Impact of the soil-vegetation model on CLM simulations

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Motivation

erformance of long term simulations with CLM on regional scale

nd-atmosphere feedback becomes very important on that scale

vestigation of the influence of soil - vegetation model on PBL (ne
urface conditions, convection)

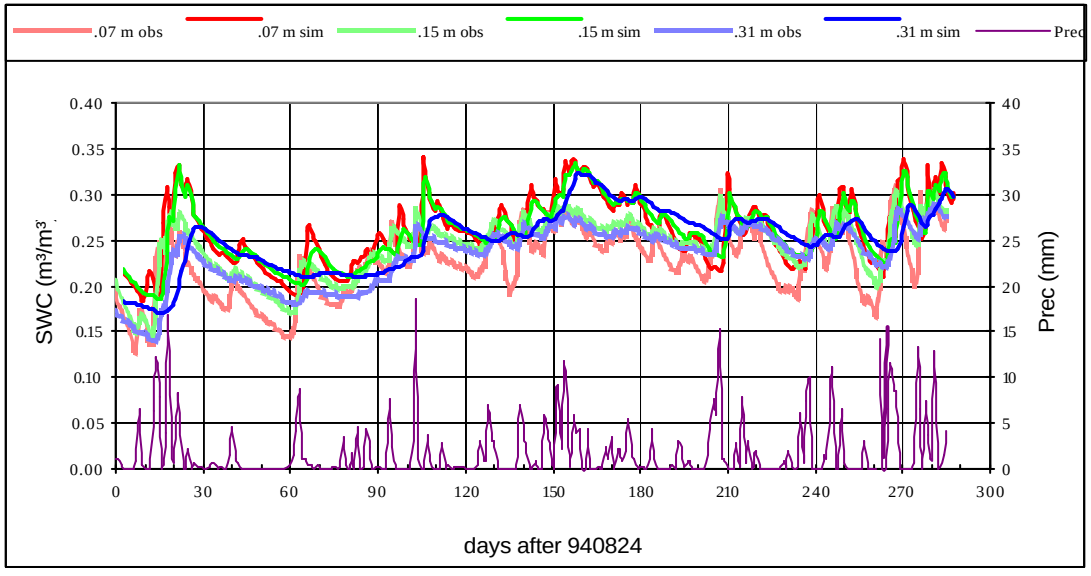
omparison of simulations with the TERRA_LM and the VEG3D fr
e KAMM model

Why use the VEG3D?

- Explicit modelling of vegetation layer (big leaf concept)

  => Better simulation of e. g. temperature and humidity over hig vegetation expected

- reliable long term behaviour shown in different simulations



Differences between the two models

Vegetation

G3D has a vegetation temperature

RRA_LM uses the surface temperature for
spiration calculation

erent calculation of transfer coefficients for
t and moisture in both models

Water Transport

- Different formulations of hydraulic conduc
  and hydraulic diffusivity
  - VEG3D: Van Genuchten
  - TERRA_LM: Rijtema
- Reduction of water transport by ice in bot
  models in different ways
- Runoff from soil layers

Snow

- Snow temperature coupling with radiation more complex in VEG3D
- Both models calculate prognostic snow density and snow albedo aging with very different equations

Model comparison

tand-alone-version to compare long term behaviour

- Data from different stations:
  - Reklip (grassland)
  - LOTREX-10E Field Experiment Hildesheimer Börde (wheat)
  - Freiburg (forest)

imulations and comparison with observations of the CLM for outhwest Germany

- Normal radiation days
- days with convection
- snow days

ng term simulations with the CLM for several years

finished

in work

Comparison stand-alone-version

atest version of soil model TERRA_LM is used

ame values for vegetation parameters like e.g. leaf area index, p
over

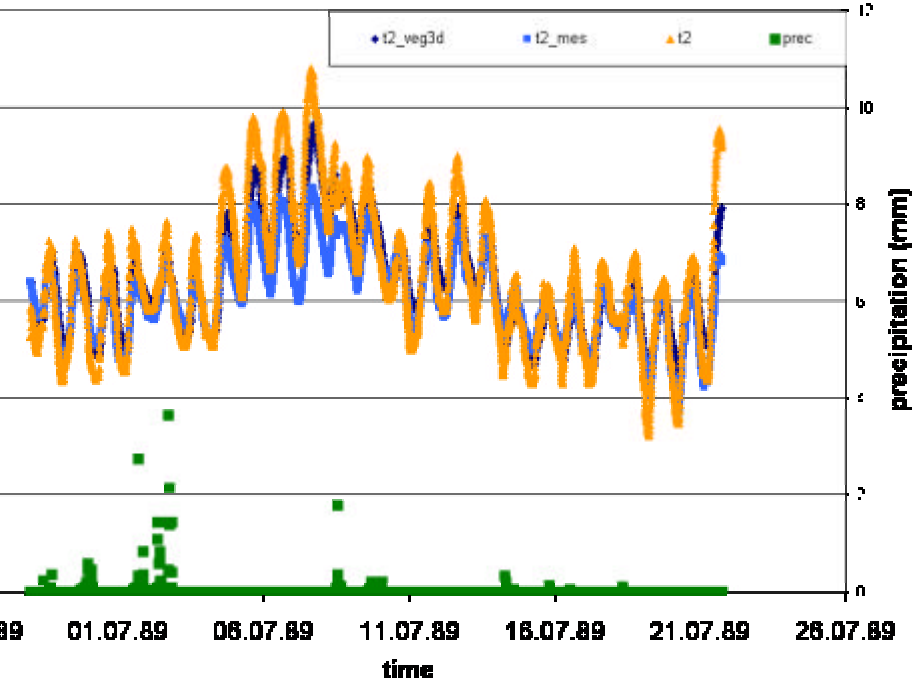
ame soil type in both models where possible

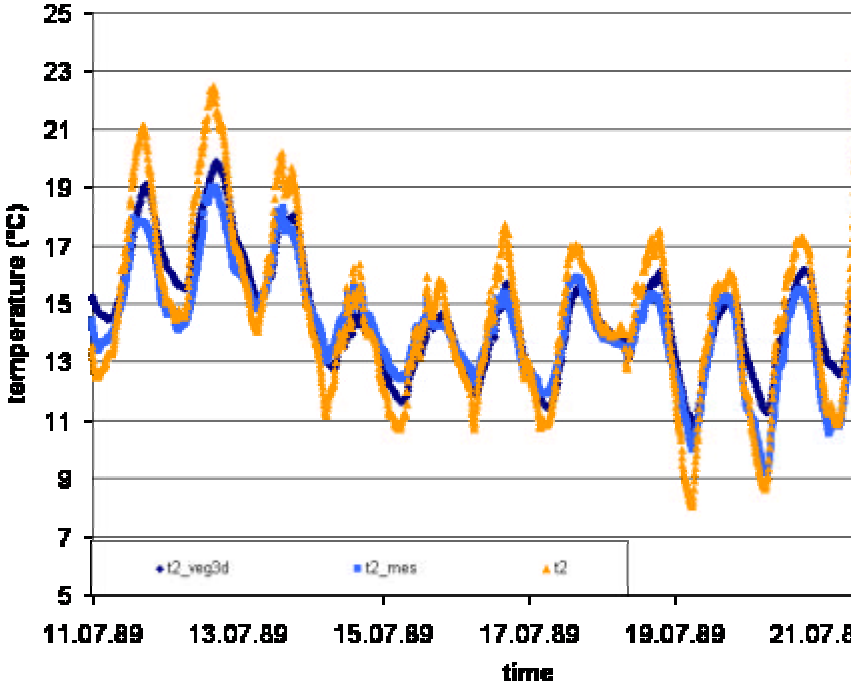
easurement site at wheat field in Hildesheimer Börde (LOTREX
ummer 1989

oil type VEG3D : silt loam TERRA_LM : clay loam

easured water content is an average over 20 cm

Temperature in 3 cm

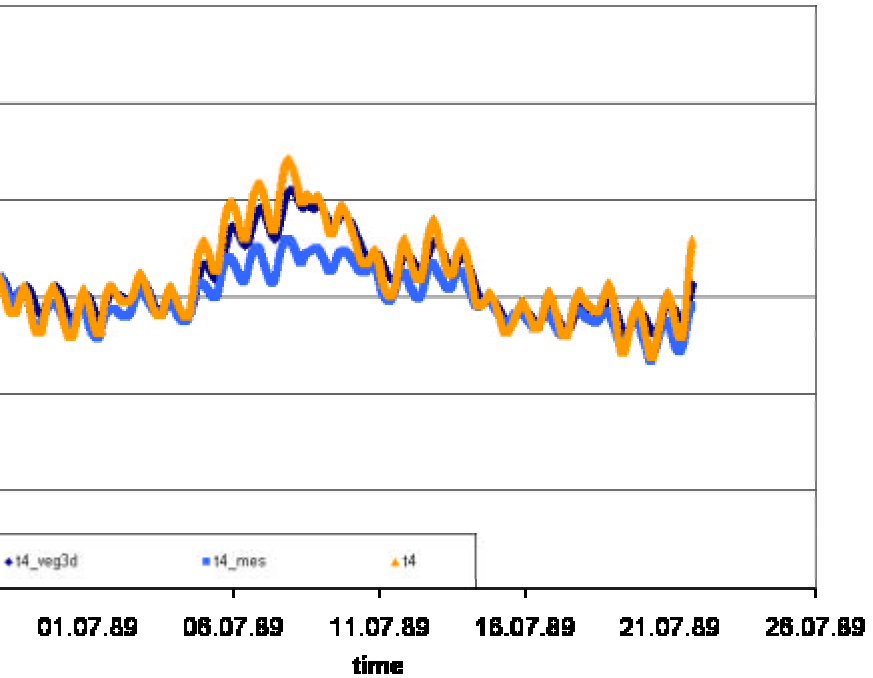




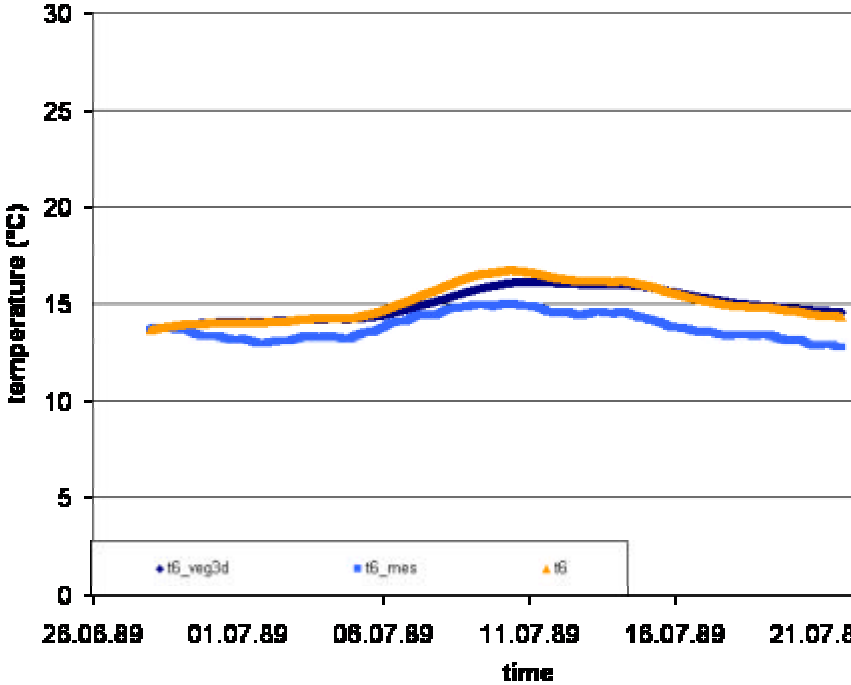
VEG3D measurement TERRA_LM

TERRA_LM too warm during dry periods

Temperature 15 cm

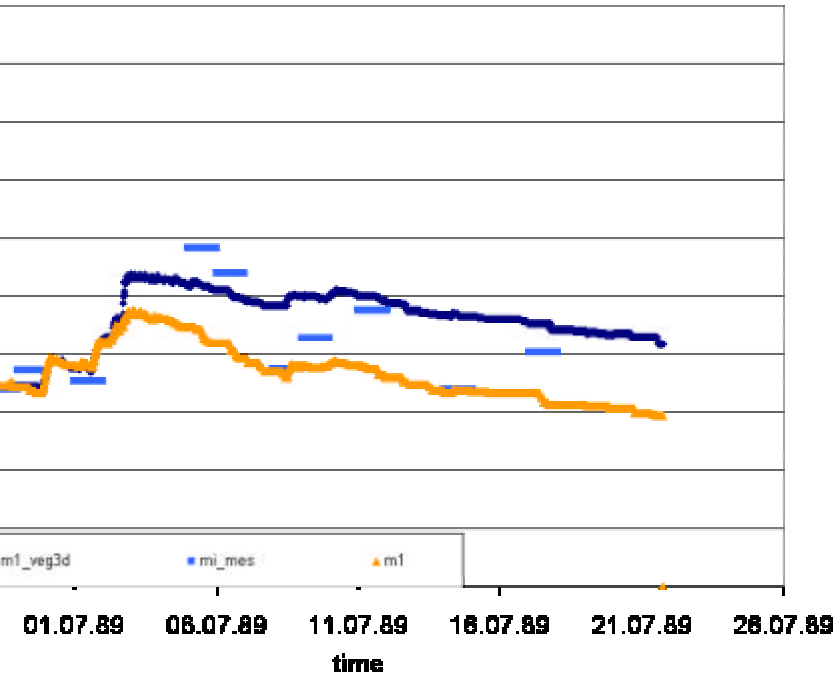


Temperature 60 cm

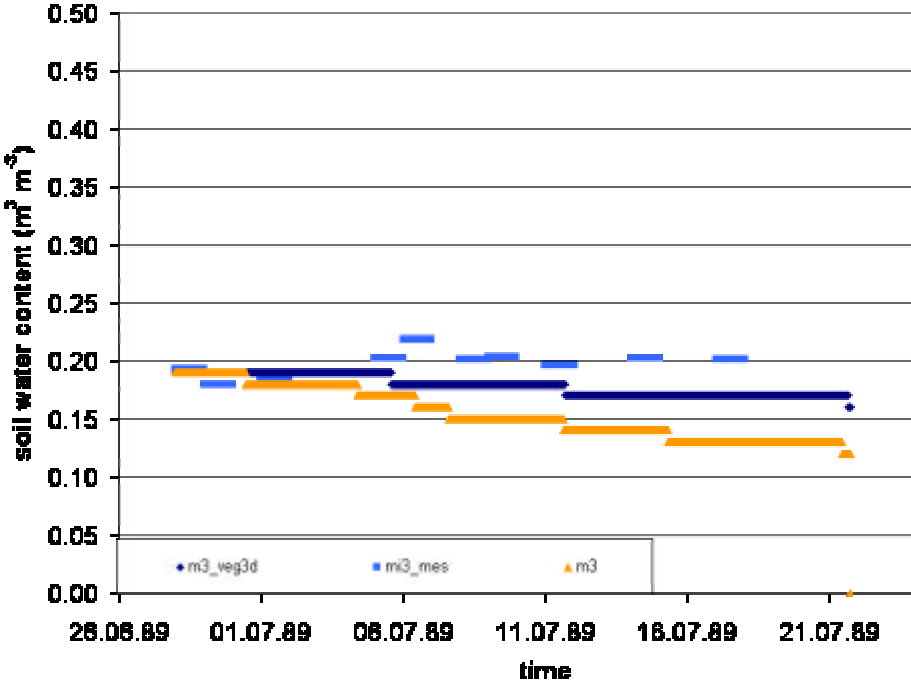


VEG3D measurement TERRA_LM

Water content 0 – 20 cm

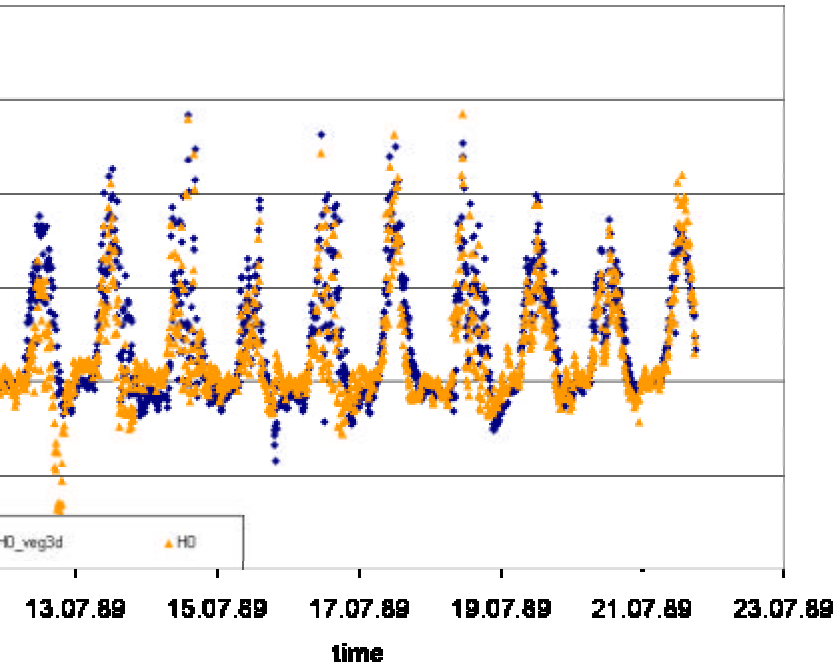


Water content 40 - 60 cm

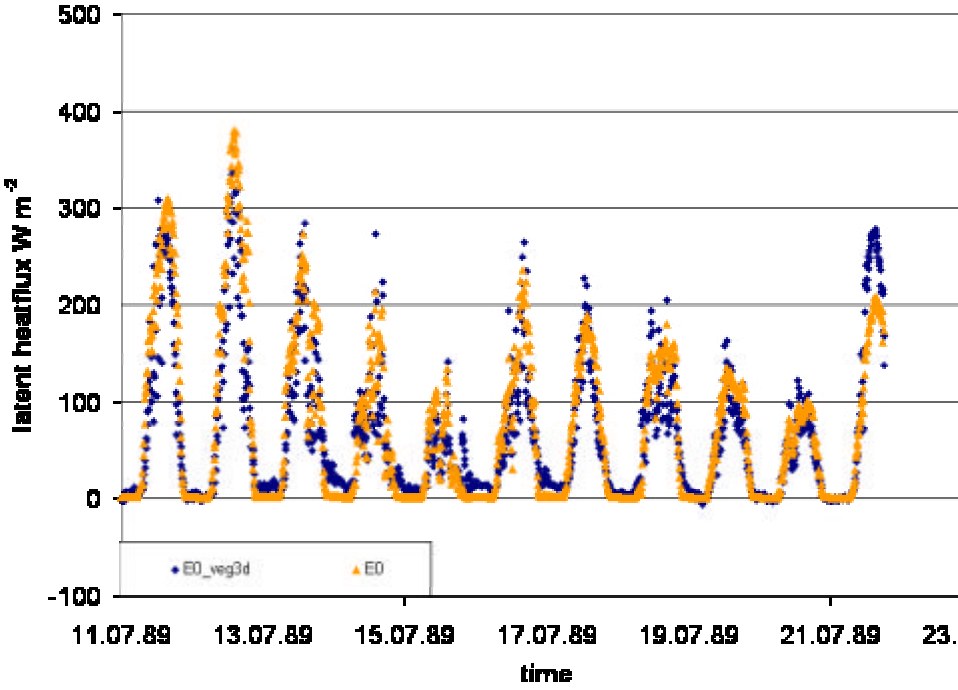


VEG3D measurement TERRA_LM

sensible heat flux



latent heat flux



VEG3D TERRA_LM

models are very sensitive to changes in plant characteristics

Comparison of CLM simulations for south west Germany

mulations with CLM for a day with normal radiation (19.06.2005)

id resolution 7km

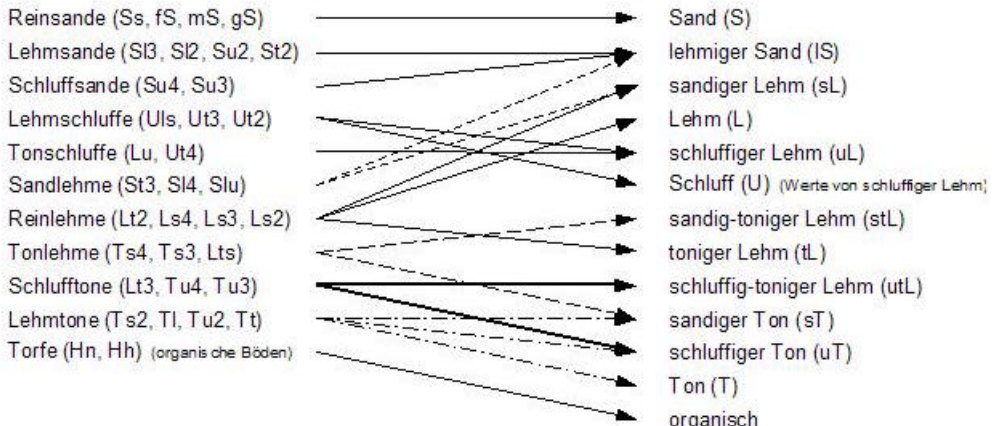
eg3d land use data from GLCC data set

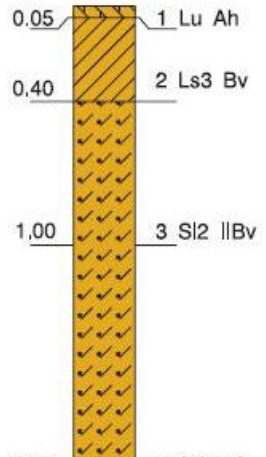
- Veg3d has only 14 land use classes

oil type in Veg3d and Terra_LM is the same

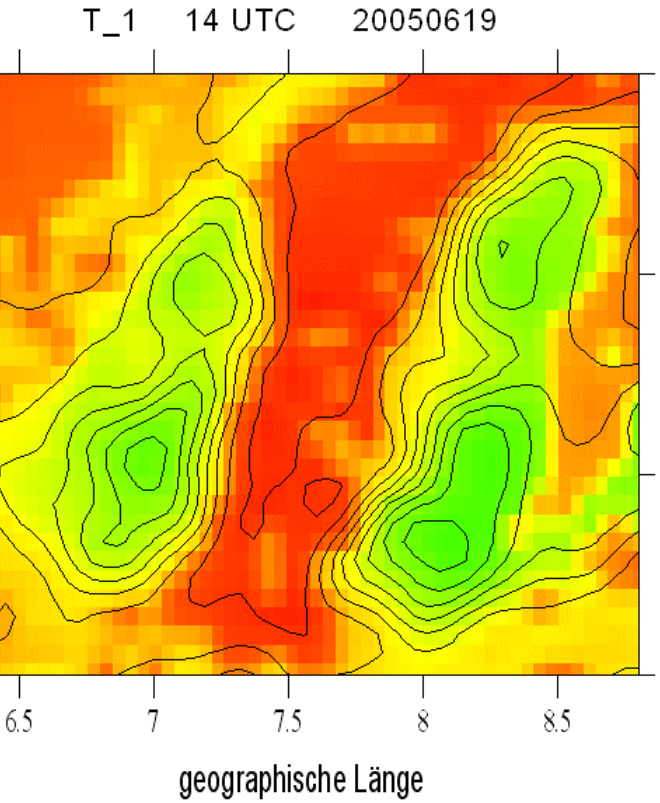
- Possibility to use different soil types within a soil column in Veg3d

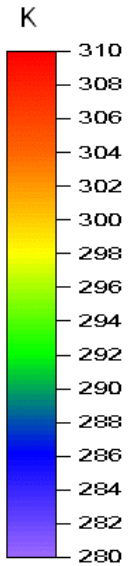
(soil horizons from “Hydrologischer Atlas Deutschland”)



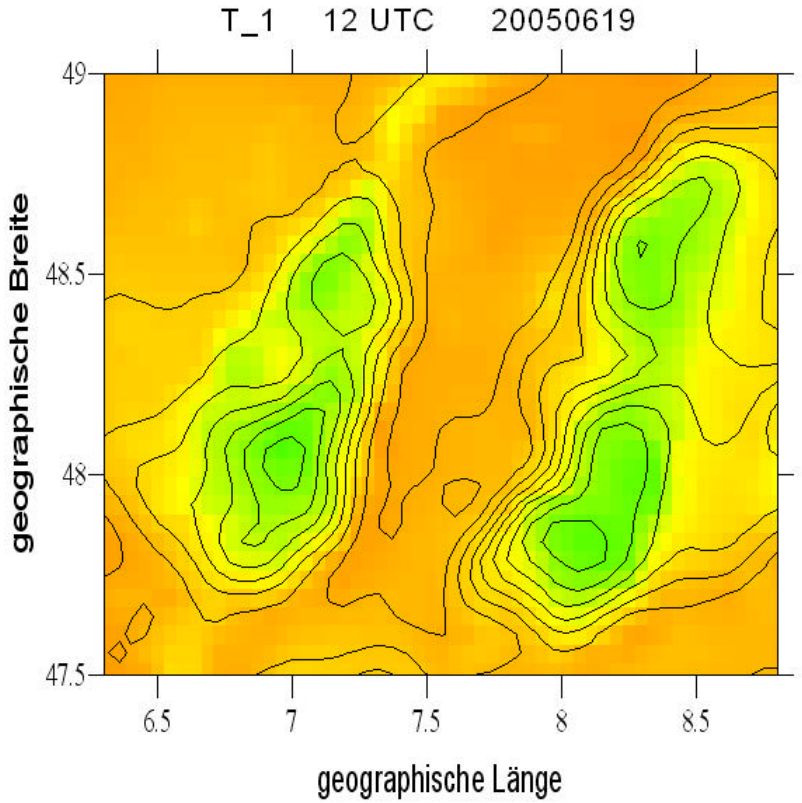


VEG3D



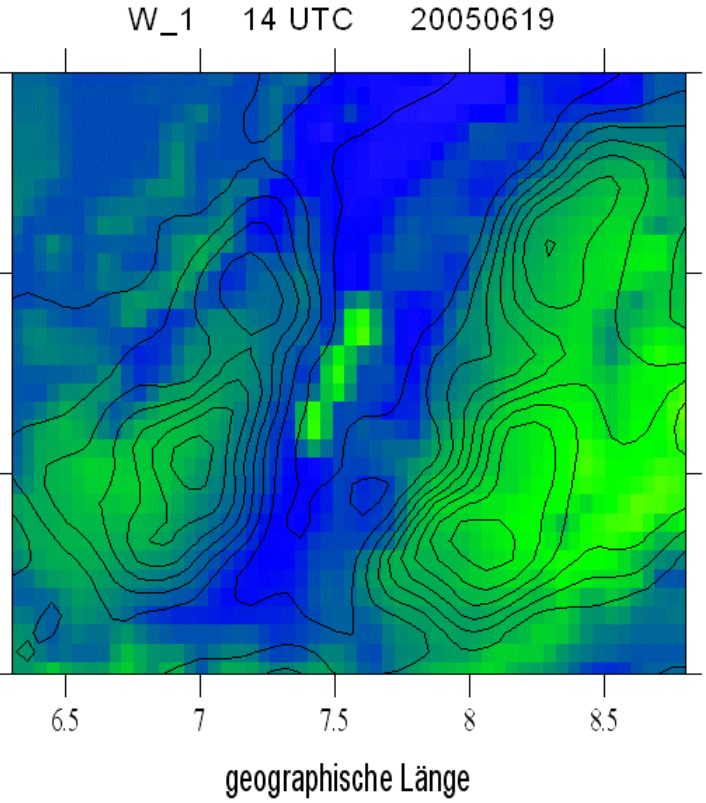


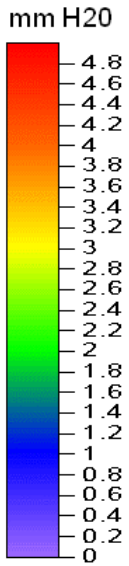
TERRA_LM



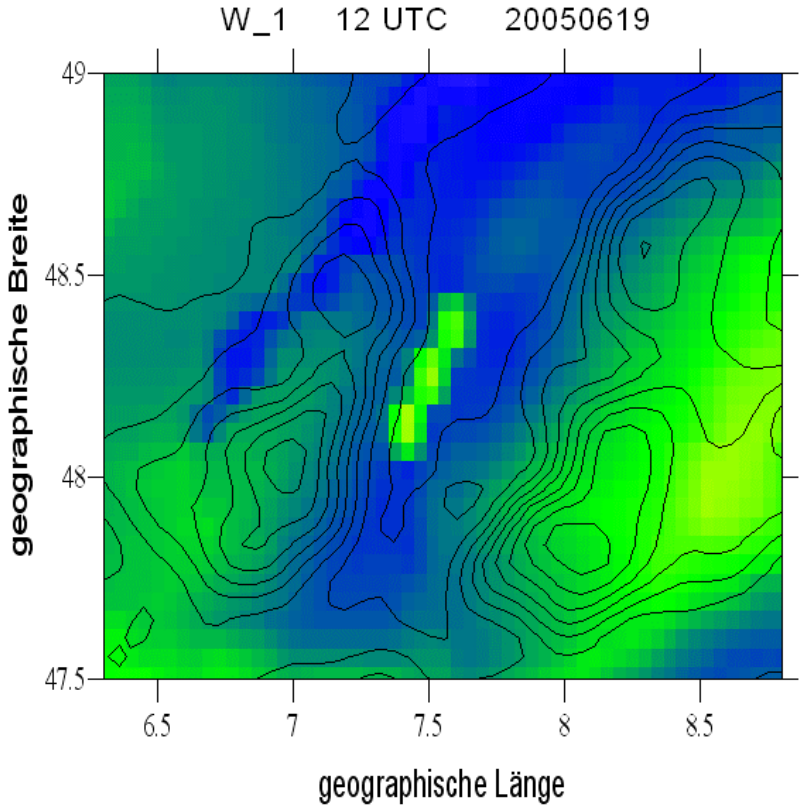
Temperature of first soil layer more structured in Veg3d

VEG3D



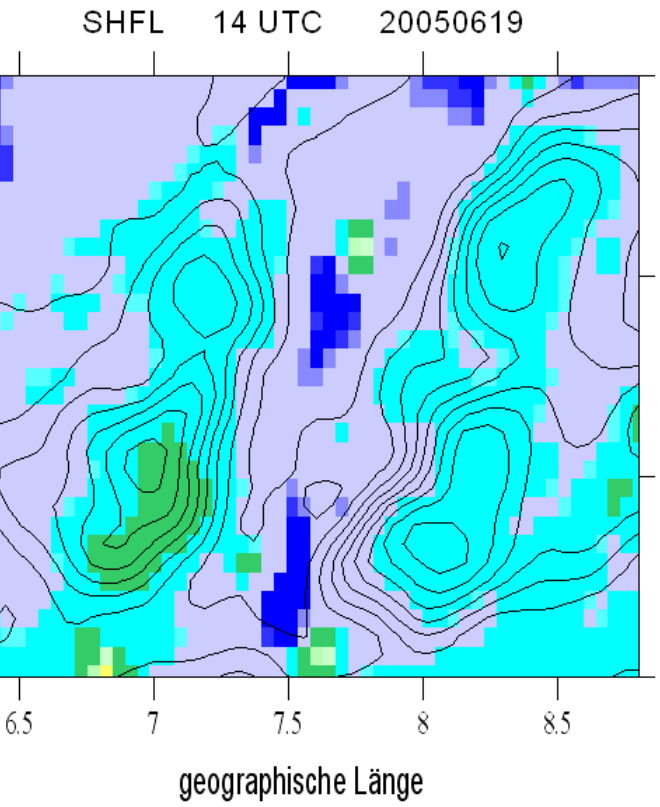


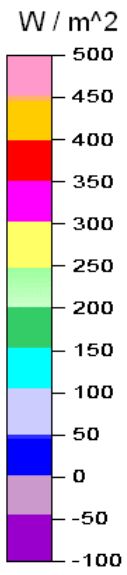
TERRA_LM



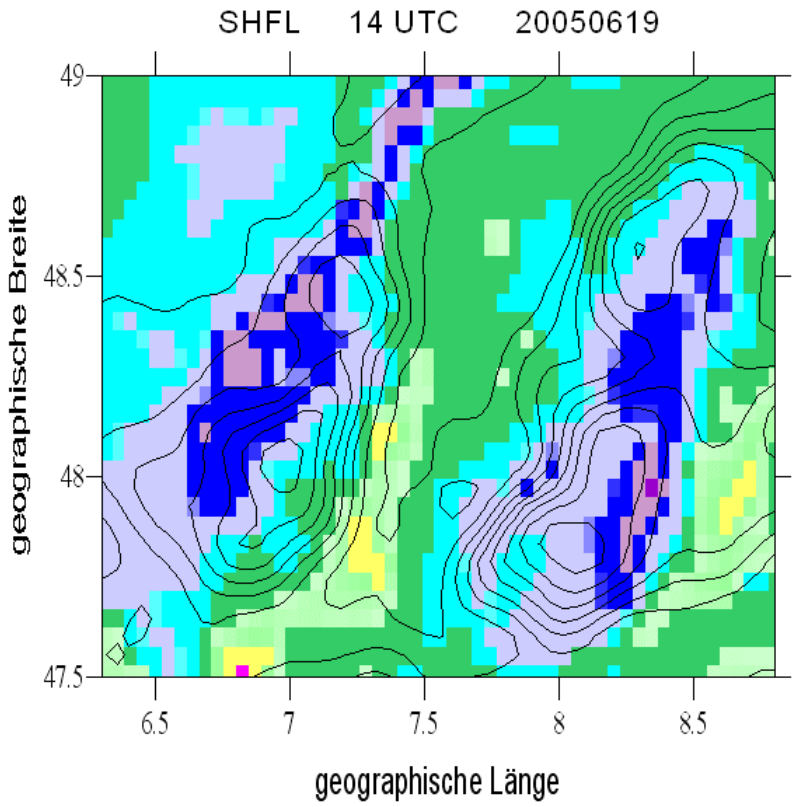
Humidity of first soil layer very similar in both models

VEG3D



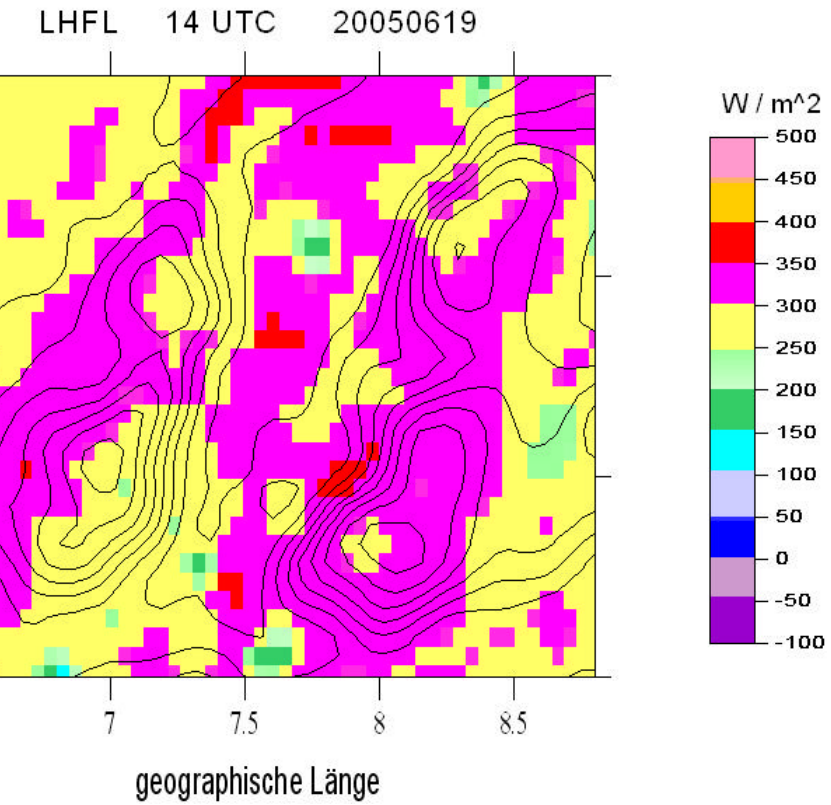


TERRA_LM

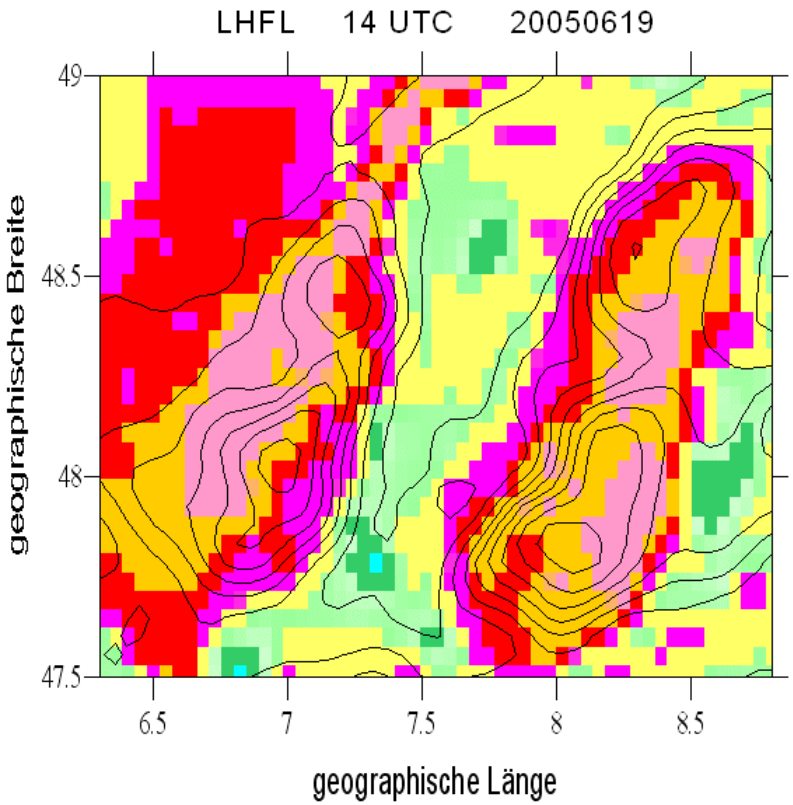


Lower sensible heat flux over forest in TERRA_LM

VEG3D



TERRA_LM



Higher latent heat flux over forest in TERRA_LM

Conclusions

xpected different behaviour of both soil-vegetation models c
gh vegetation can be seen in stand alone version and CLM
mulation

urther simulations have to be conducted

- Stand alone comparison for other land use classes (e.g. for
- Comparison for snow and freezing periods
- long term simulations (waiting for new LM / CLM model vers