“High-quality” climate data ...

... “accurate and representative” measurements
... “efficient and reliable” data quality control
... “standardized and relevant” metadata
... “rational and efficient” homogenization procedures

... "???“ grid datasets
What does „high quality“ mean with regard to spatial climate datasets?

Practice and experience at MeteoSwiss

Christoph Frei and Francesco Isotta
Rebekka Erdin, Denise Keller, David Masson, Reinhard Schiemann, Raphaela Vogel, Bettina Weibel, Marco Willi (former collaborators)

Data Management Workshop 28.-30.10.2015, St. Gallen, Switzerland
Application and Users

Hydrology
- Runoff forecasting,
- Flood protection,
- Land slide risks, ...

Agriculture
- Crop suitablity maps,
- Crop desease and pests,
- Subsidies, ...

Energy & Construction
- Renewable energy,
- Heating/cooling design, ...

Snow & ice
- Avalanche risk,
- Slope stability,
- Glacier monitoring, ...

Research
- ETH, Univ., FHS
- Univ. outside CH

Internal
- Climate monitoring,
- Model verification,
- Local forecasts,
- CC-Scenarios, ...

Agencies
- Federal,
- Regional

Private Sector
- Insurance
- Engineering

Internal
- Climate monitoring,
- Model verification,
- Local forecasts,
- CC-Scenarios, ...
User Requirements

- high accuracy (small random errors)
- fine spatial resolution (km)
- high temporal resolution (1 day, 1 hour)
- multi-parameter – physically consistent
- multi-decadal – climate consistent
- timely – possibly real-time
Trends in Viticulture

1981-2010 Trend in Huglin Index

change in station network

based on high-res daily grid data

HI = sum((Tm + Tx)/2 – 10degC)
April – September
Effects from network changes

Interpolation Bias

year

degC

WFJ
CHD

GST

COV

Frei 2014
Purpose-Design Philosophy

Data products targeted to application groups

Methods depend on intended application

Individual balance between method and data

Limitations / uncertainties are openly communicated
The MCH Grid-Data Suite

~ 40 products, Temp (m, n, x), Precip, Sun, Radiation territory of Switzerland, 2 km norm, monthly, daily, (hourly), anomaly 1961-actual, 2004-actual (radar-gauge) automatic production and delivery web, reports

Precipitation (mm)

Relative Sunshine Duration (%)

Temperature (degC)
Precipitation – Products

Real-time (hourly)
Radar-Gauge combination, t-KED
Erdin et al. 2012, Sideris et al. 2014

Real-time (daily)
Statistical reconstruction (RSOI)
Schiemann et al. 2012

Aug. 2005
Anomaly wrt Norm
>1960, SYMAP
Shepard 1984, Frei et al. 1998

High-resolution (daily, monthly, ...)
PRISM & SYMAP
Schwarb et al. 2001, Frei et al. 1998, 2004

23.07.2009

22.08.2005

-> talk by Francesco on Friday
Relative Sunshine Duration

High-resolution SSD
Merging satellite (MSG Clear-sky index) and in-situ data (Heliometer, ~75 stations)
Non-contemporaneous, PCA & KED
Frei et al. 2015, Stöckli 2013
Relative Sunshine Duration

SS : Fraction of explained spatial variance
(spatial Nash-Sutcliffe efficiency)

Leave-one-out crossvalidation all days 1998-2001

Frei et al. 2015
Overview sheet with list of products

Underlying data
Analysis method
Applications and target users
Accuracy and limitations
Grid structures
Update cycle
Versions

Documentation for Users

www.meteoswiss.ch  Search for „Gitterdaten“
User Wishes (2013)

*Your applications could benefit from new products/developments with priority on ...*

- ... higher spatial resolution
- ... finer time resolution (hourly)
- ... more parameters
- ... more real-time products
- ... uncertainty information (quantitative)
- ... longer time coverage (<1961)
- ... better long-term consistency
- ... areal extent beyond Swiss border

Number of responses: 26
Our Experience

• “High quality” = USEFUL. Meeting the requirements of applications.

• Requirements are diverse. Products tailored for applications.

• There is not “a best method”.

• Users need to grapple with requirements and specifications. User-friendly product information.

• Be honest about limitations.

• Improving through collaboration. Bridging producer – user gap.

• “High-quality climate services” is about sharing thought, not just data.
Publications


