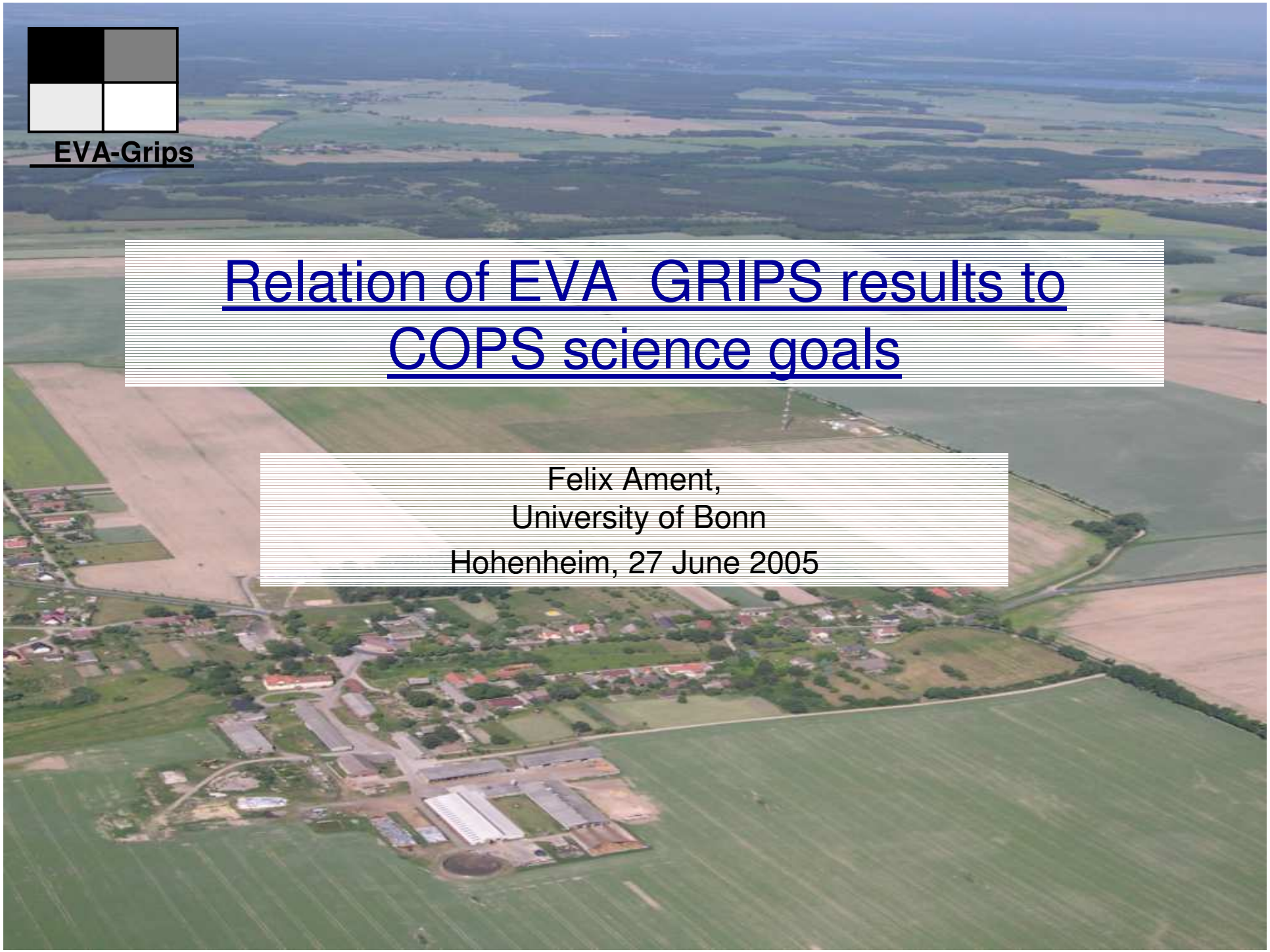


EVA-Grips

Relation of EVA GRIPS results to COPS science goals

Felix Ament,
University of Bonn

Hohenheim, 27 June 2005

EVA-Grips

The EVA GRIPS project

"Evaporation at the Grid/Pixel scale over heterogeneous terrain"

- joint project funded by BMBF in the framework of DEKLIM.
- finished since December 2004
- results will be published in a special issue of "Boundary-Layer Meteorology"
- key component: LITFASS-2003 experiment

DEKLIM

H.-T. Mengelkamp, S. Hunecke, K.-P. Johnson, H. Lohse

F. Beyrich, J.P. Leps

T. Foken, M. Mauder, C. Liebethal

J. Bange, P. Zittel, T. Spiess

B. Hennemuth

S. Raasch, J. Uhlenbrock

F. Berger, C. Herret, A. Tittebrand

G. Heinemann

C. Simmer, F. Ament

EVA-Grips

LITFASS-2003 experiment

(19. May – 17. June 2003)

Models

Measurements

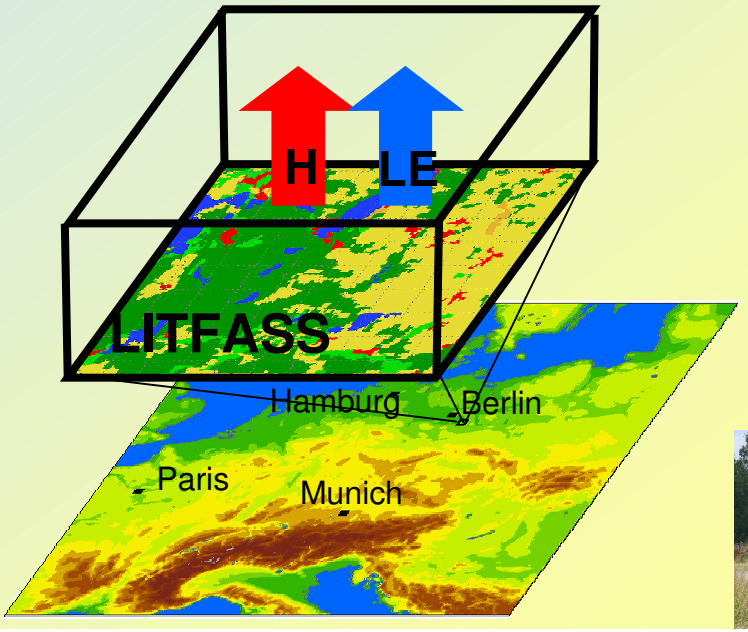
“Description of area averaged surface fluxes and boundary layer development”

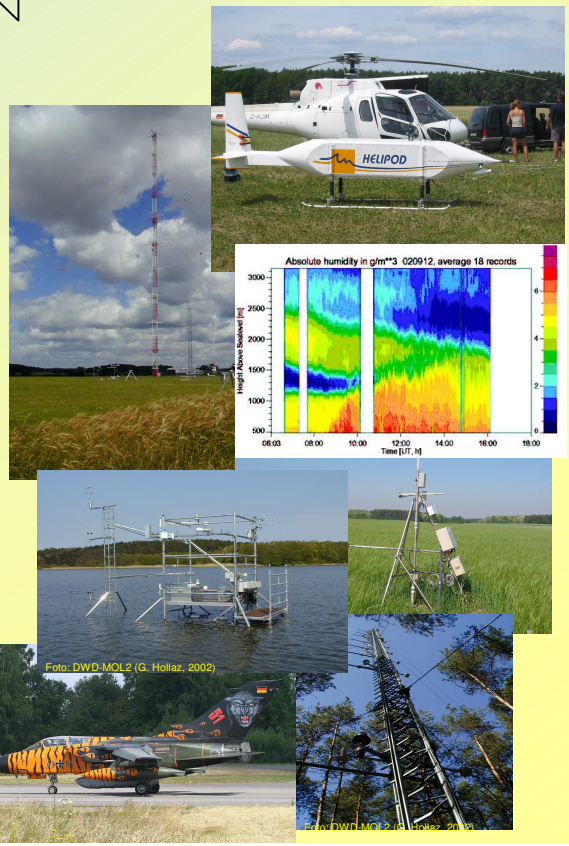
REMO

LM

FOOT 3dK

LES PALM





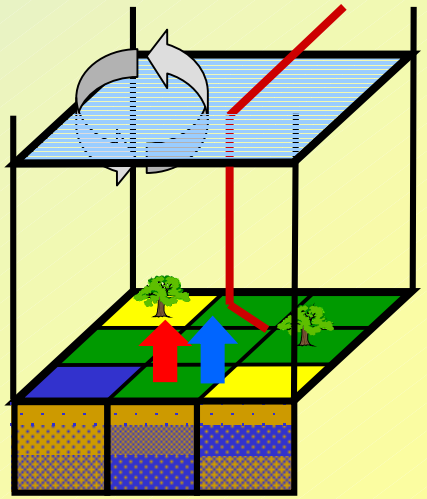
EVA-Grips

EVA Grips meets COPS

(Behrendt et al.)

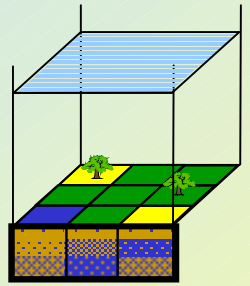
Development of a convective environment:

- Entrainment
- ABL profiles
- Surface fluxes
- Soil moisture

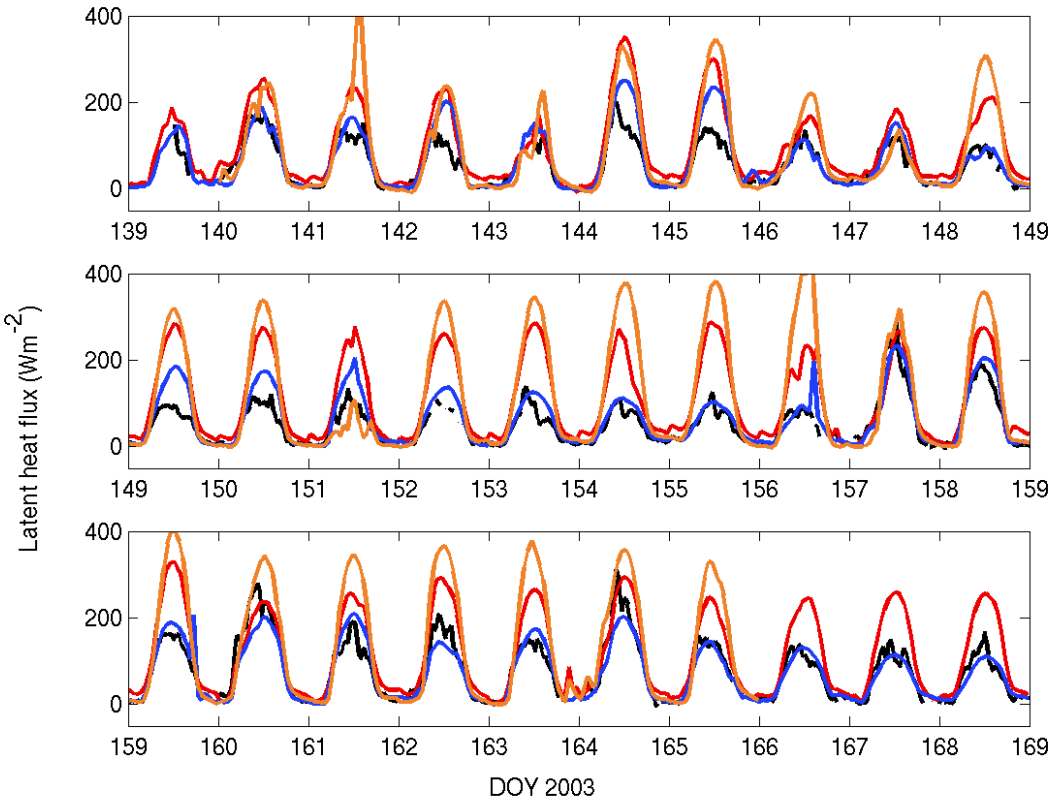


EVA-Grips

Impact of soil moisture on evapotranspiration



LITFASS domain average

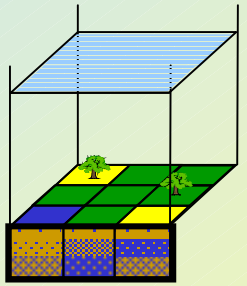


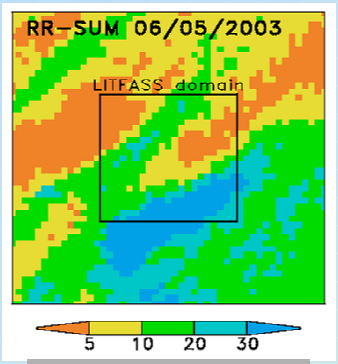
REMO	ECMWF SM analysis
LM	DWD SM analysis
LM	Measurement forced SM analysis (MSMA)

—— Composite of 14 eddy-covariance stations

EVA-Grips

Soil moisture feedback

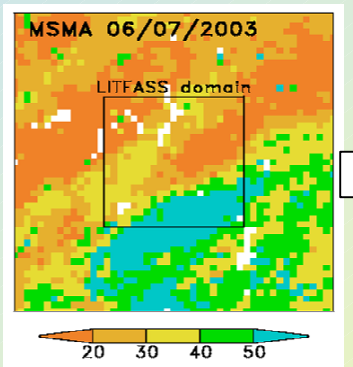




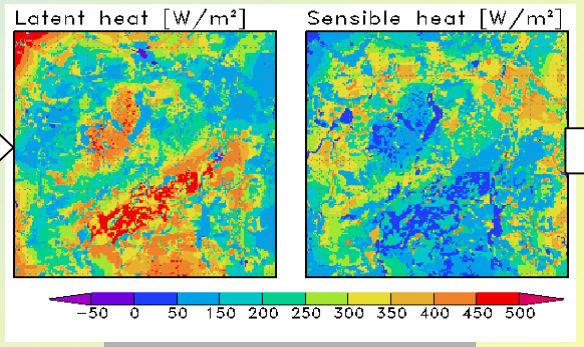
Precipitation

Strong convective rain event on 06/05/2003

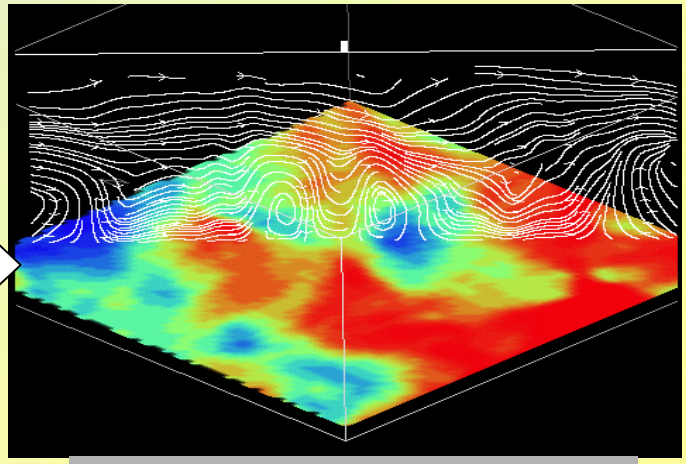
2 days later



Soil moisture



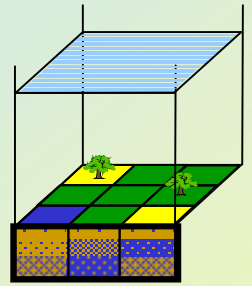
Surfaces fluxes

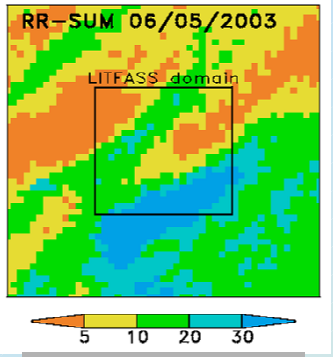


ABL circulation

Soil moisture feedback

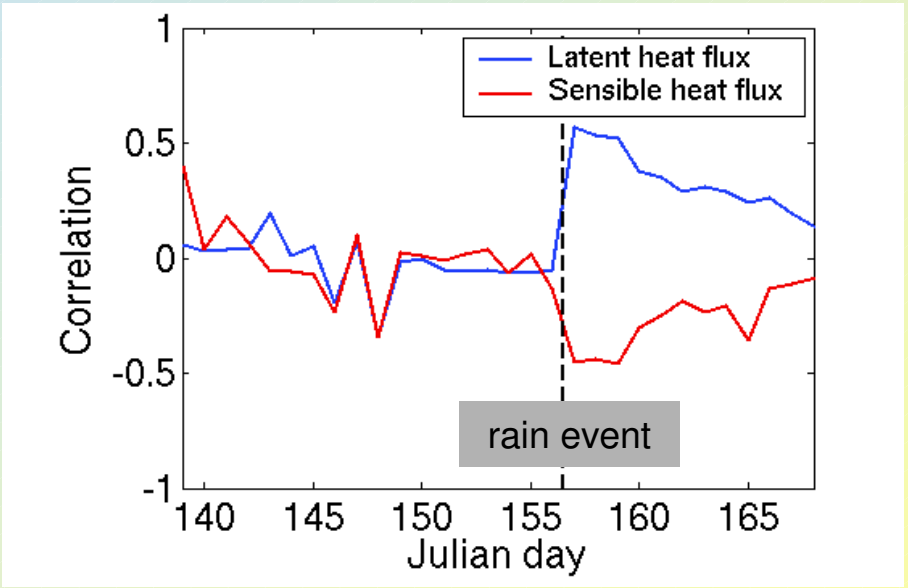
EVA-Grips



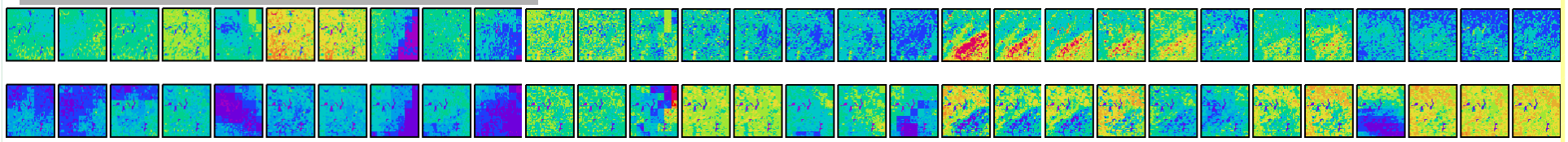


Precipitation

Pattern-correlation



Latent and sensible heat flux

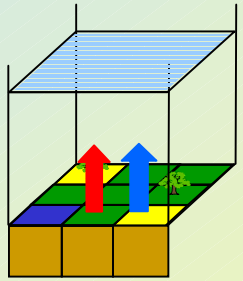


LITFASS-2003 period

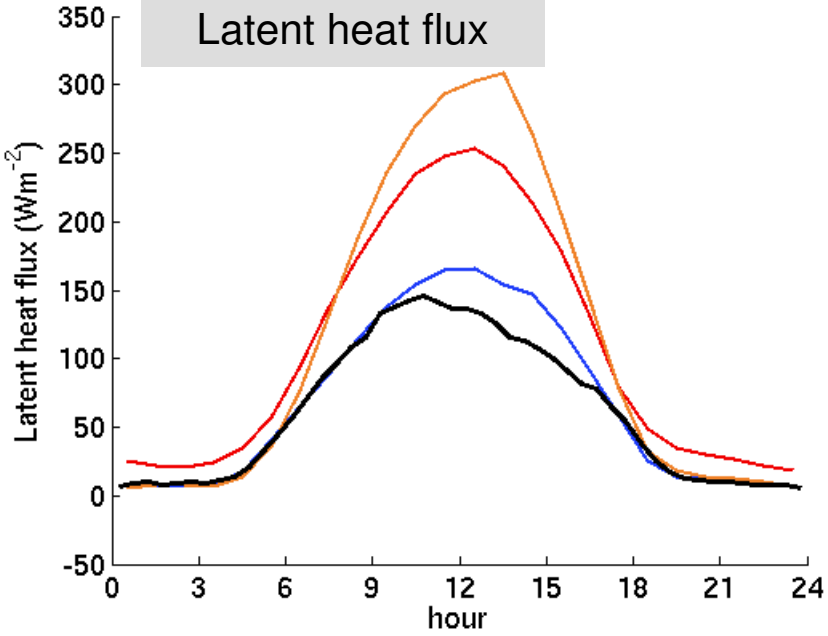
time

EVA-Grips

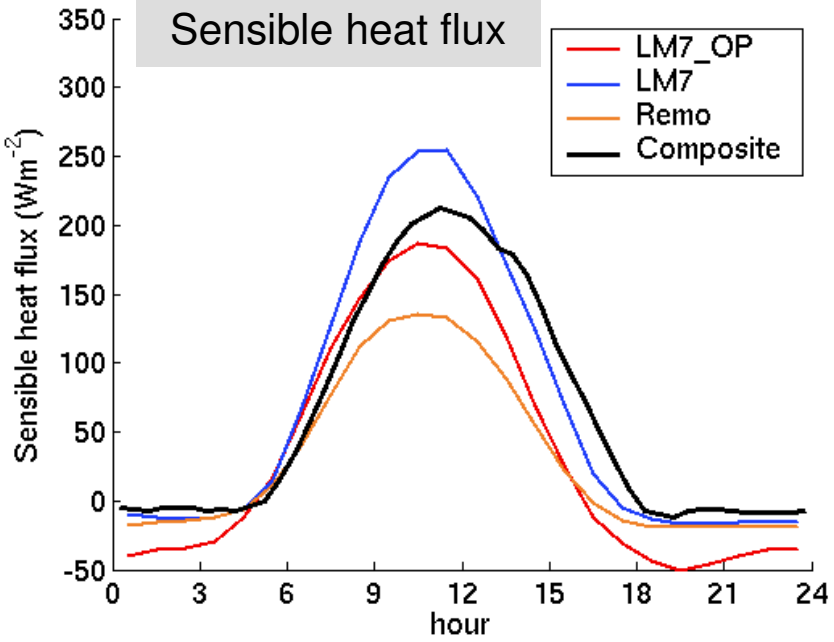
Mean daily cycle



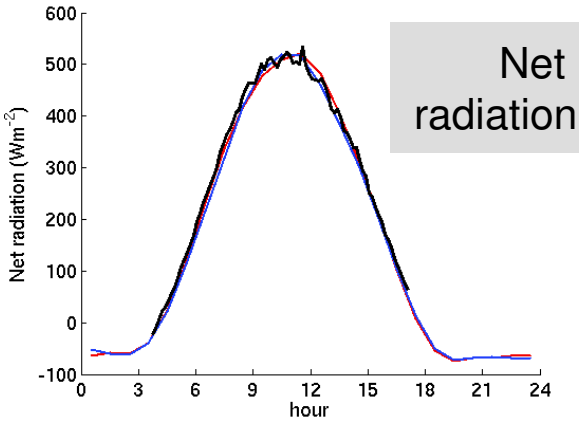
Latent heat flux



Sensible heat flux



Net radiation



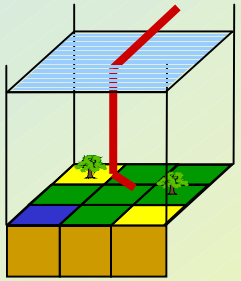
(Mean over 30 days and LITFASS domain).

→ Phase error in latent and sensible heat flux.

→ Reduction in λE in the afternoon especially above forest (not shown).

EVA-Grips

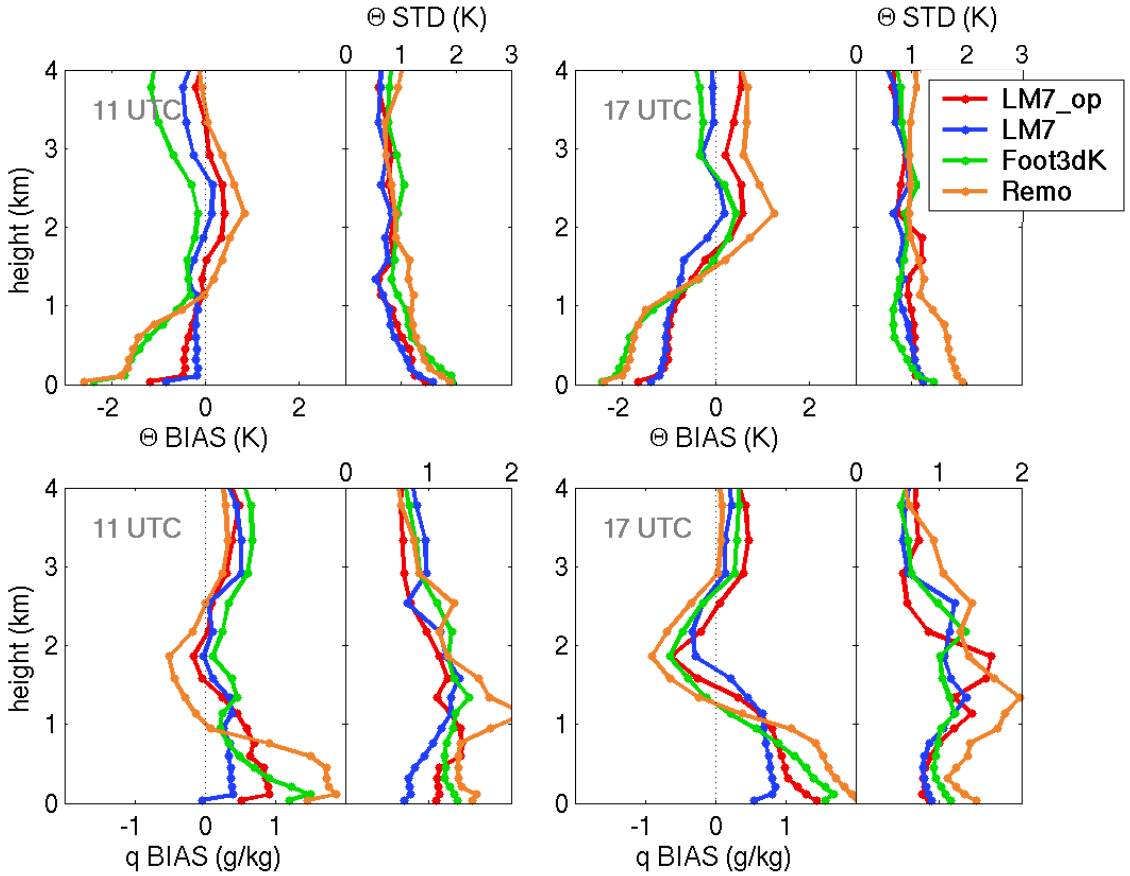
Validation using radiosonde data



BIAS and standard deviation of modeled temperature and humidity profiles

Pot. Temperature

humidity



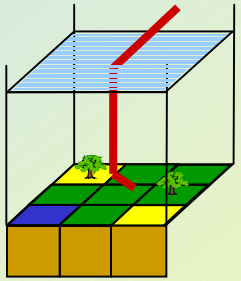
Modeled ABL is

- too cold
- too wet
- too thin

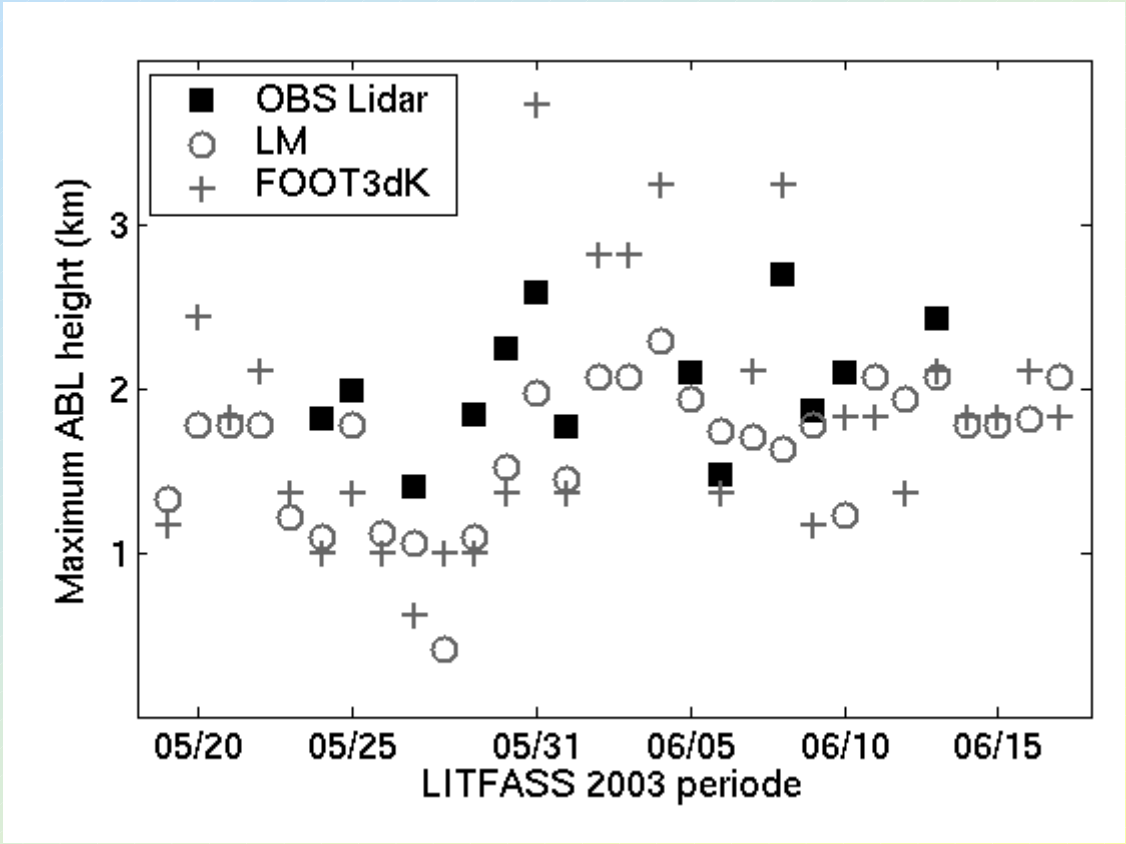
(sample size: 24 days of LITFASS-2003)

EVA-Grips

Boundary layer height



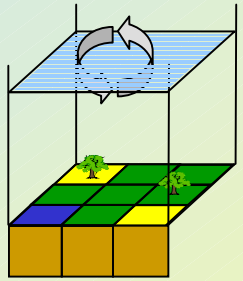
Comparison of modeled daily maximum ABL heights with **DIAL observations**.



• Again, modeled ABL heights are too low.

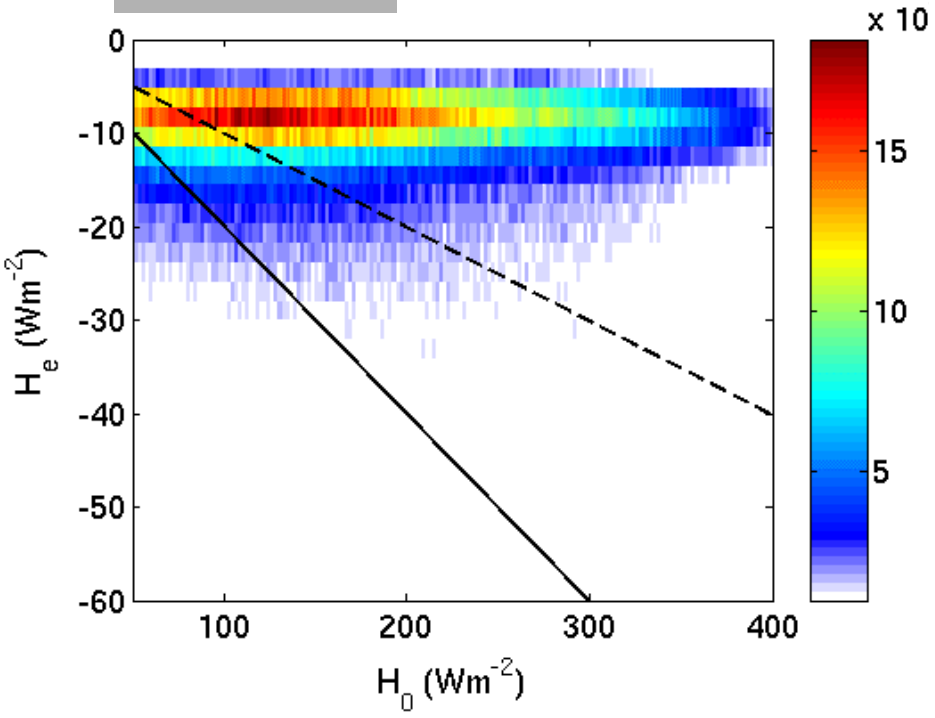
EVA-Grips

Entrainment fluxes

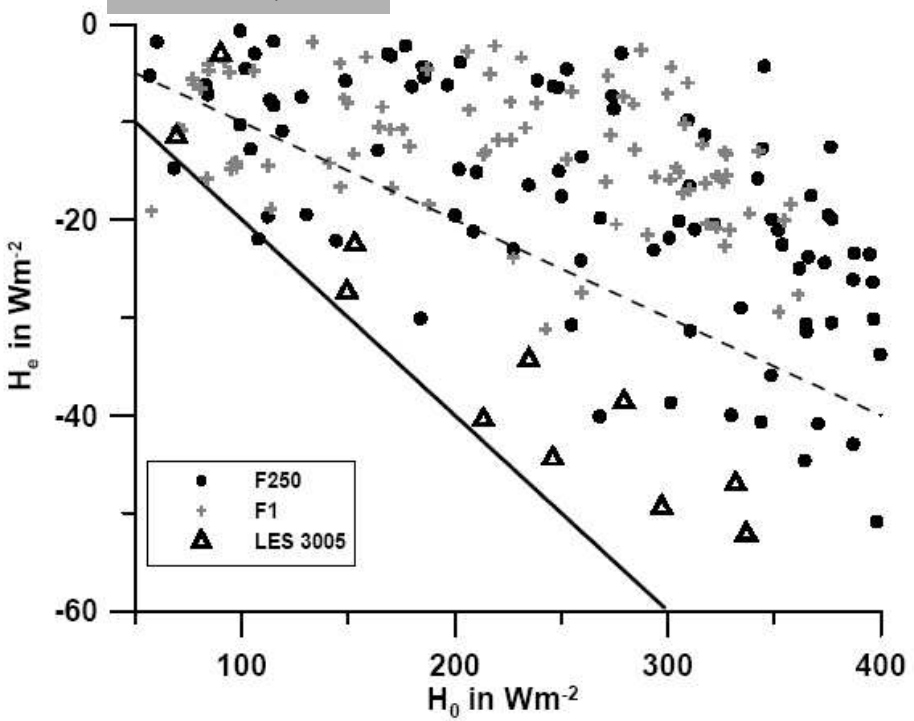


PDF of modeled **entrainment flux H_e** and **surface heat flux H_o**.

LM



Foot3dK, LES

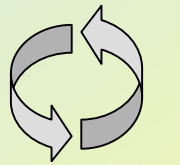


- LM shows no relation between H_e and H_0.
- Both mesoscale models underestimate the entrainment flux.

EVA-Grips

Conclusions

- **Entrainment** is strongly underestimated. (solutions: shallow convection scheme, non local closure, horizontal diffusion, …?)



- Modeled ABLs tend to be **too wet, too cold** and **too thin**. (reasons: surface fluxes, entrainment?)

- **Phase shift** in fluxes observed. Can this result form LITFASS be generalized?

- Accurate **soil moisture analysis** are essential (e.g. MSMA). Precipitation induced **SM structures** influence atmospheric circulations.