Monthly gridded datasets for temperature and precipitation over Slovenia

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Outline

• Interpolation challenges
• Input data density and distribution
• Methodology and results
Geographical facts

- Area: 20273 km²
- Complex terrain: 0–2864 m a.s.l.
Climate of Slovenia

- Diverse Climate
- Influence of three major climate types

... Submediterranean ...

Continental ...

... Subalpine
Monthly gridded dataset

- The aim: the production of monthly homogenous spatial dataset
- How to ensure consistency and homogeneity over time
- How to address high spatial variability in 1 km resolution
High variability in data density over time

Period 1961-1990

- climatological stations
- precipitation stations
Methodology

**Temperature signal**

- Climate normals
- Anomalies

- Strongly linked to local geographical characteristics
- Very high spatial variability

- Climate variability and change signal
- Higher spatial coherence
Methodology

1. Station Monthly Normals
2. Spatial Interpolation
3. Averaging
4. Addition/Multiplication
5. Homogenised Monthly Station Datasets
6. Station Monthly Anomalies
7. Spatial Interpolation
8. Monthly Gridded Anomalies 1 km Resolution
Spatial interpolation of temperature - data

NORMALS:
• All available data (15 years)
• 89 quality controlled stations
• Adaptation to the reference period using correlation with neighboring stations

ANOMALIES:
• 49 homogenised monthly datasets
Spatial interpolation of temperature normals

Residual kriging: MMTA = f (x, y, x2, y2, xy, z) with backward regression analysis

<table>
<thead>
<tr>
<th>Month</th>
<th>Regression analysis</th>
<th>Cross validation</th>
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<tbody>
<tr>
<td></td>
<td>Explanatory variables</td>
<td>R² (%)</td>
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Spatial interpolation of temperature anomalies

- Residual kriging: \(\text{MMTA} = f(x, y, x^2, y^2, xy, z)\) with backward regression analysis
- High variability of statistical scores
Spatial interpolation of precipitation - data

NORMALS:
• All available data (15 years)
• 319 quality controlled stations (daily precipitation and totalizer)
• Adaptation to the reference period using correlation with neighbouring stations

ANOMALIES:
• 267 homogenised monthly datasets
Residual kriging: MMTA = f (x, y, x2, y2, xy, z) with backward regression analysis

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Spatial interpolation of precipitation anomalies

- Residual kriging: $\text{MMTA} = f(x, y, x_2, y_2, xy, z)$ with backward regression analysis
- High variability of statistical scores

![Graph of $R^2$ percentages over months](image1)

![Graph of $R$ over months](image2)
Spatial interpolation of anomalies

- Inclusion of elevation (z) is important!
- Dangerous because of very small number of measurements for temperature
- Measure for elevation inclusion in regressional analysis: Correlation coefficient > 0.5
High resolution monthly temperature climatology for Slovenia

Semi-automatic system based on:

- VBA (interface)
- R (calculation)

- Monthly anomaly values in regular grid (1 km)
- Monthly mean temperature values in regular grid (1 km)
- Period 1961–last month
- Derived values (10 and 30 years means)
- Arc ASCII \rightarrow NetCDF
Thank you for your attention!