Documentation of MeteoSwiss Grid-Data Products

Anomalies of Mean Temperature: TanomD9120, TanomM9120 and TanomY9120

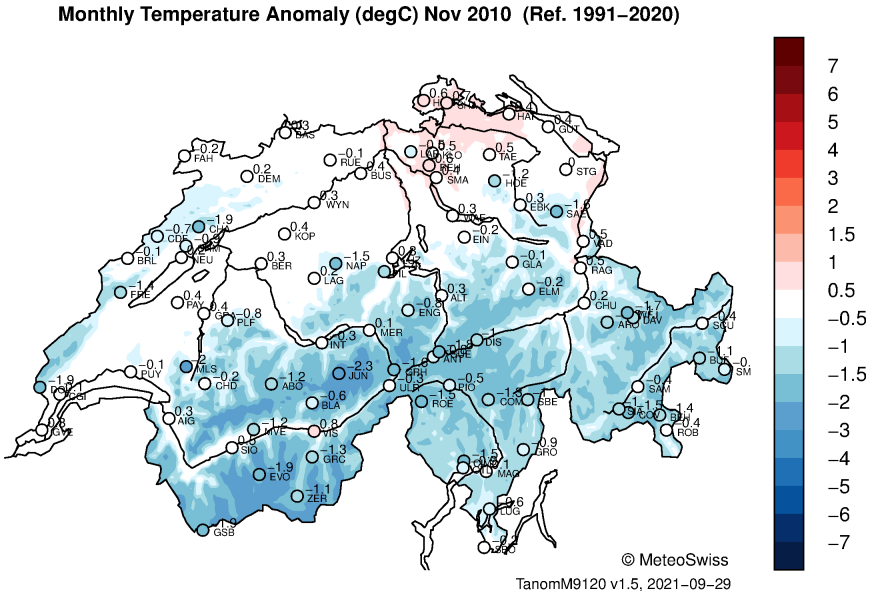

Figure 1: Monthly mean surface temperature anomaly (degrees C, reference 1991–2020) for November 2010.

Variable

Difference of surface mean temperature from the long-term mean of 1991-2020 (norm period) in degrees Celsius. Daily, monthly and yearly anomalies are relative to the long-term mean of the corresponding calendar day, month and the year.

Application

Climate monitoring. Monitoring of temperature-related natural systems (e.g. glaciology) and weather impacts on socio-economic sectors (e.g. agriculture and energy production).

Overview

TanomD9120, TanomM9120 and TanomY9120 are spatial analyses of deviations of daily, monthly and yearly mean temperatures from the corresponding climatological norm (reference 1991-2020). They are based on homogeneous measurement time series at about 80 stations and cover a multi-decadal period (1961-present). The interpolation is estimated using a km-scale digital elevation model in combination with non-linear and regionally variable topography temperature relationships. The datasets are intended primarily for monitoring purposes, such as those placing variations in glacier extent/volume, energy consumption and agricultural yields in relation to temperature evolutions.

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Data base

The data underlying the three data products are daily, monthly and yearly mean temperature measurements, exactly like those used for products TabsD, TabsM and TabsY. (See the documentations of the pertinent data products.)

Method

The anomaly fields are calculated simply as the difference between the analyses for absolute temperature (products TabsD, TabsM and TabsY) and those for the long-term mean conditions (products TnormD9120, TnormM9120 and TnormY9120). Refer to the corresponding product documentations and to Frei (2014) for details on their calculation.

Target users

The primary purpose of the temperature anomaly products is the monitoring of long-term temperature variations in Switzerland, including the study of its regional variations and height dependencies (see e.g. Ceppi et al. 2010). The long-term consistency of TanomM and TanomY makes them useful for the interpretation of variations in other natural systems (e.g. glaciers, permafrost, water resources, see Glaciological Commission 2007, PERMOS 2009) and of climate-sensitive quantities in economic sectors, such as in agriculture or the energy sector. The datasets may also be interesting for quantitative empirical modeling in these fields.

Accuracy and interpretation

The remarks on utility and interpretation as well as the figures of accuracy are similar to those given for absolute temperature products (TabsD, TabsM and TabsY). The user is referred to the corresponding product documentations for detail.

Of particular note is that, even though the measured time series are of good long-term consistency (Begert et al. 2003, 2005), the homogeneity of the data products may be compromised by changes in the station network over time. This is particularly relevant for TanomD9120, where we have clear signs of inhomogeneity as a consequence of network variations. Datasets that satisfy high standards in long-term temporal consistency are provided using a reconstruction concept and strictly stationary station networks (e.g. Trecanom9120Y1961).

Related products

Trecanom9120M1864, Trecanom9120M1901 and Trecanom9120M1961 (and similarly for annual “Y”): These are alternative datasets for the monthly and yearly datasets described here, but they are constructed to satisfy very high standards in temporal consistency and they extend over much longer time periods, starting in 1864, 1901 and 1961, respectively. The involved reconstruction method allows to work with a station sample that is strictly stationary in time, but much smaller in number. The difference between TanomM9120 and Trecanom9120M1961 is that the former builds on more stations and hence has a finer effective resolution, while the latter has a better temporal consistency, and, hence, is more appropriate for inspecting long-term change.

TnormD9120, TnormM9120 and TnormY9120: Long-term mean temperature for calendar days, months and the year of the norm period 1991-2020.

There is full consistency of TanomD9120, TanomM9120 and TanomY9120 with these related products in the sense that they correspond exactly to the difference of absolute quantities (mean temperatures) from the long-term mean over the norm period.

Grid structures

TanomD9120, TanomM9120 and TanomY9120 are available in the following grid structure:

ch02.lonlat, ch01r.swiss.lv95

Versions

Current versions: TanomD9120 v1.4, TanomM9120 v1.5, TanomY9120 v1.5

Previous versions:

TanomM v1.2 and TanomY v1.2 were calculated with a less robust estimation procedure for the vertical profile and layering scheme compared to the actual version.

TanomM v1.0 and TanomY v1.0 were calculated directly from the anomalies from the norm using a simpler functional form of the vertical profile.

Update cycle

TanomD9120 for day D is calculated firstly in the morning of day D+1, but is updated at the beginning of the subsequent calendar month to include changes of station measurements from ongoing data quality control. TanomM9120 is updated monthly and is usually available at the beginning of the following month. TanomY9120 is updated yearly and is available in January.

References

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