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COSMO

Review of land-surface activities

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COSMO Surface activities

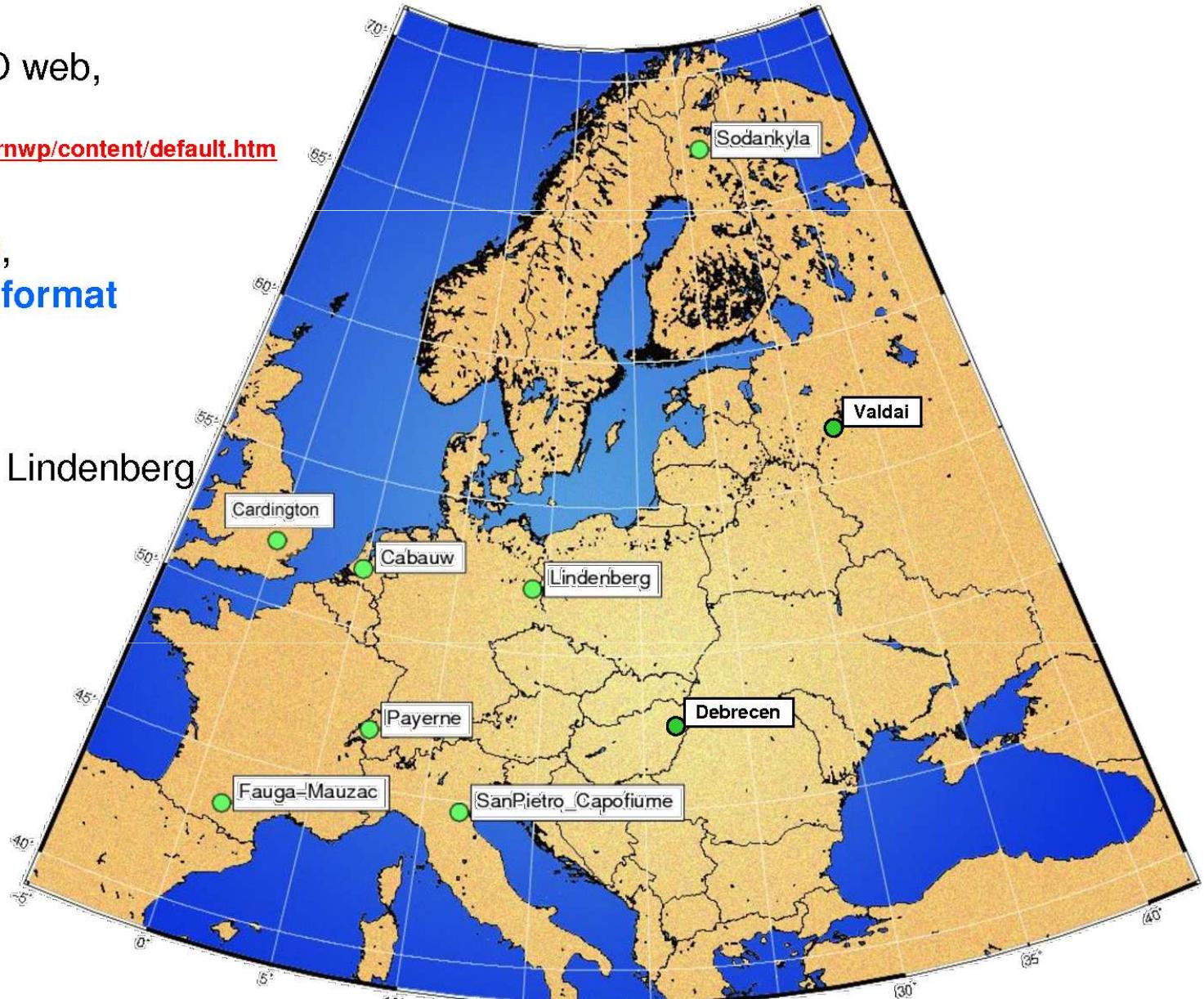
Summary 1

- Permanent activities
 - **Data pool action** (data base of soil & surface observations)
 - Coordination of **EXTPAR** development (generation of external parameters)
 - Link with **SOILVEG** (CLM community)
- PT and PP
 - PP **CALMO** (calibration of COSMO model)
 - **PT SNOWE** (snow water equivalent for analysis)
- Recent developments ready for operations,
available in **EXTPAR 2.0 / INT2LM 2.0 / COSMO 5.0**
 - Soil moisture dependent **thermal conductivity** (bug fix in 5.1!)
 - **Flake** (lake model)
 - EXTPAR: GLOBCOVER (**land use**), HWSD (**soil texture**), ASTER (**topography**)
 - EXTPAR: MODIS based surface **albedo** (climatology, annual cycle)
 - EXTPAR: NDVI based **vegetation climatology**



SRNWP Data Pool Action

- Access from COSMO web,
password protected
<http://www.cosmo-model.org/srnwp/content/default.htm>
- Currently **9 sites**,
data from **2006-2013**,
in a **common ASCII format**
- **Soil**, **surface** and
BL observations
- Work done at DWD / Lindenberg



Status

- Data available from start of the action to end 2013 from
Cabauw (NL), **Capofiume** (IT), **Lindenberg** (DE),
Payerne (CH), **Sodankyla** (FI)
- Sites not updated since 2012
Fauga-Mauzac (FR), **Cardington** (GB)
- Almost no data for
Debrecen (HU)
- New site **Valdai** (RU)
... but no fluxes measurements, no deep soil measurements ...



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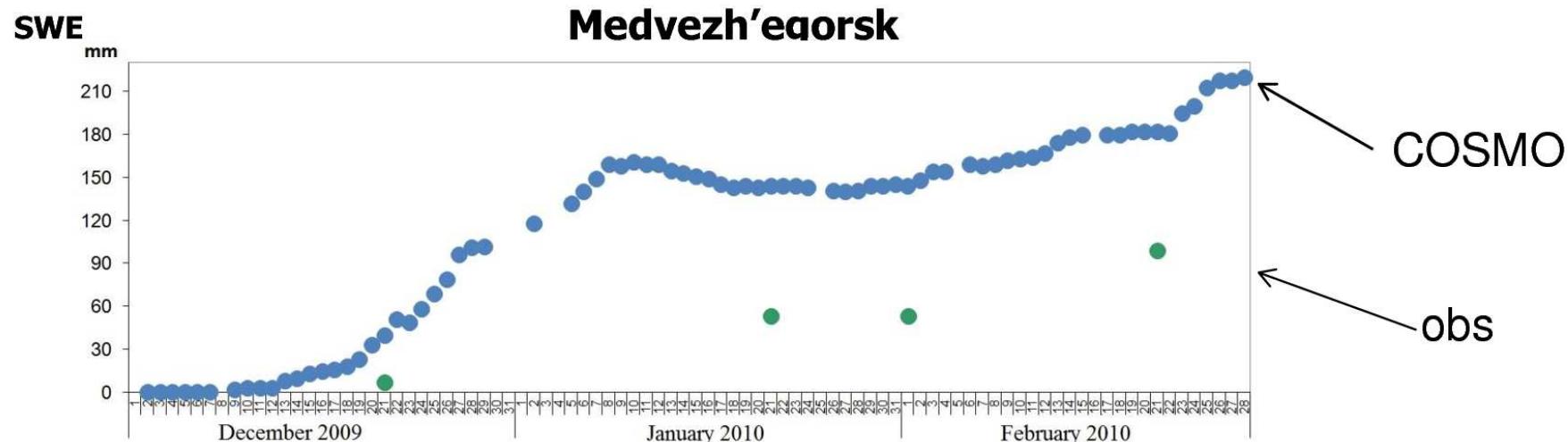


Priority Task SNOWE (Snow water equivalent for snow analysis)



Motivation

- Initial GME-fields of **snow water equivalent** (SWE) may have significant **errors** when compared with hydrological measurements
- This has a detrimental impact on **T2m** through the parameterization of **partial snow cover**, in particular in spring





Method



1D multi-layers snow model, observation driven

Computed at each SYNOP location

Computed through the whole snow season

Provide snow density and snow water equivalent at SYNOP locations

Combine this information with satellite derived snow mask and model first guess

Interpolation of snow density and snow water equivalent

Integrate in current COSMO snow analysis

Combine model first guess, snow depth observation and snow mask

Coordinate with M. Lange / DWD



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Accuracy of simulated diurnal valley winds in the Swiss Alps: Influence of grid resolution and land surface characteristics

J. Schmidli¹, S. Böing¹, and O. Fuhrer²

¹ETH and ²MeteoSwiss

Acknowledgments:

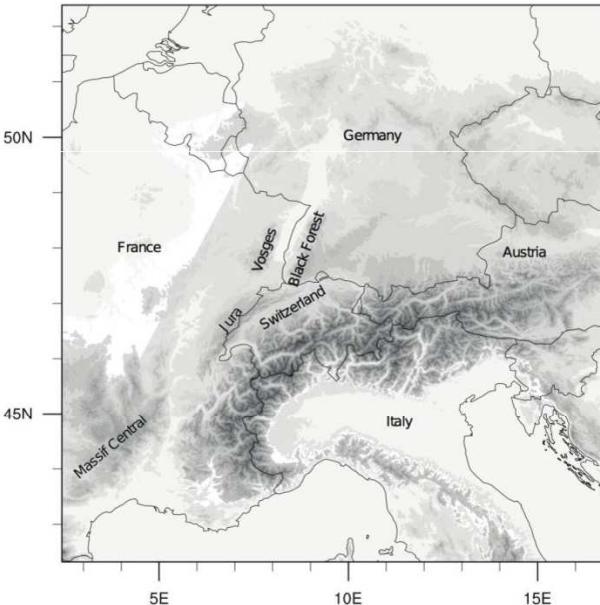
D. Lüthi, W. Langhans, C. Schär and the COSMO-1 team



Experimental setup

Basic setup

- COSMO v5 @ 2.2 and 1.1 km
- Initialized with and driven by ECMWF analysis (25km)
- **Soil initialized** from 10-yr climate run with 2km resolution (N. Ban)
- Standard physics options (MY-PBL scheme, no horiz. diffusion)



High-resolution surface data

- ASTER topography (30 m)
- GC2009 land cover (300 m)
- HWSD soil type (1 km)
- Raymond filter for topography (def: cutoff ~5 dx)

→ C2_ref, C1_ref

Low-resolution surface data

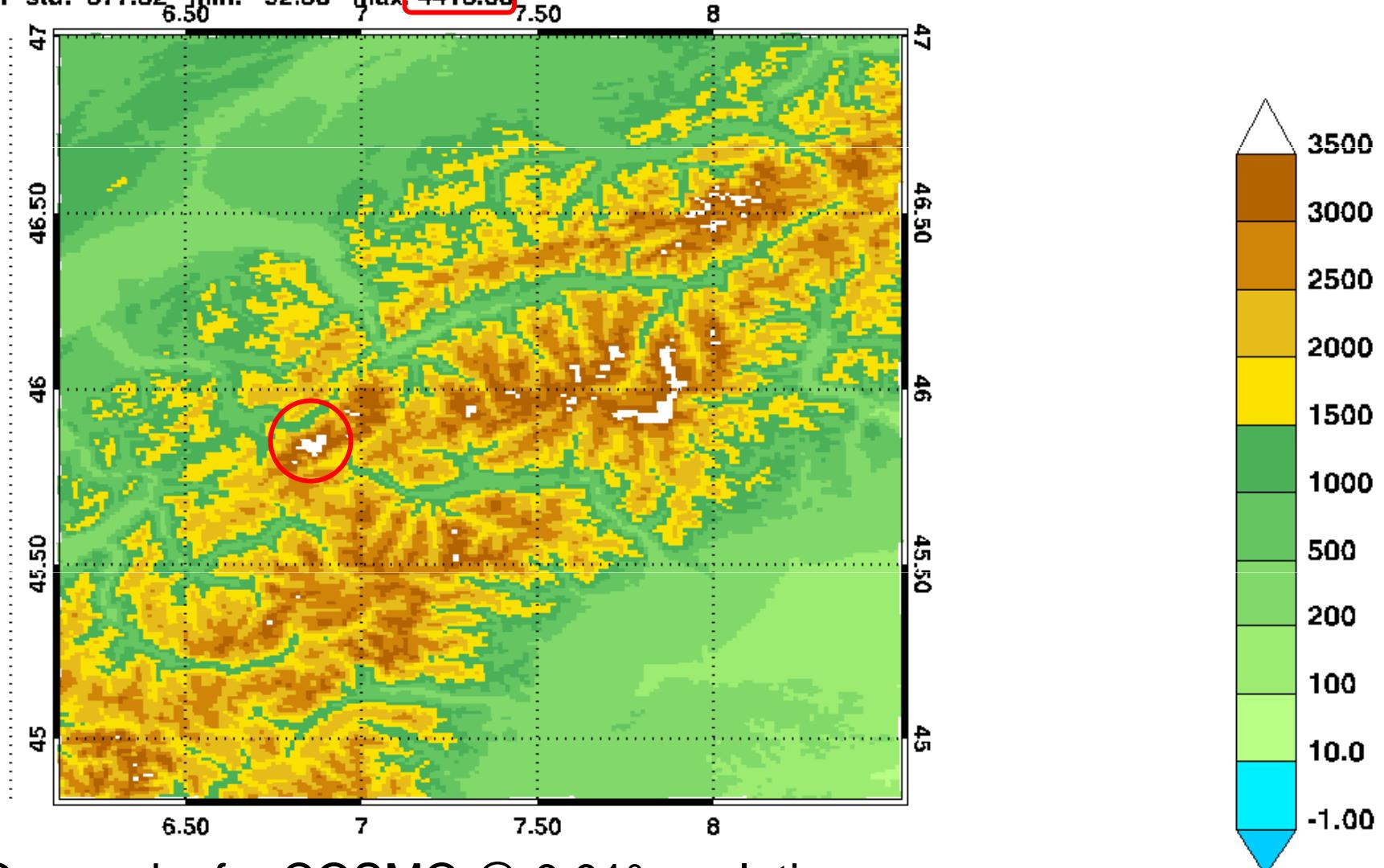
- GLOBE topography (1 km)
- GLC2000 land cover (1 km)
- FAO DSMW (10 km)
- Raymond filter for topography (def: cutoff ~5 dx)

→ C2_sfc, C1_sfc

HIGHRES land-surface data

DWD 10101 0000 0-0 h surface 0 HSURF m

mean: 1361.61 std: 877.32 min: 92.50 max: 4413.00

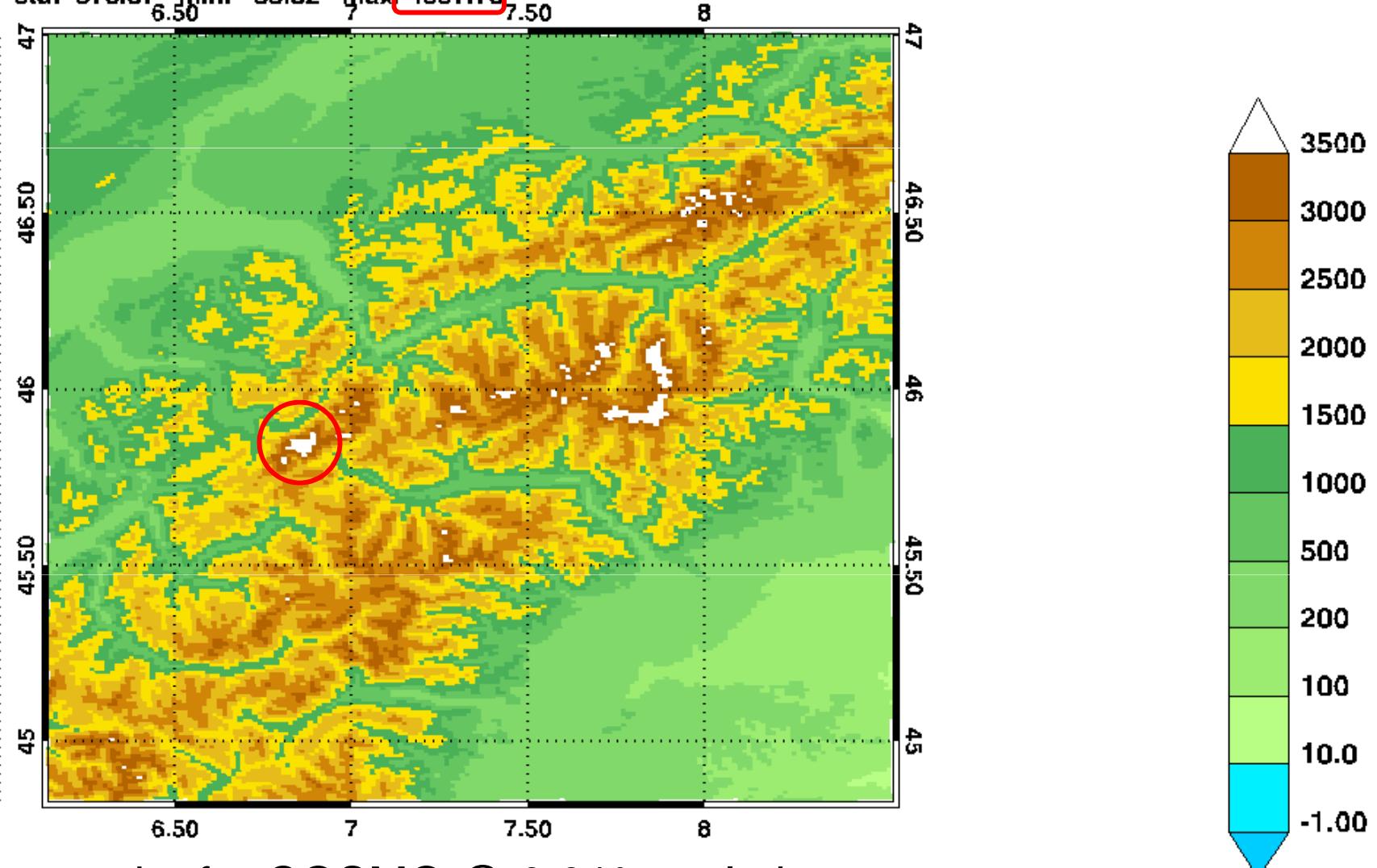


GLOBE Orography for COSMO @ 0.01°resolution

HIGHRES land-surface data

DWD 10101 0000 0-0 h surface 0 HSURF m

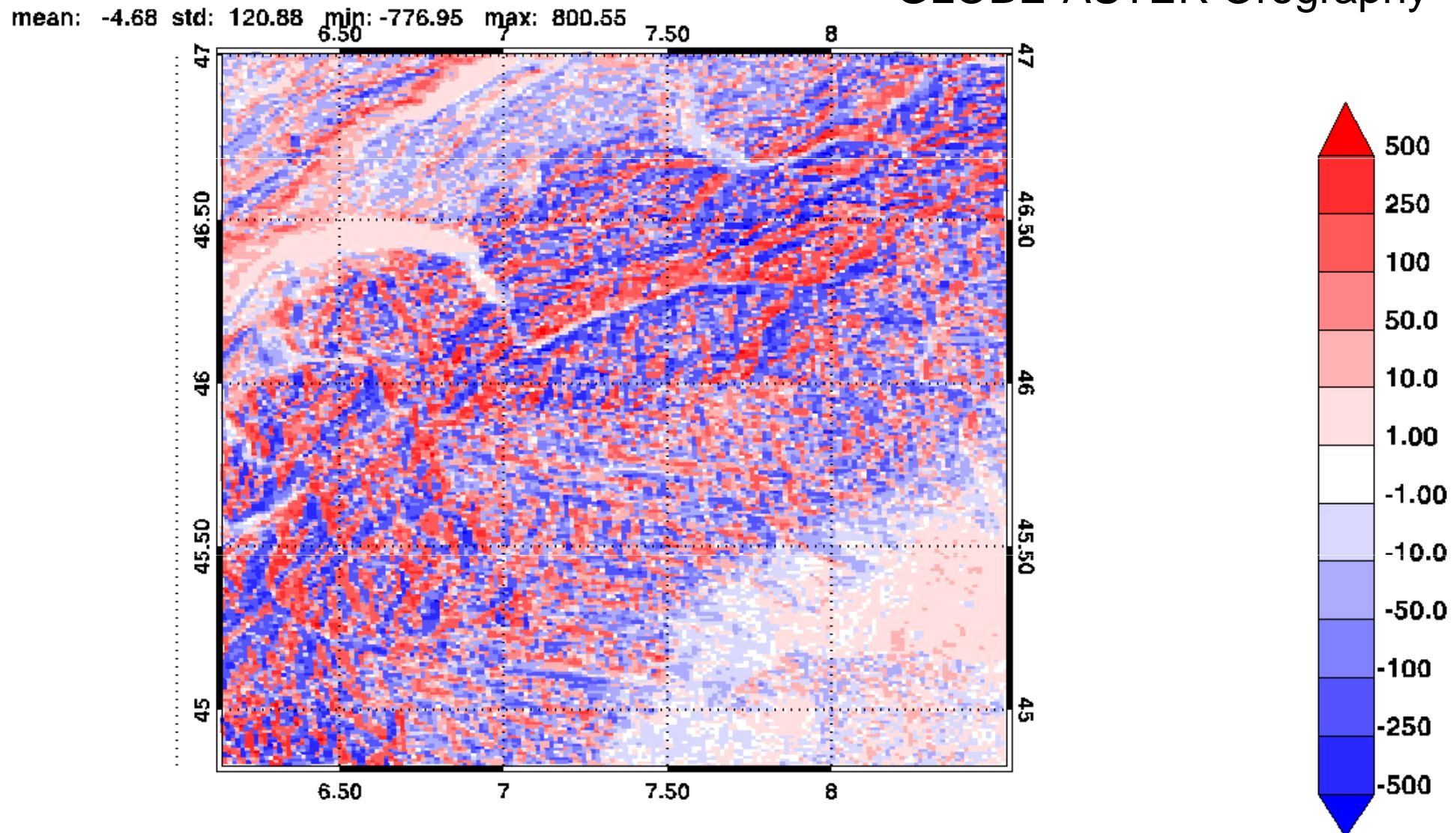
mean: 1366.29 std: 876.67 min: 88.82 max: 4537.70



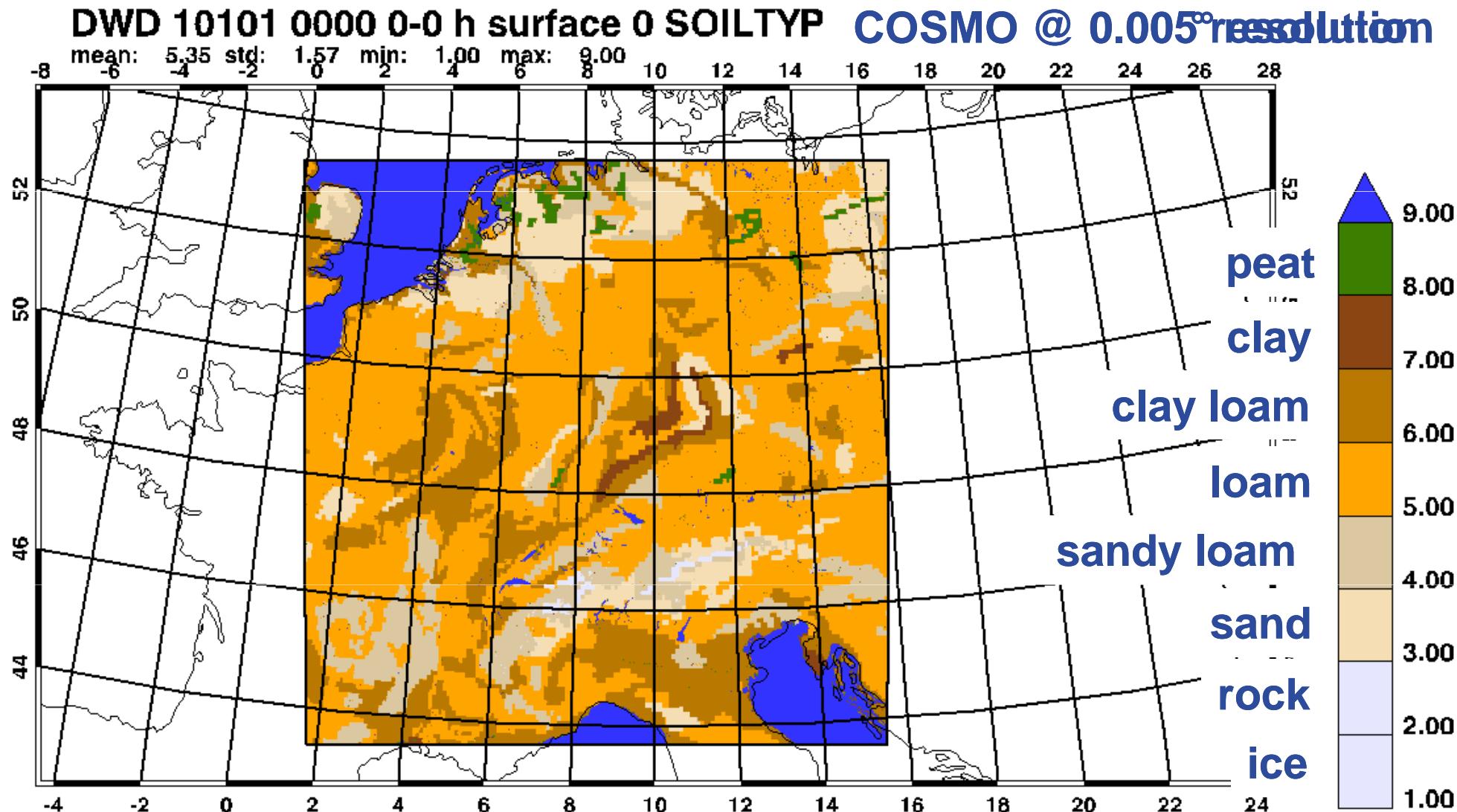
ASTER Orography for COSMO @ 0.01°resolution

HIGHRES land-surface data

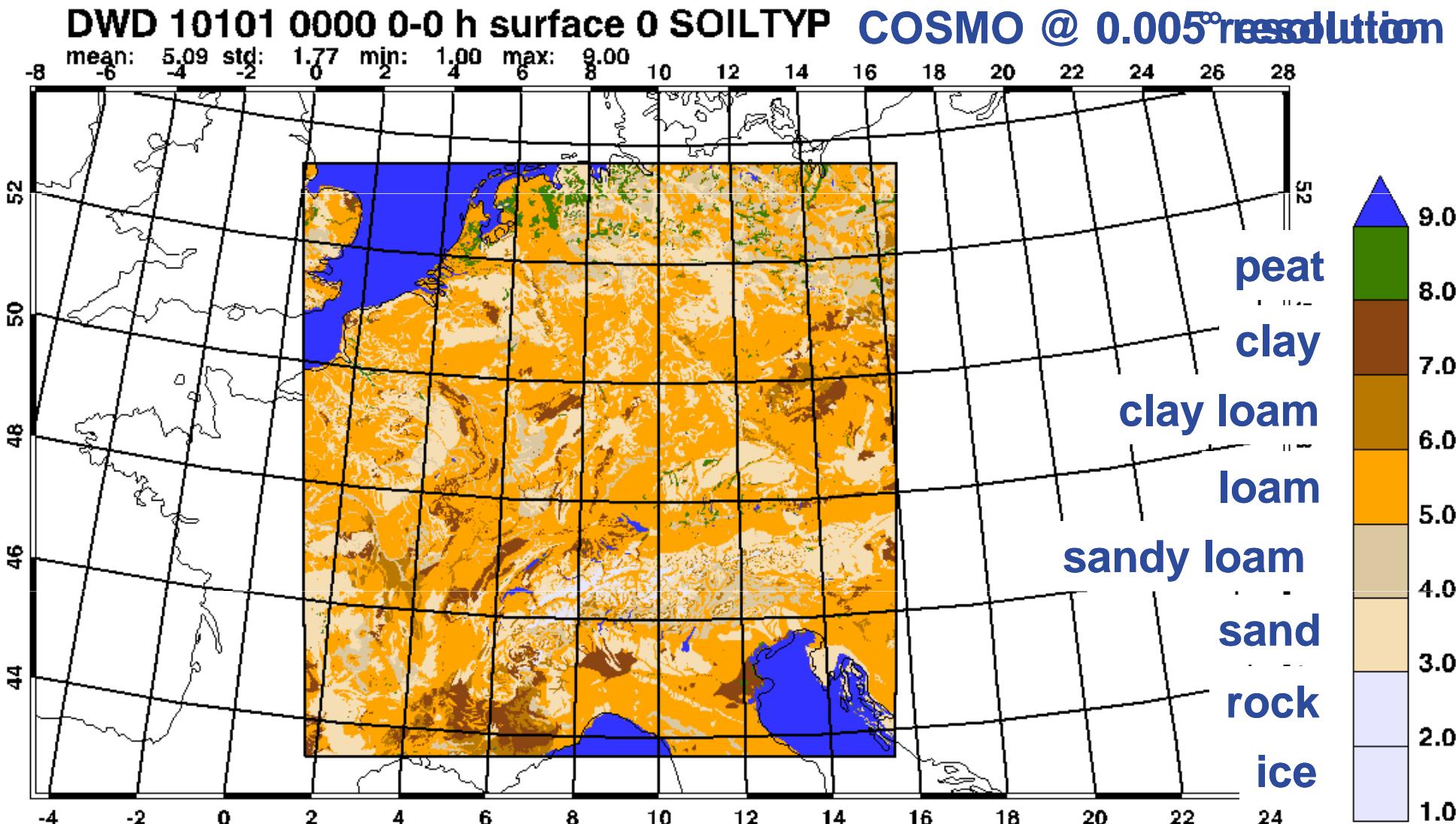
GLOBE-ASTER Orography



EXTPAR: Geo-spatial data

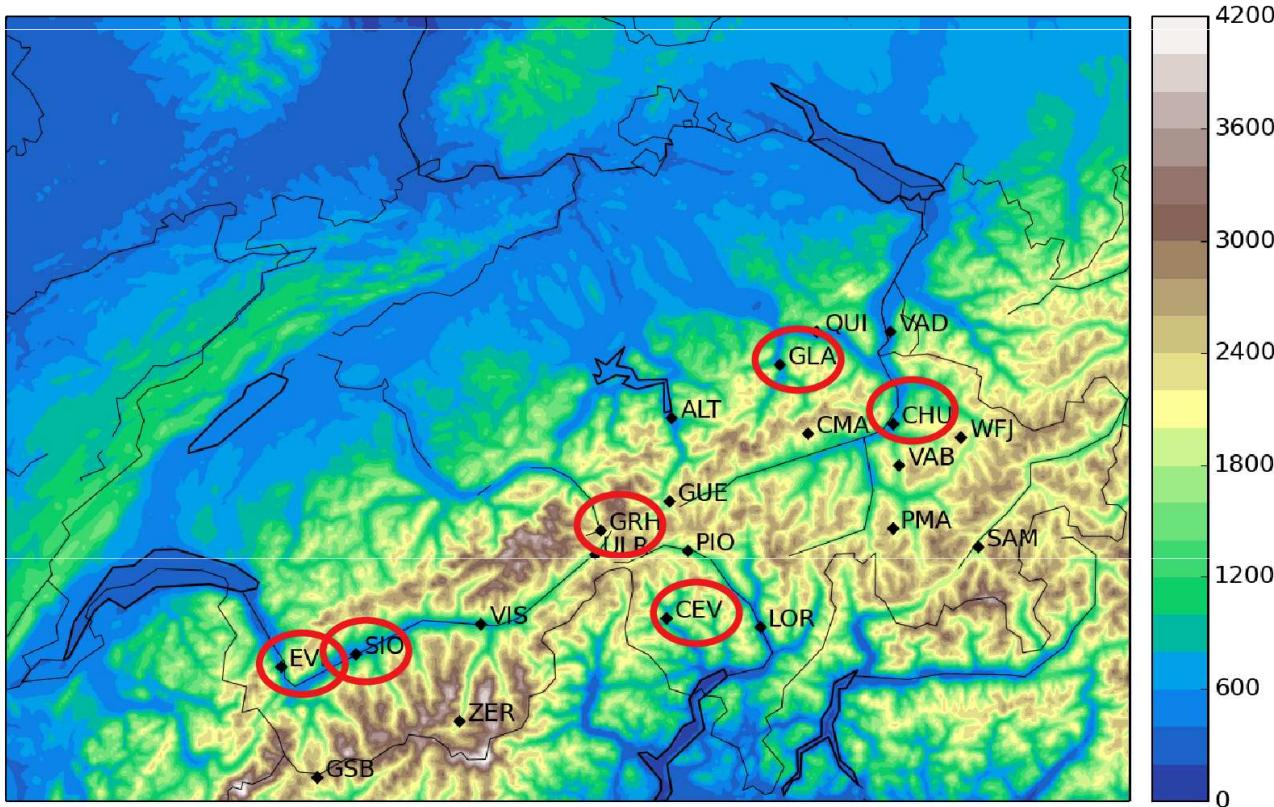


EXTPAR: Geo-spatial data



“Valley wind” stations

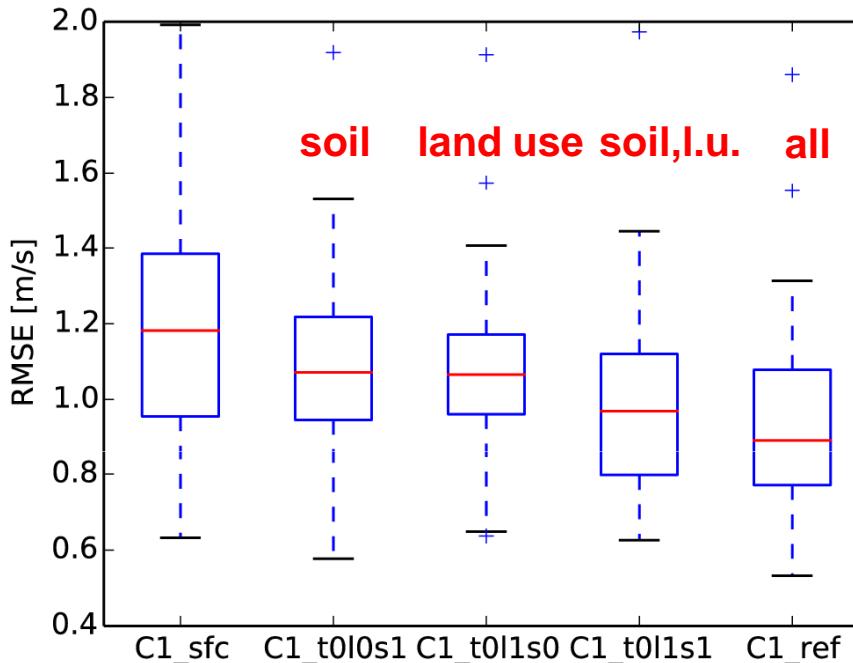
“Top-six” stations



Mean maximum wind > 4 m/s → 21 stations

Influence of surface data (soil, land cover, topography)

“Valley wind” stations (21)



- All three components (soil, land cover, topography) important
- Similar contribution to improvement

COSMO Surface activities

Summary 2

- **Recent developments, not yet finalized**
 - Revised **bare soil evaporation**
 - Systematically overestimated (Observations at Falkenberg)
 - IMGW: Hour of day and temperature dependent formulation
Fit to reduce error of near surface parameters
 - Revised parameterization of **water infiltration**
 - Depth dependent, higher values at top (soil defaults)
 - Large sensitivity observed in CLM simulation (ETHZ)
 - Revised **soil water transport**
 - Brooks and Corey, support soil vertical heterogeneities as available in HWSD
 - **Phenology** model to catch vegetation inter-annual variability
 - Workshop at MeteoSwiss planned in 2014Q4
 - Exponential **root profile**



COSMO Surface activities

Summary 3

- **Recent developments, not yet finalized (ctn'd)**
 - **Tile** approach
 - Available in ICON, incl. dynamic snow tile (partial snow cover)
 - Still some technical issues (GRIB coding...)
 - Multi-layers **snow** model
 - Available in ICON
 - Still stability issue (coarse resolution only), coupling with analysis missing
 - **Urban** module
 - **Mire** parameterization
 - In 5.0, being tested, documentation being prepared
 - Target availability for 5.2
 - Open problem to define mire (external parameters)



- **Common COSMO / ICON library**
 - Terra developments available in ICON only
 - numerical stability improvements
 - new options (e.g. exponential root distribution)
 - Still to be done
 - develop COSMO interface (e.g. tiles, optional schemes)
 - thorough testing

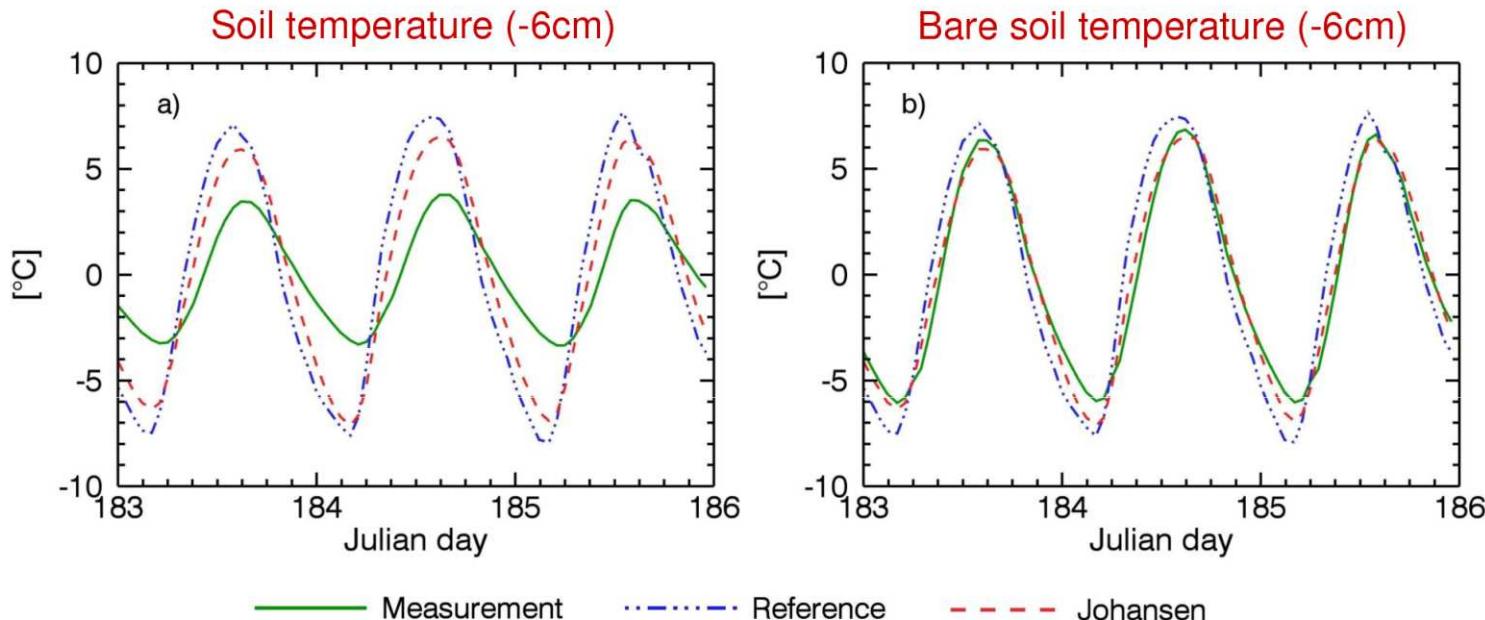


Outlook

- **Vegetation shading**
 - Important impact on diurnal cycle of near surface parameters

Offline TERRA: Falkenberg 2 - 4 July 2010

Thermal conductivity: Johansen



- Diurnal temperature range reduced by Johansen by about 2°C
- Compared to bare soil measurements this is very good
- Shading (even by grass) has a huge effect

Jan-Peter Schulz et al.: *Ground heat flux*

Outlook

- **Vegetation shading**
 - Important impact on diurnal cycle of near surface parameters
 - Resources, planning ?
- **TERRA standalone**
 - Useful tool to bring the soil in equilibrium for a new configuration
- **SRNWP data pool**

Access for universities could push usage of the data

