Deutscher Wetterdienst

Department Climate Monitoring

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Motivation

- Request from WMO: European snow climate monitoring
- DWD has taken over a lead function in a Regional Climate Centre RCC on Climate Monitoring of the WMO
  - providing climate monitoring products for Europe
- a number of national snow products available, but with high variety concerning data basis, kind of product, method, layout
  - specific products for Europe were missing
- snow (and ice) cover is one of the key variables of our climate system (reflectivity properties, feedback mechanisms)
- has direct impact on daily life (traffic roads, winter tourism, agriculture)

A specific request from WMO

The Extreme cold and snow events of the early boreal winter of 2010
Facts, mechanisms and possible impacts

By WMO in collaboration with the MetOffice, UK, NOAA, USA; DWD, Germany; Meteo-France, France; CMA, China

1- Area extent, intensity and impacts of the current cold and snow conditions recorded in Northern Hemisphere. Temperature figures and area extent comparing with the history and/or similar past events would constitute key information.

2- The Mechanisms; description of the existing knowledge for attributing this phenomena: Blocking systems, ElNino, Decadal variability, etc.?

3- Invoking climate change and possible linkage in the literature, e.g. the impact of global warming on global ocean conveyor belt and its subsequent cooling factors

4- Inter-seasonal interactions based on the albedo forcing that might be triggered by the large snow cover conditions

5- Possible consequences, e.g. if a sudden temperature increase might follow which could lead to large snow melt and water inflow in various water bodies which could cause flooding in some areas.

To be provided within one week !

Our snow variables

- Daily
  - actual snow depth (06 UTC)
  - percentage of monthly climate mean
  - number of snowdays (days with snow depth >= 1 cm) since start of snow season (recent 1st September)
- Monthly
  - mean and maximum snow depth
  - number of snowdays per month
- Annual
  - first and last day of the snow season
  - duration of snow season

Our products (www.dwd.de / snowclim)

- ➔maps of monthly **mean** (Europe)
- ➔maps of long-term **climatology** (1981-2005)
- ➔climatological tables for selected **regions** within Europe
- ➔diagrams of **time series** since 1981

Data basis and problems

- ➔ national data networks not available for whole Europe
- ➔ satellite data not used: snow cover, but no snow depth available
- ➔ instead SYNOP observations used (absolute snow depth at 06 UTC), from GTS (around 1100 stations)
- ➔ very few data before 1981

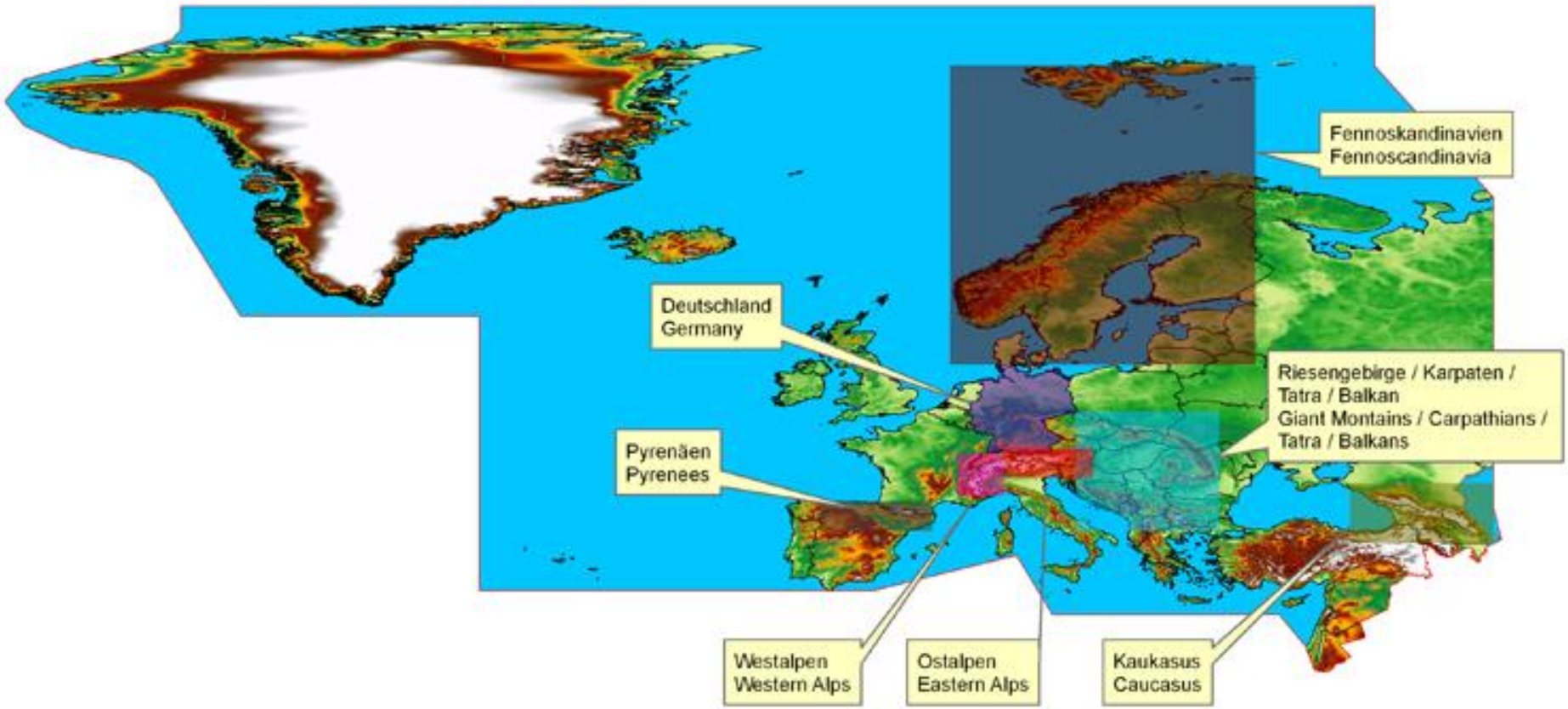
Data Quality and Check

- ➔ no standard routine check for SYNOPs at DWD except for Germany
- ➔ first plausibility check: many high unrealistic snow depths
- ➔ setting thresholds of highest „possible“ snow depth dependent on location and altitude
- ➔ to distinguish zero values from not reported snow depth: manual check of time series
- ➔ omitting some doubtful rare observations
- ➔ extended quality control developed: consistency to temperature, precipitation, amount of fresh fallen snow

Gridding and Mapping Method

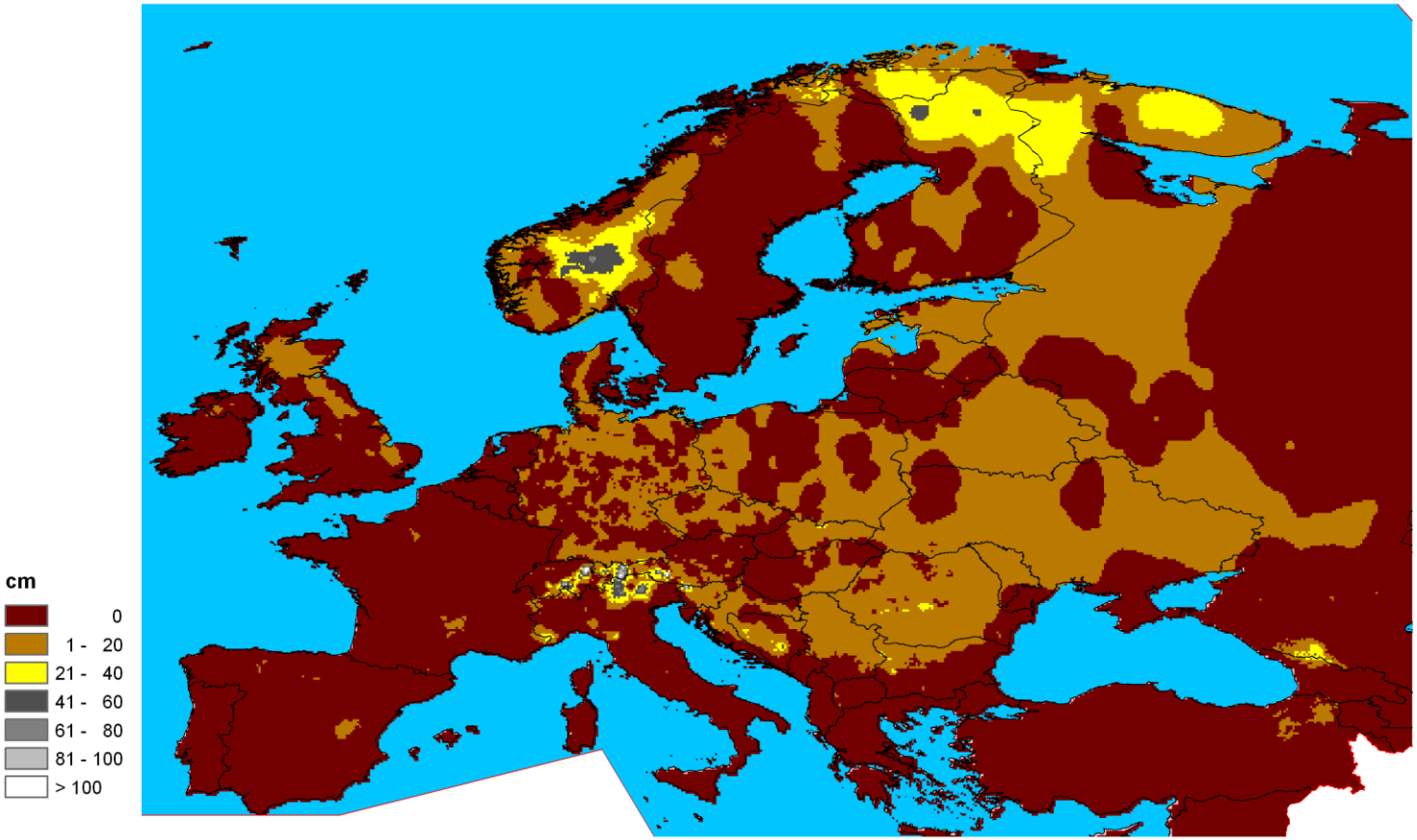
- 3-dimensional reduction (linear regression in latitude, longitude, altitude; improvement of method in preparation)
- interpolation of residuals using Radial Basis Functions
- recomputing interpolated residuals to original latitude, longitude, altitude
- removing some unrealistic „interpolation islands“ after manual check (carefully!)
- spatial resolution 0.1° x 0.1°

Definition of regions for computing areal means

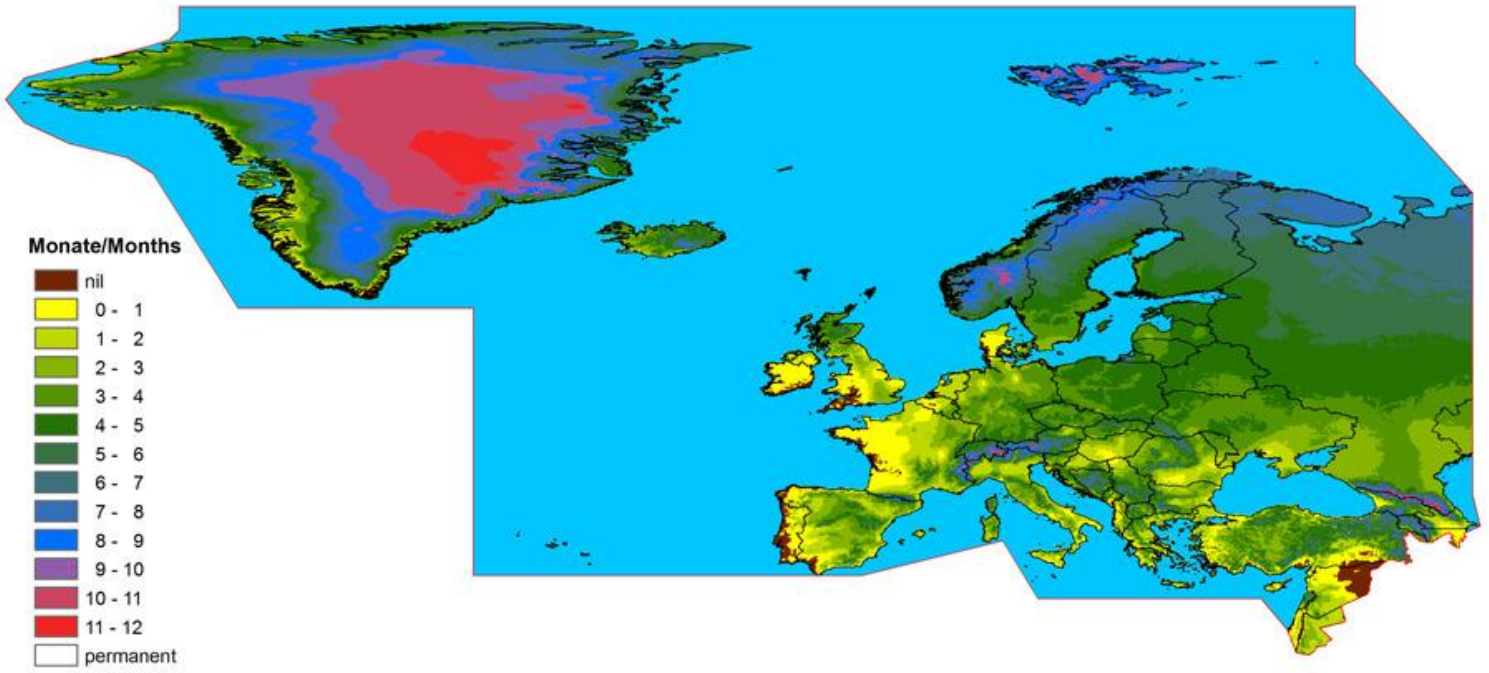


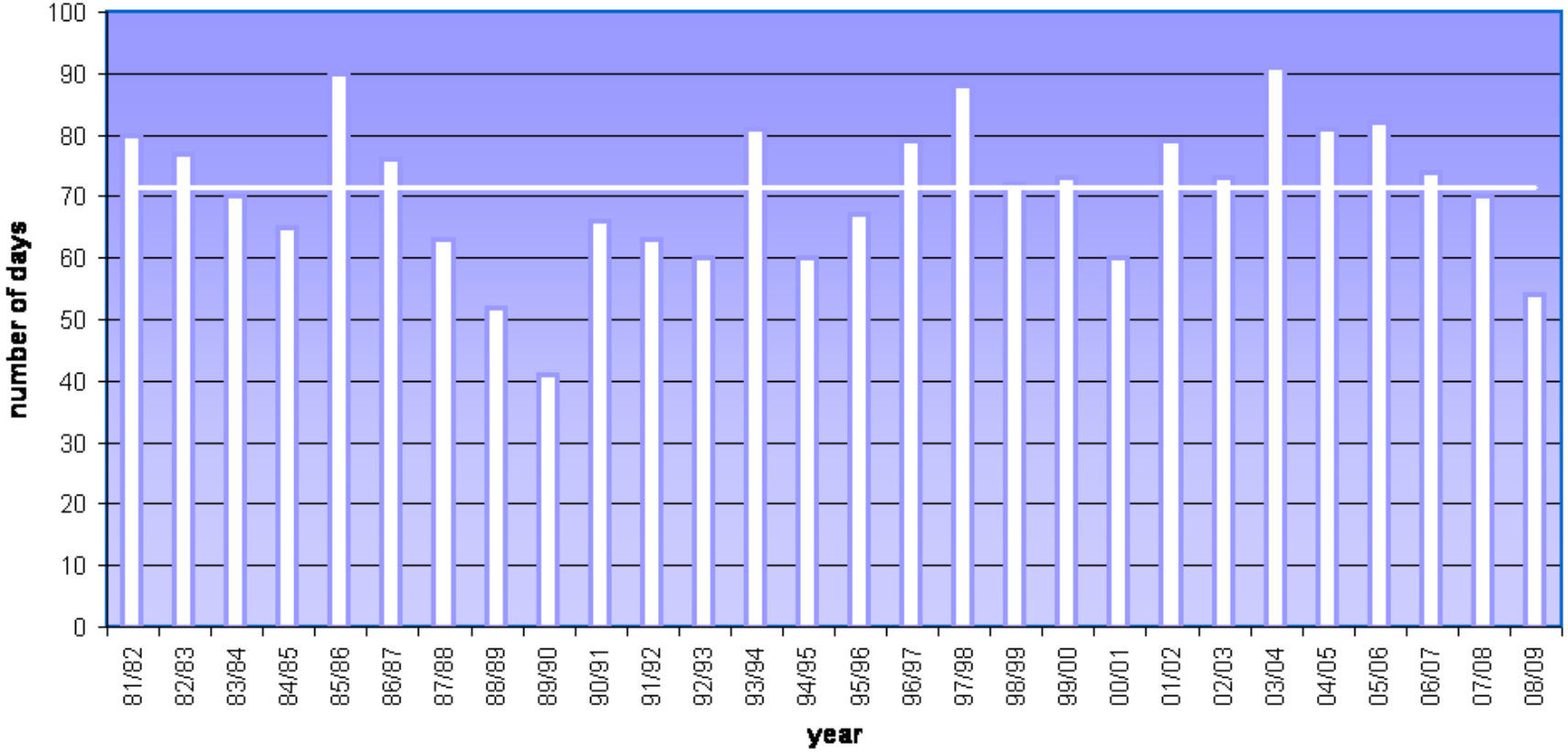
Mittlere Schneehöhe Dezember 2009
Mean snow depth December 2009

Datenbasis/Data basis: SYNOP
Stand/last update: 01.01.2010



Länge der Schneeperiode 2008/09
Duration of snow period 2008/09

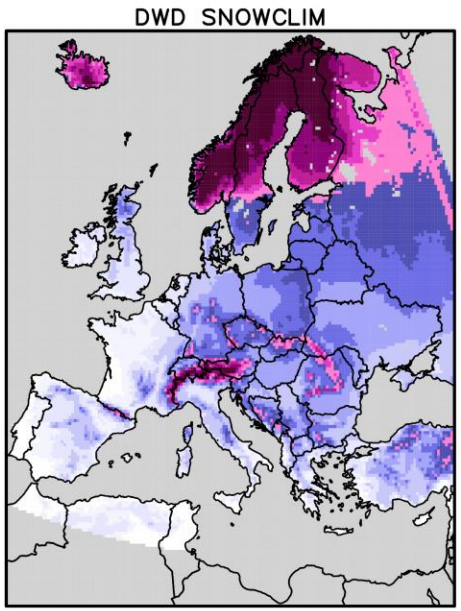



Number of days with snow depth >= 1 cm
Western Alps 500 - 1500 m
during autumn, winter and spring
number of days
0
10
20
30
40
50
60
70
80
90
100
81/82
82/83
83/84
84/85
85/86
86/87
87/88
88/89
89/90
90/91
91/92
92/93
93/94
94/95
95/96
96/97
97/98
98/99
99/00
00/01
01/02
02/03
03/04
04/05
05/06
06/07
07/08
08/09
year

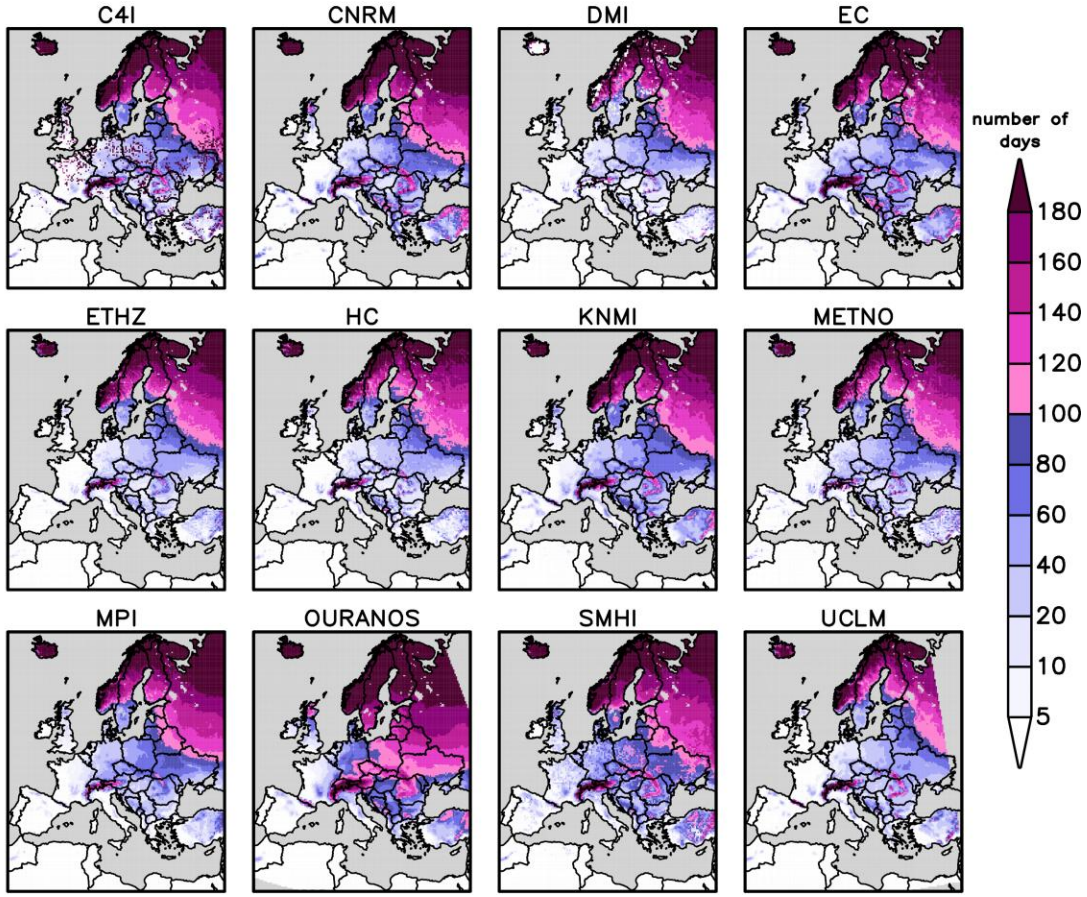
Comparison SnowClim data – Regional climate model data (S. Kotlarski, ETH Zurich, Switzerland)

Number of snow days per year (mean 1981–2000), sncrit RCM = 0.003 mwe

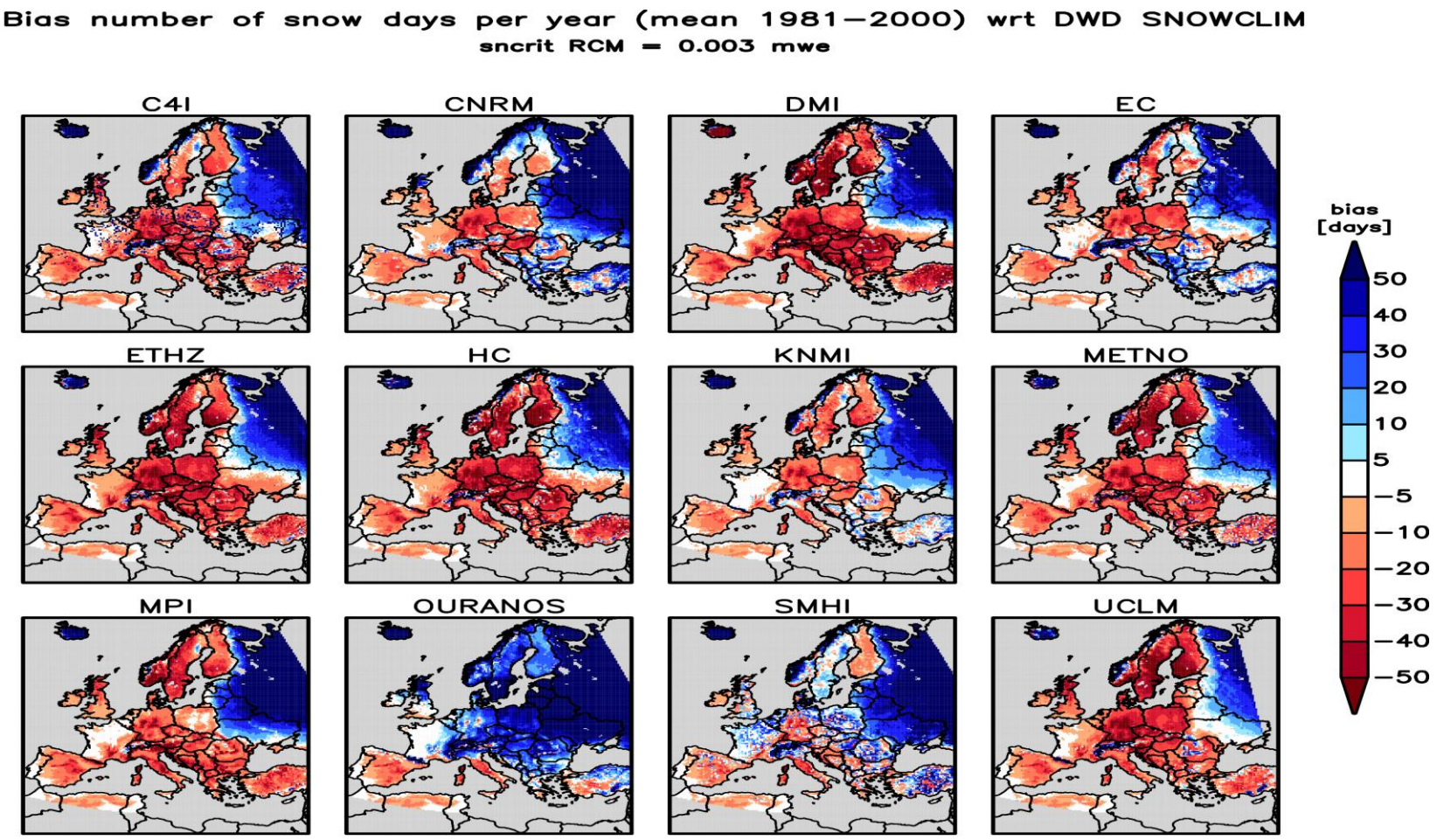
ENSEMBLES models
25 km res., driven by ERA40



Snowclim data, 0.1° res.
interpolated from SYNOPS

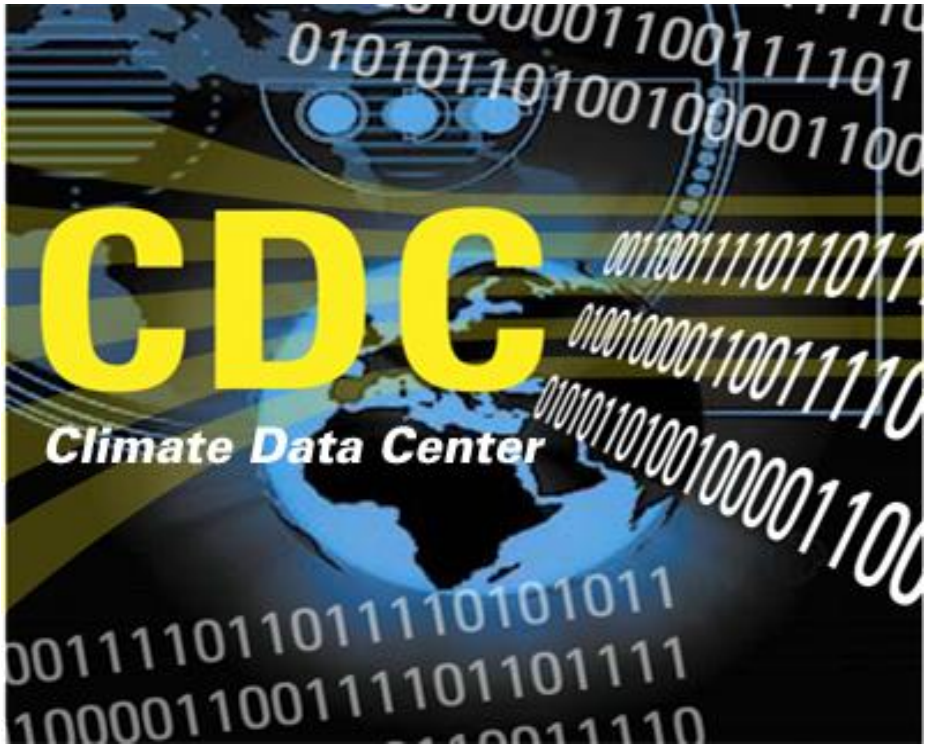


Bias model data - SnowClim data (S. Kotlarski, ETH Zurich, Switzerland)



SnowClim gridded data

- are available at DWD on request
- will be accessible by the new Climate Data Centre (CDC) of DWD
- will be reprocessed probably this year
- Contact address of CDC: **cdc.daten@dwd.de**




Don't worry be happy
Best wishes
Thank you