Mesoscale re-analysis of historical meteorological data over Europe

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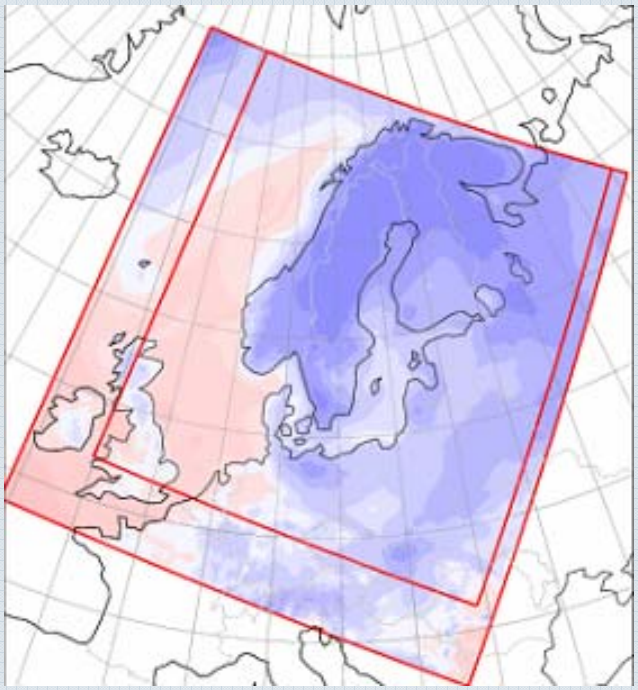
- **ERAMESAN – A first attempt at SMHI for re-analyses of temperature, precipitation and wind over Europe**
- **SHOWCASE EUROGRID – Towards Gridded Climate Data and Products for Europe**

Operational MESAN



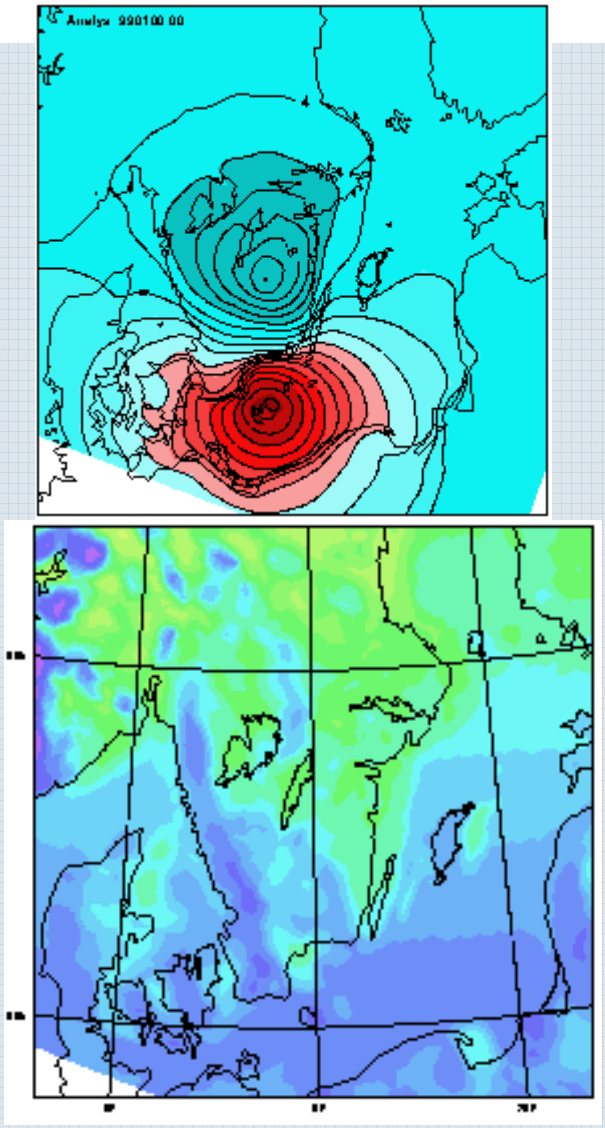
- **Resolution** - 11 km, earlier 22 km, for every hour
- **Method** - Optimum Interpolation
- **Data**

- HIRLAM as first guess field
- satellite and radar imagery
- synop, climate, metar and AWS
- physiographic fields

- **Examples on analysed parameters**

- 2 m temperature, min- and max- temperature
- precipitation, 1, 3, 12 and 24 h, fresh snow
- clouds, total, low, top, base
- 10 m wind and gust
- relative humidity, visibility, pressure at msl

Optimum Interpolation in MESAN



Structure functions consider:

- fraction of land/water
- roughness length

First guess error reflecting precipitation climate

Ref: Tellus 2000, 52A, p 2-20

The ERAMESAN-dataset

Parameters:

- 2 m temperature
- 12 and 24 h acc.
- precipitation (06 and 18 UTC)
- 10 m u- and v-wind

Period:

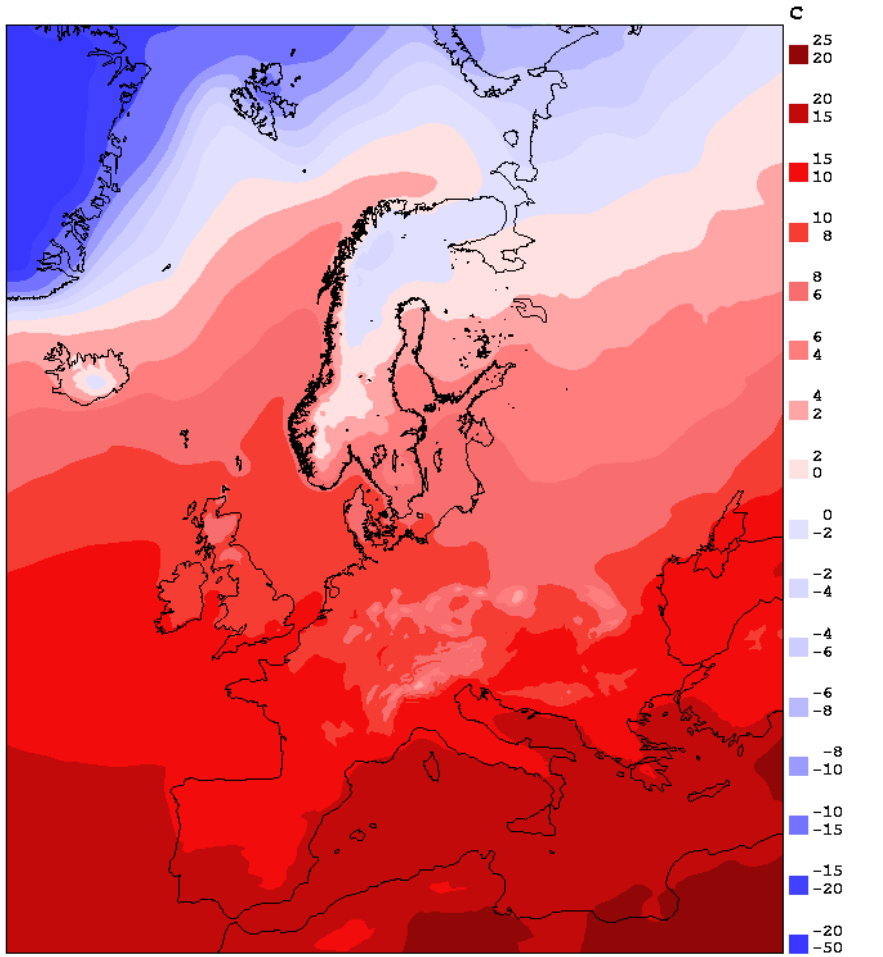
- 1980 – 2004

Resolution:

- 11 km
- every 6 hour

Input data:

- ERA-40 as first guess
- Observations from SMHI:s archive

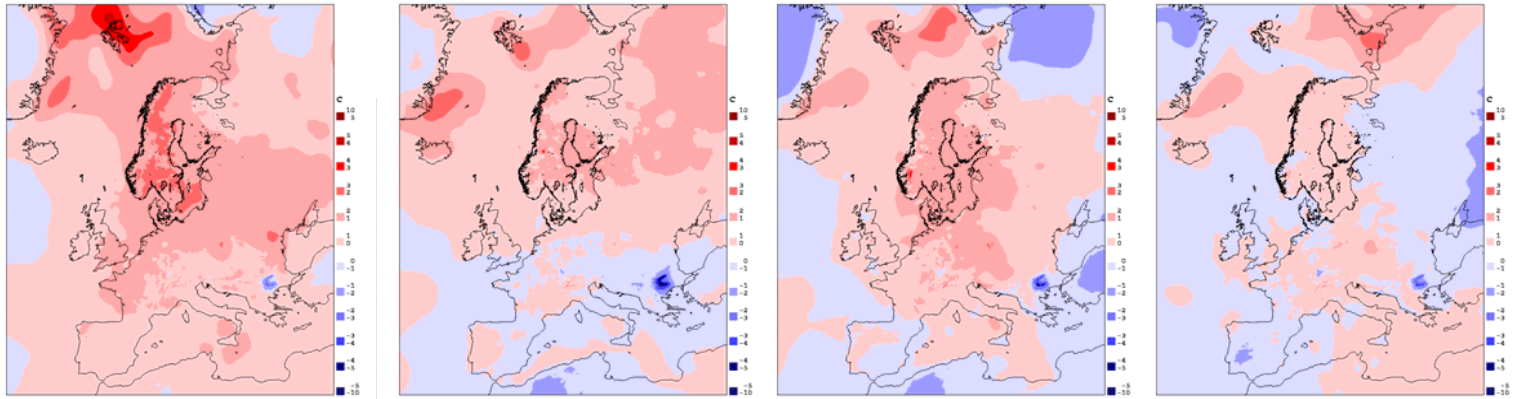


example: annual mean temperature 1980-1989

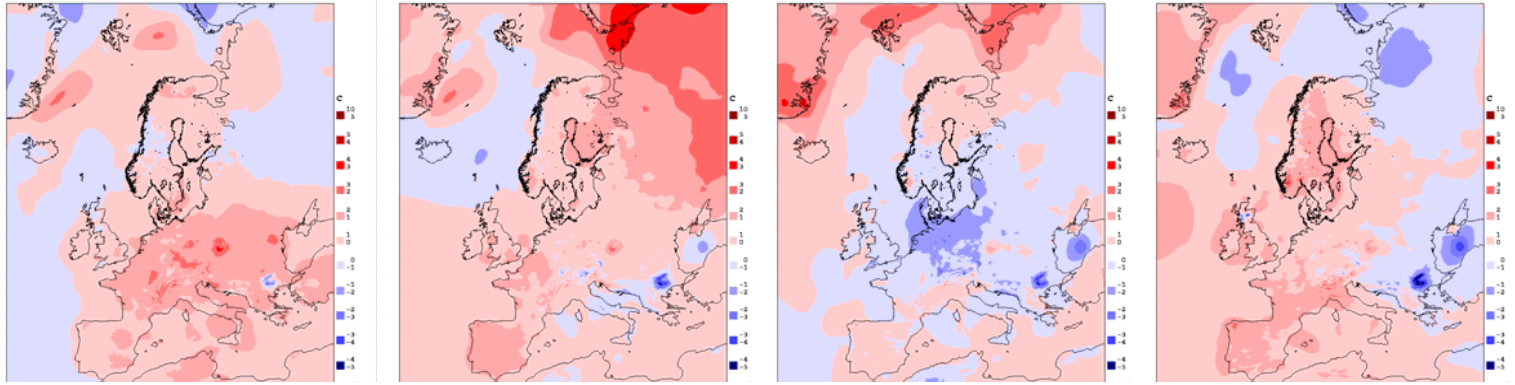
Annual mean temperature –

Deviations from selected reference period 1980-1989

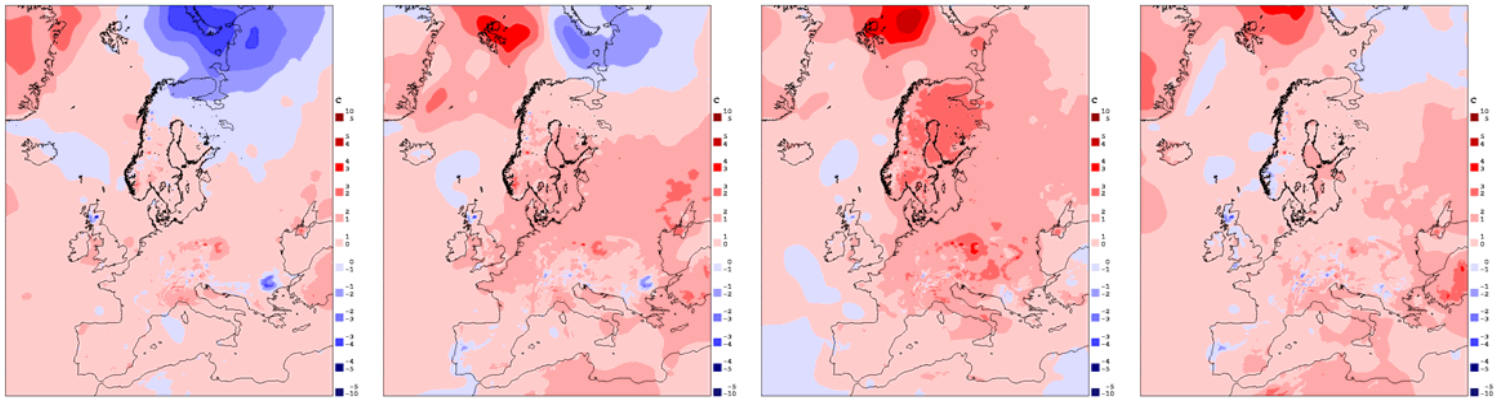
1990-1993



1994-1997



1998-2001



Showcase EUROGRID

A EUMETNET demo project during 2007-2008
14 (soon 16) participating countries, SMHI Responsible Member

Basic objectives:

- *demonstrate how shared gridded historical meteorological and environmental data from European NMSs can be used for products to the European society*
- *prepare for an efficient use of results from planned future very high resolution European re-analysis – but the development of a consistent re-analysis system and dataset for Europe is **not** included!*
- *prepare for the realization of the full-scale EUROGRID concept, in line with e.g. the EU INSPIRE directive*

SMHI

Showcase EUROGRID work tasks

Harmonized visualization of existing - non consistent - datasets contributed by the members

- National datasets:
  France, Germany, Iceland, Norway, Switzerland, UK, Denmark
  Temperature, Precipitation, 1x1 km, 24h or month
  European datasets:
  ERAMESAN (SMHI), Temp, Prec, 11x11 km, 6/12h, 1980-2004
  ENSEMBLES (FP6), Temp, Prec, 25x25 km, 24h, 1950-2006

Creation of a demo-product portfolio

- Selected years for the demo: 2002 (flooding in Central Europe) and 2003 (heat wave)

Harmonized access to products and data for test users

- EEA (European Environment Agency)
- Research Groups (maybe BALTEX)
- ……

Plan for a future full-scale EUROGRID

Showcase EUROGRID Services

Data visualization

1. MapView (2D-raster files)

- WMS (Web Map Service)
- Visualization of distributed data (hosted at the members' sites)
- Products hosted at central site

2. DataView (SQL-database)

- Extraction of data at grid points from MySQL5-database by mouse-click
- Plot of the time-series
- XHTML-table

Data dissemination

1. MapView (2D-raster files)

- WCS (Web Coverage Service)

2. DataView (SQL-database)

- XHTML-table

3. Datasets for scientific communities

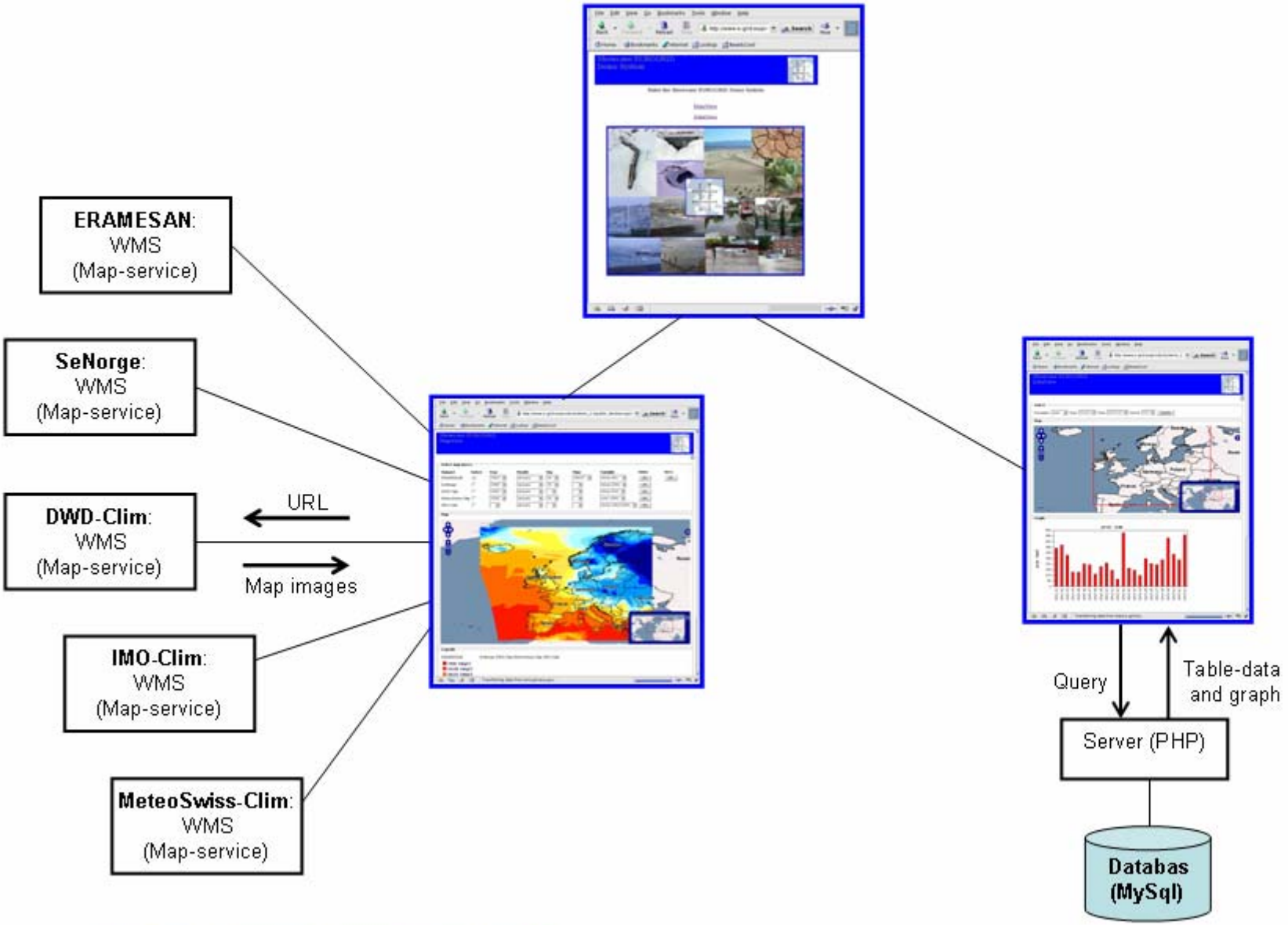
- GRIB-files made available (data policy depending) *Possibly for Baltex*

Showcase EUROGRID web portal

http://www.e-grid.eu/public/

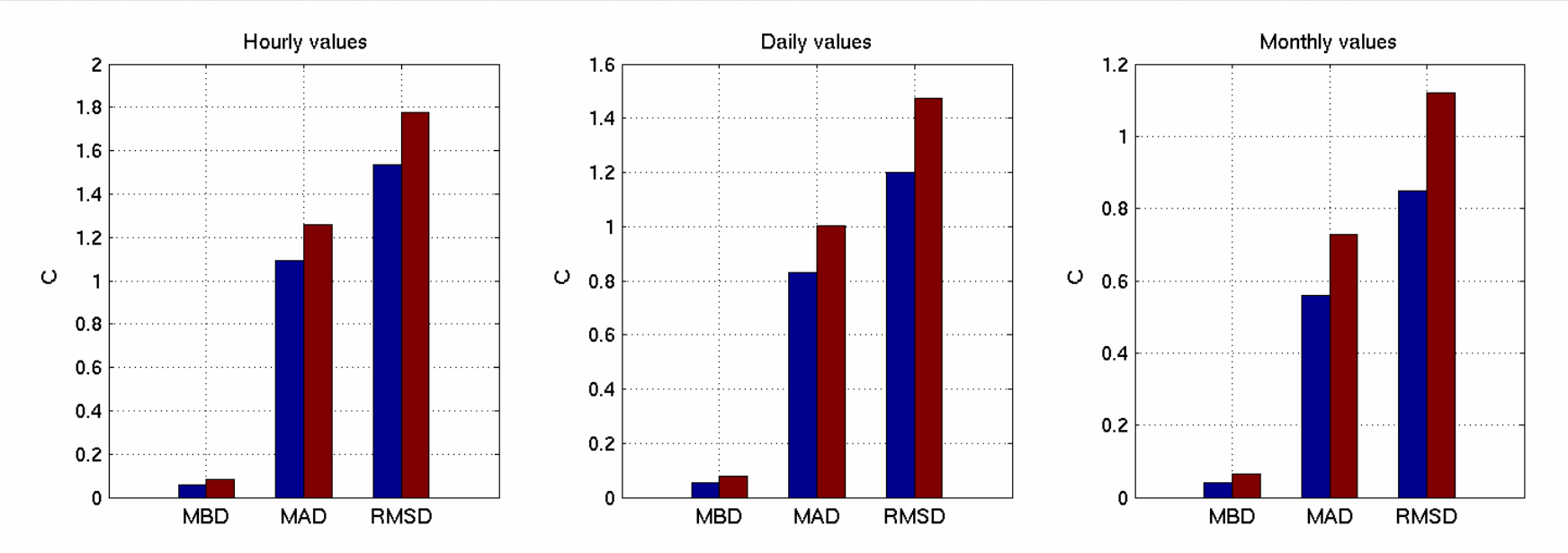
http://www.e-grid.eu/products/ **(restricted)**

Showcase EUROGRID Demo System



Limited ERAMESAN cross validation – Temperature

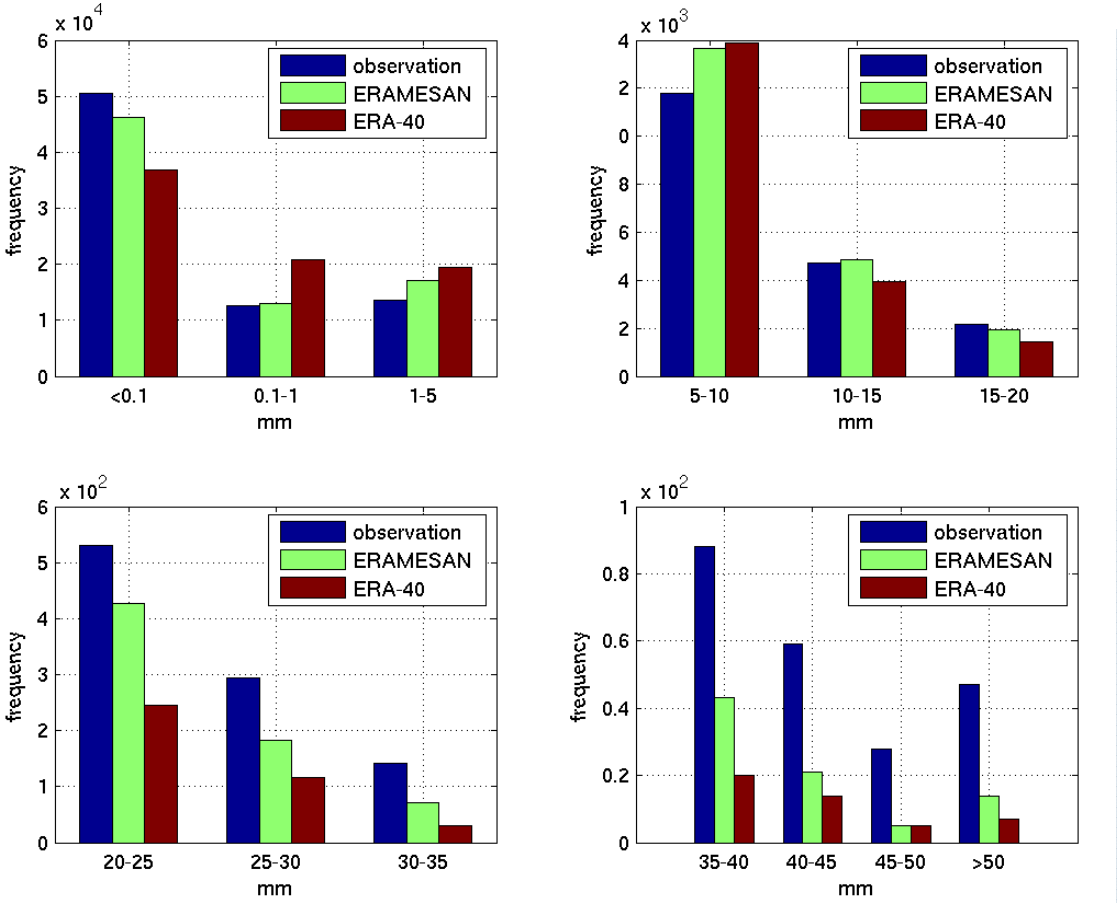
Hourly (every 6h) Daily (24h) Monthly



Validated against independent data, totally 6% stochastically selected stations over Europe
Time period 1998-2000
MBD = Mean Bias Deviation (Obs minus Analysis)
MAD = Mean Absolute Deviation
RMSD = Root Mean Square Deviation
ERAMESAN (blue bars) and ERA-40 (red bars)

Partial validation – Daily (24h) precipitation

Frequency of different prec. amounts



Time period 1998-2000
Observations (blue bars)
ERAMESAN (green bars)
ERA-40 (red bars)

Looking forward – while waiting for EURRA

A European high-resolution re-analysis is necessary for the full-scale EUROGRID

- ERAMESAN is only a first attempt made at SMHI
- We would like to initiate a three-step re-analysis procedure:
  - Dynamic 3- or 4-D down-scaling with ERA40/ERA-Interim as boundaries
  …followed by
  - e.g. an improved ERAMESAN (2-D), better scaling based on predictors
  …and maybe
  - A final statistical down-scaling
- Using data, not trans-nationally exchanged in routine, includes problems!
- Quality control and consistency of observational data critical!
- Resources needed