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Monthly gridded datasets for temperature and precipitation over Slovenia

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Outline

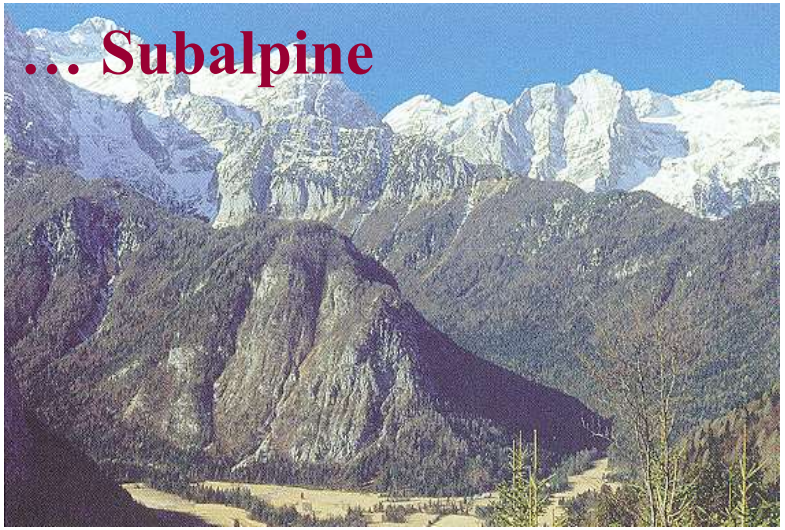
- Interpolation chalanges
- Input data density and distribution
- Methodology and results

Geographical facts

- Area : 20273 km^2
- Complex terrain: 0–2864 m a.s.l.

Climate of Slovenia

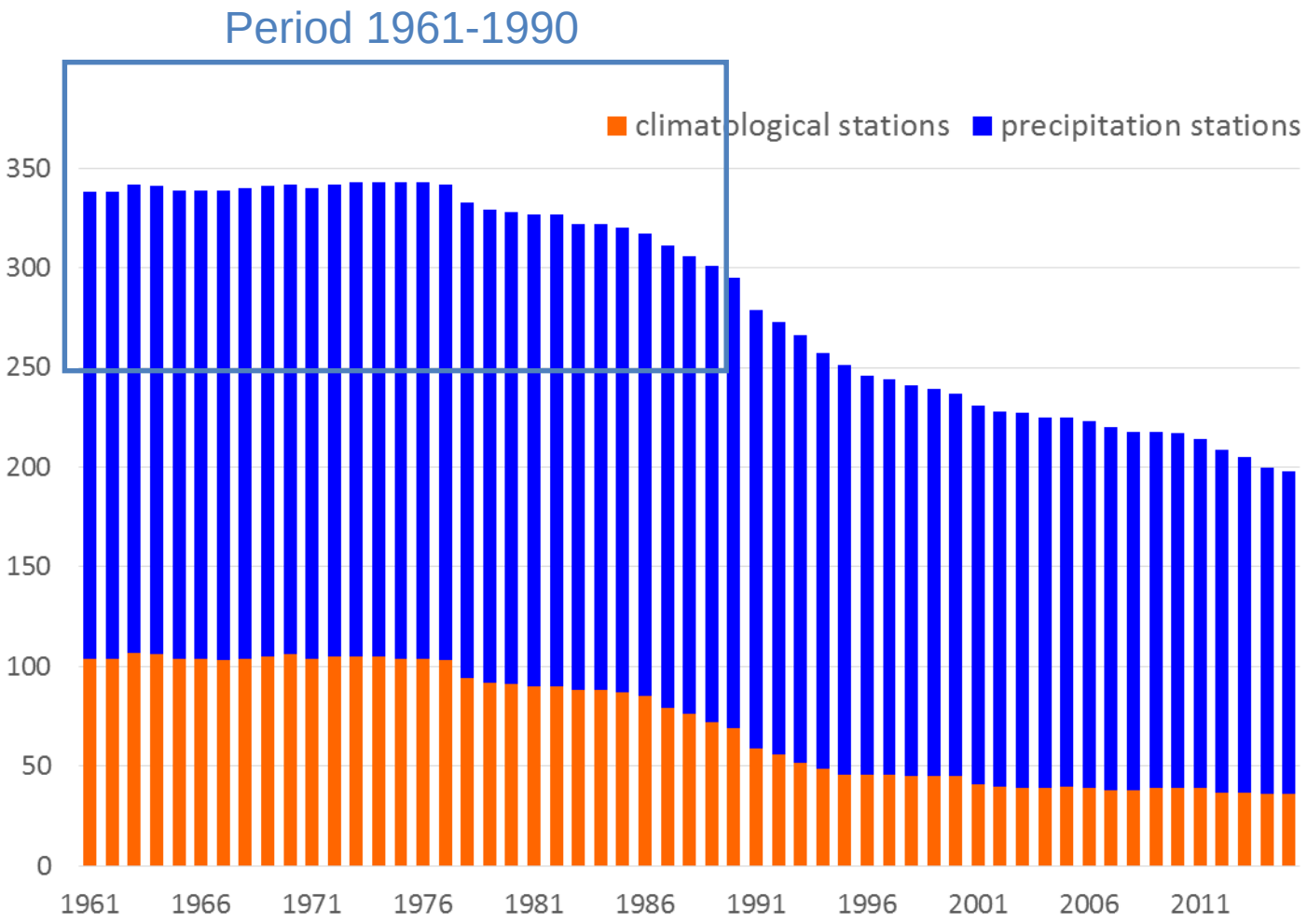
- Diverse Climate
- Influence of three major climate types



Monthly gridded dataset

- The aim: the production of monthly homogenuous spatial dataset
- **How to ensure consistency and homogeneity over time**
- **How to adress high spatial variability in 1 km resoluiton**

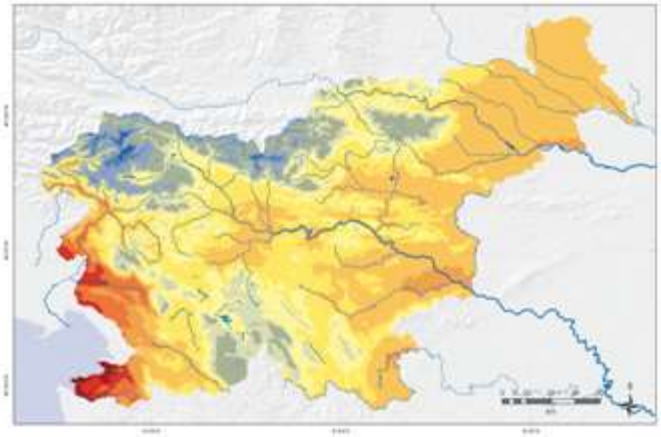
High variability in data density over time



Methodology

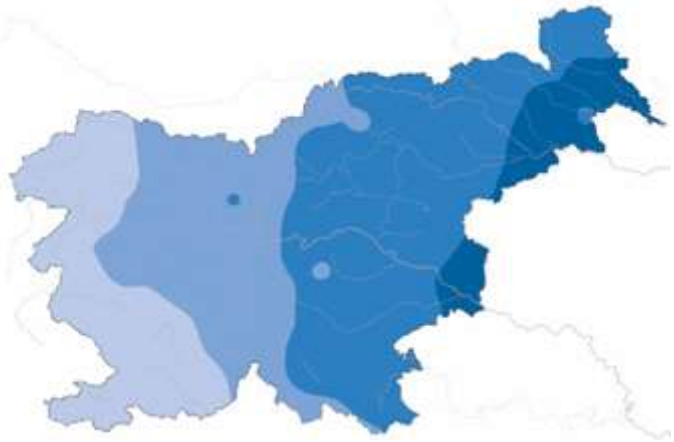
Temperature signal

Climate normals



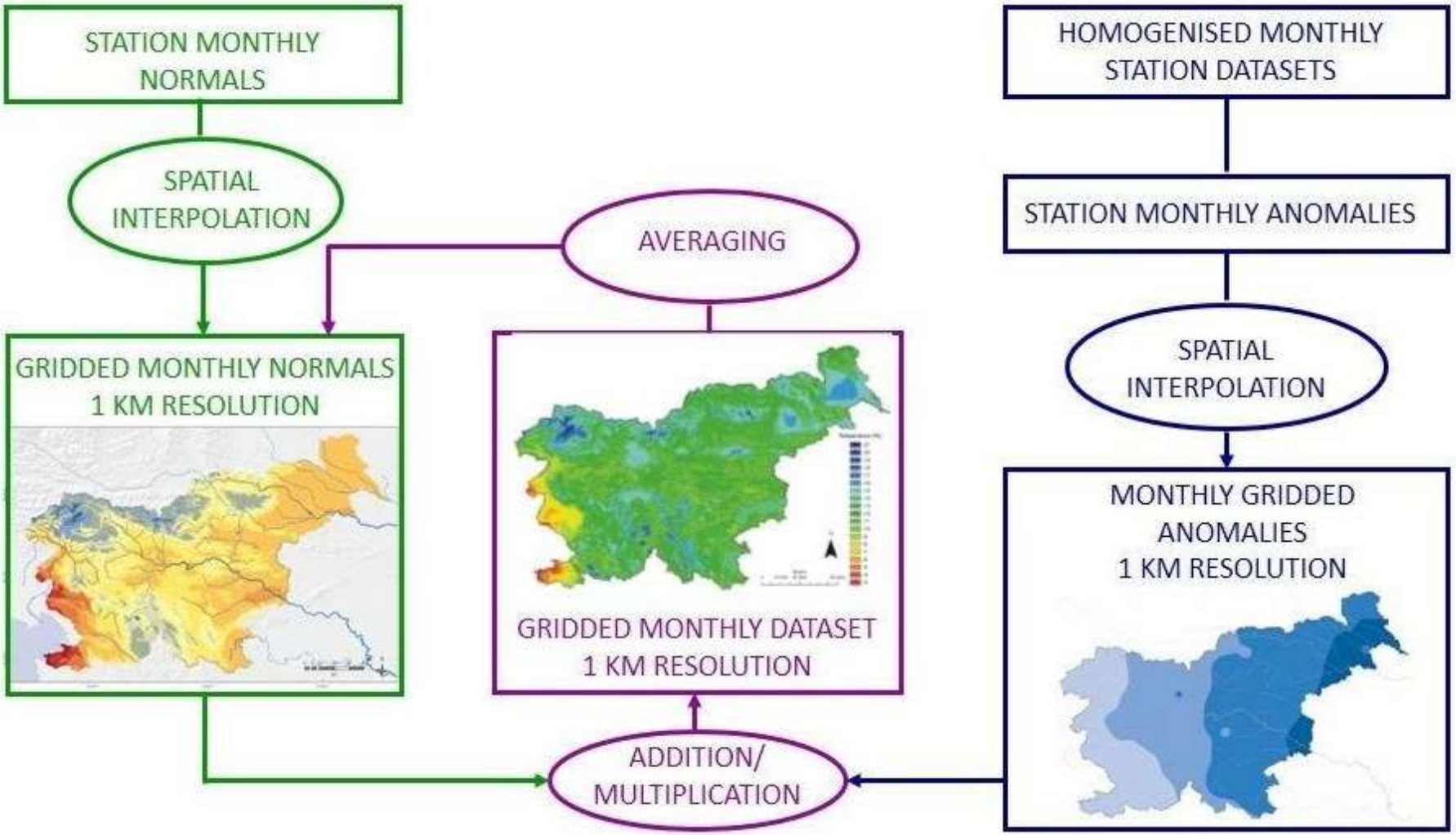
- Strongly linked to local geographical characteristics
- Very high spatial variability

Anomalies

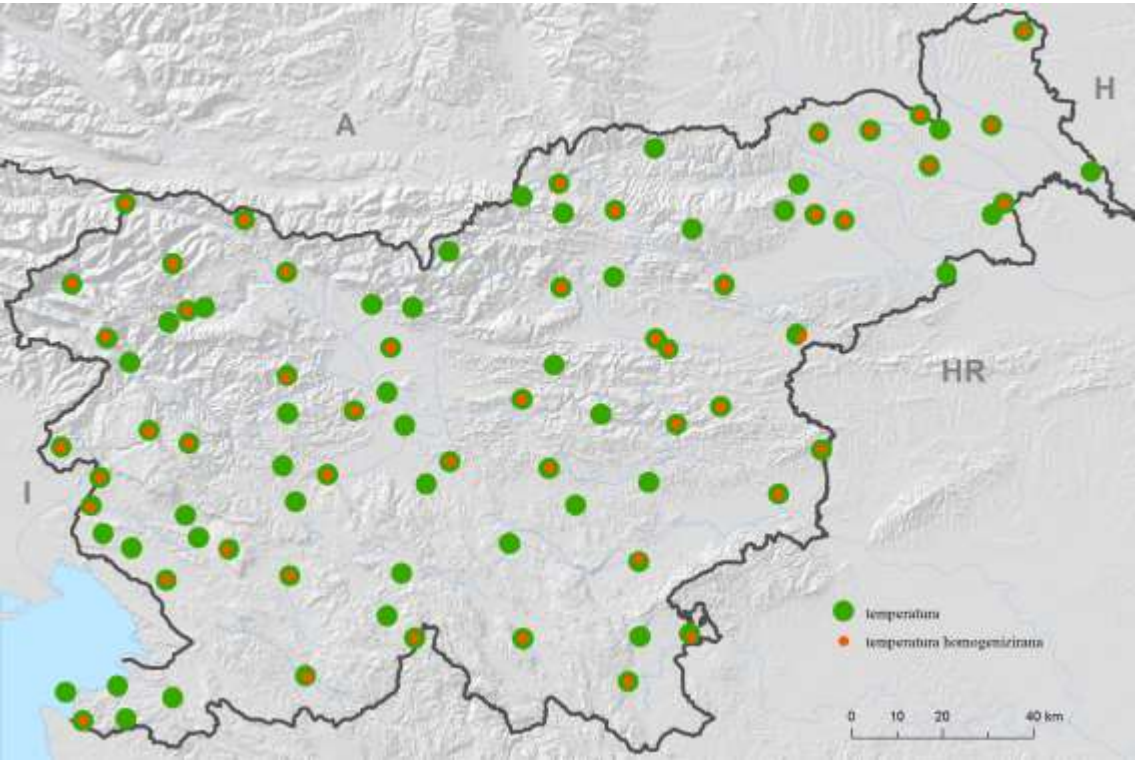


- Climate variability and change signal
- Higher spatial coherence

Methodology



Spatial interpolation of temperature - data

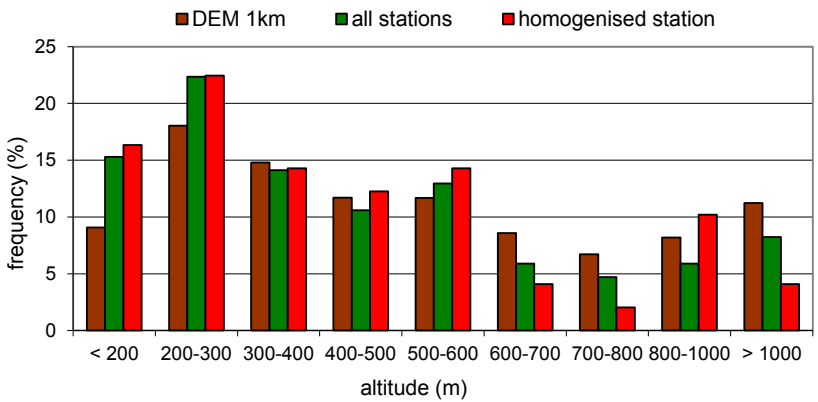


NORMALS:

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

ANOMALIES:

- 49 homogenised monthly datasets



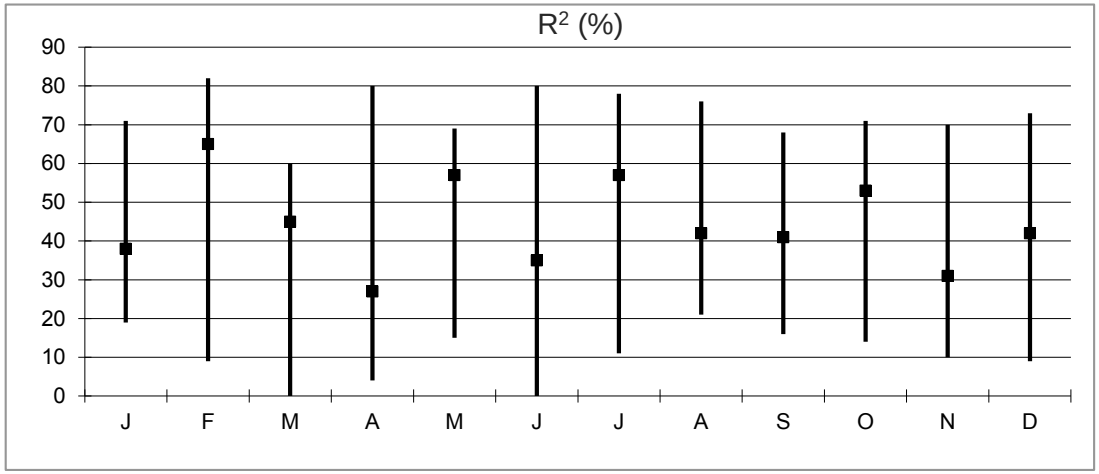
Spatial interpolation of temperature normals

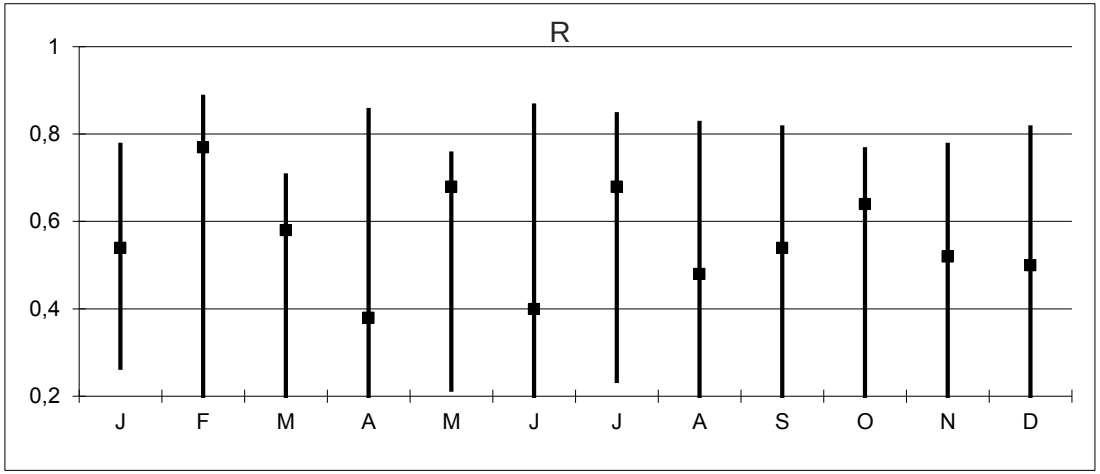
Residual kriging: MMTA = f (x, y, x2, y2, xy, z) with backward regression analysis

Month	Regression analysis		Cross validation
	Explanatory variables	R^2 (%)	R
Jan	x ,x^2, y^2, z	81	0.89
Feb	x, x^2, xy, z	79	0.90
Mar	x, y ,x^2, y^2, z	84	0.92
Apr	x, y ,x^2, y^2,xy, z	88	0.95
May	x, y ,x^2, y^2,xy, z	90	0.98
Jun	x, y ,x^2, y^2,xy, z	92	0.96
Jul	x, y ,x^2, y^2,xy, z	91	0.97
Aug	x, y ,x^2, y^2,xy, z	92	0.96
Sep	x, x^2, y^2,xy, z	90	0.95
Oct	x, y ,x^2, y^2, z	86	0.94
Nov	x, x^2, y^2,xy, z	88	0.90
Dec	x, x^2, y^2, z	83	0.91

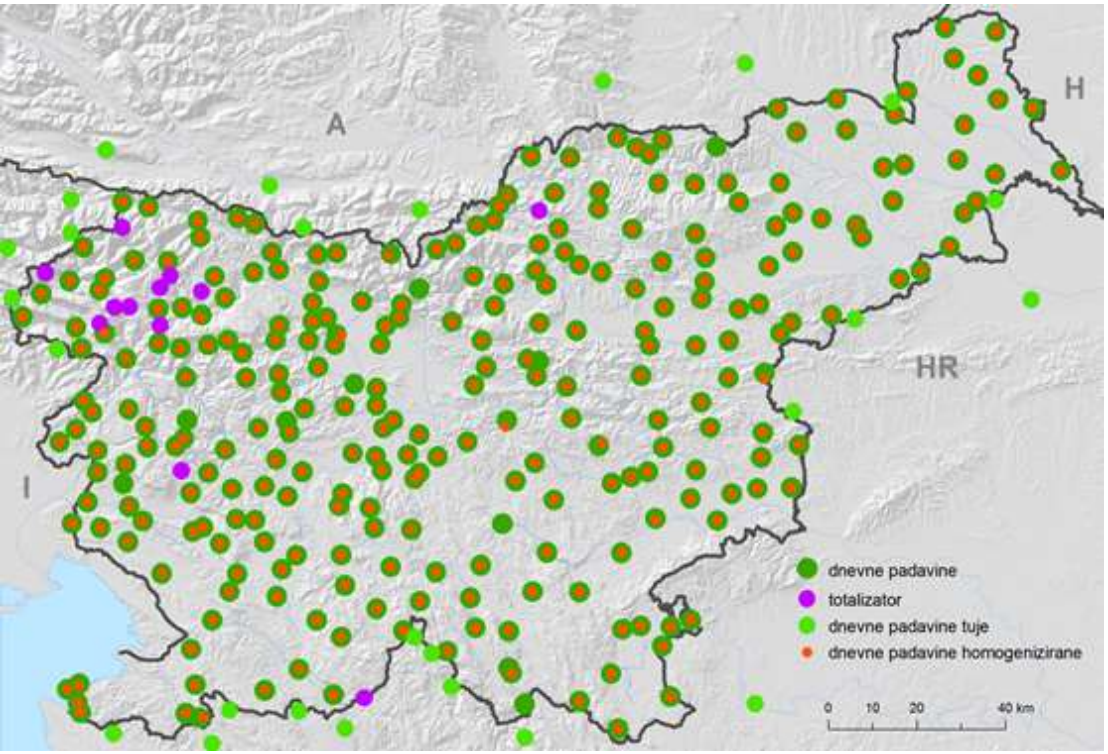
Spatial interpolation of temperature anomalies

- Residual kriging: MMTA = f (x, y, x2, y2, xy, z) with backward regression analysis
- High variability of statistical scores





Spatial interpolation of precipitation - data

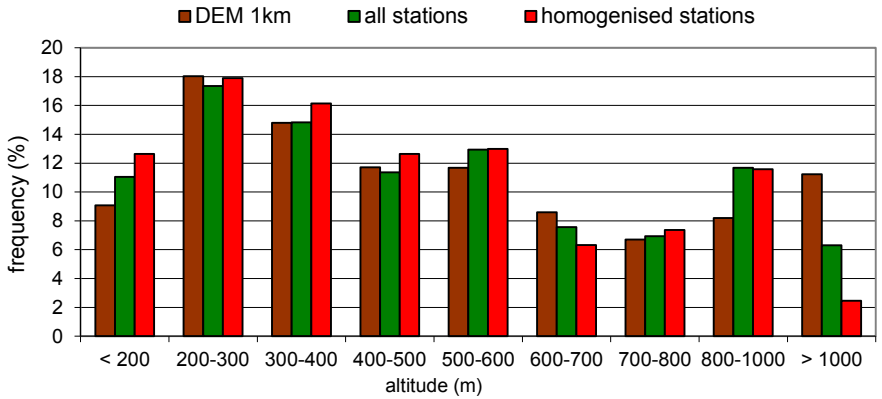


NORMALS:

- 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



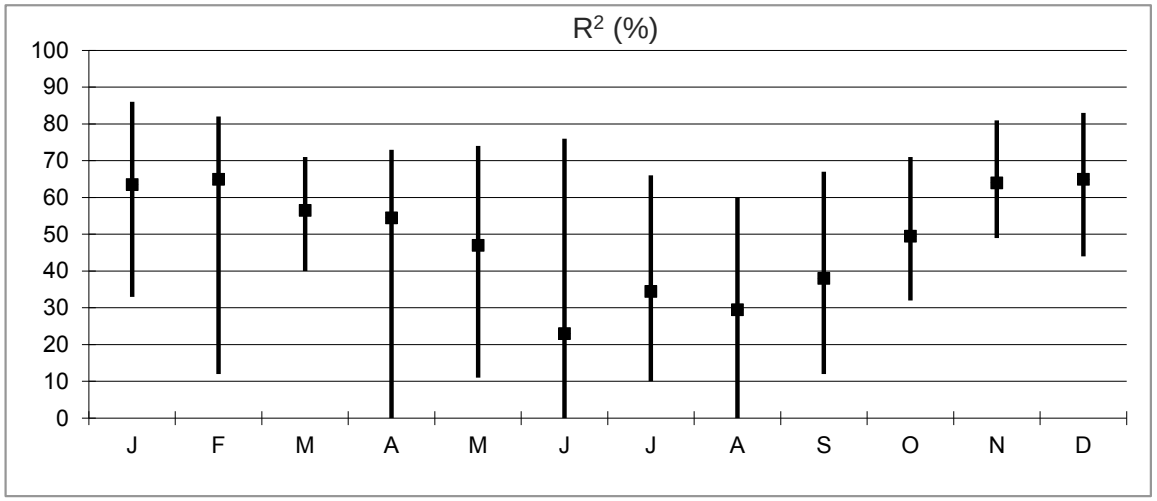
Spatial interpolation of precipitation normals

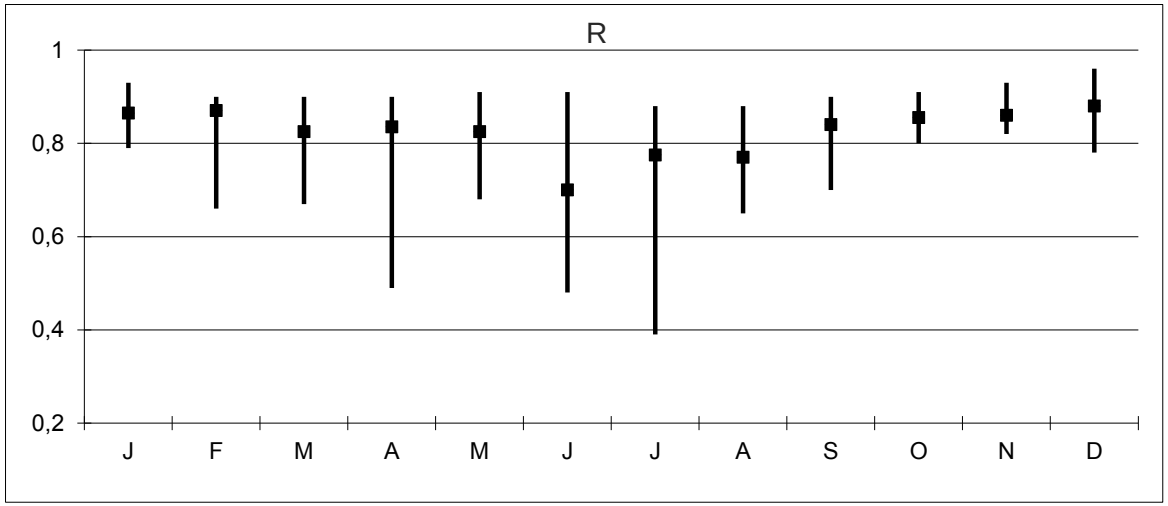
Residual kriging: MMTA = f (x, y, x2, y2, xy, z) with backward regression analysis

Month	Regression analysis		Cross validation
	Explanatory variables	R^2 (%)	R
Jan	x , y, x^2, zNE, z	68	0.89
Feb	x, y, x^2, xy, z	59	0.82
Mar	x, y ,x^2, xy, zNE, z	60	0.85
Apr	x, y ,x^2, y^2,xy, z	69	0.91
May	x, y ,x^2, y^2,xy, z	68	0.90
Jun	x, y ,x^2, y^2,xy, z	64	0.86
Jul	y ,x^2, y^2,xy, z	68	0.84
Aug	x, y ,x^2, y^2,xy, z	60	0.78
Sep	x, x^2, zNE, z	65	0.91
Oct	x, y ,x^2, xy, zNE z	67	0.91
Nov	x, y, x^2, y^2,xy, zNE, z	65	0.85
Dec	x, y, x^2, xy, zNE, z	61	0.92

Spatial interpolation of precipitation anomalies

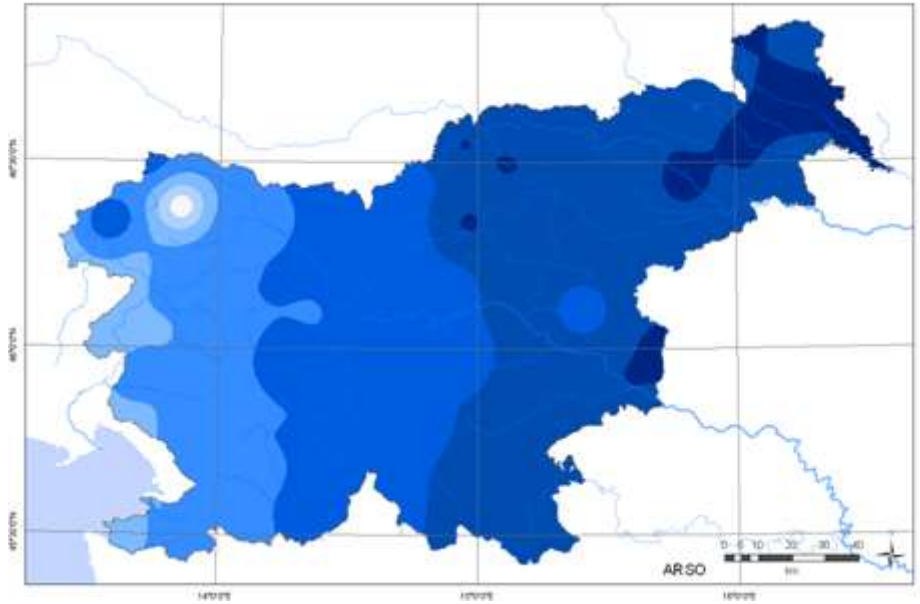
- Residual kriging: MMTA = f (x, y, x2, y2, xy, z) with backward regression analysis
- High variability of statistical scores

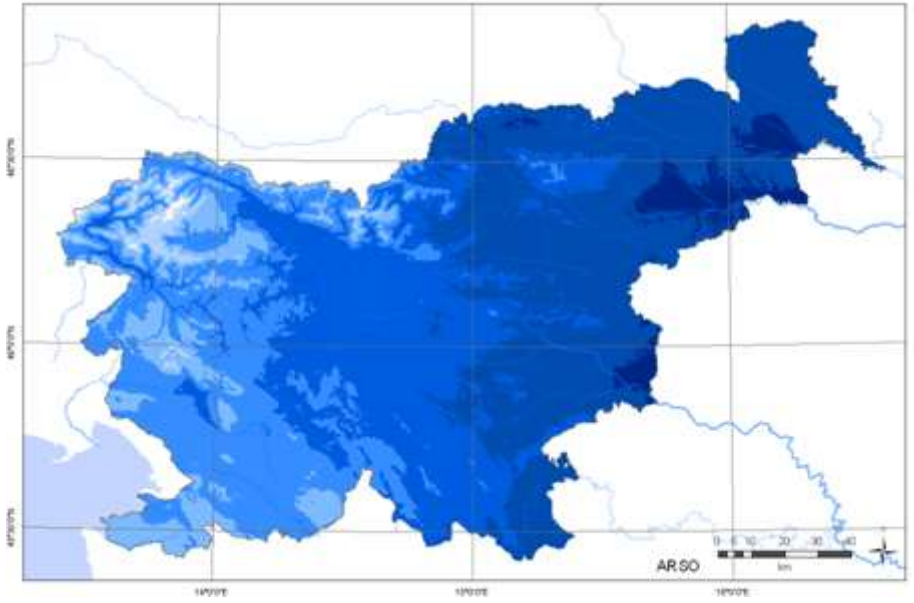




Spatial interpolation of anomalies

- 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

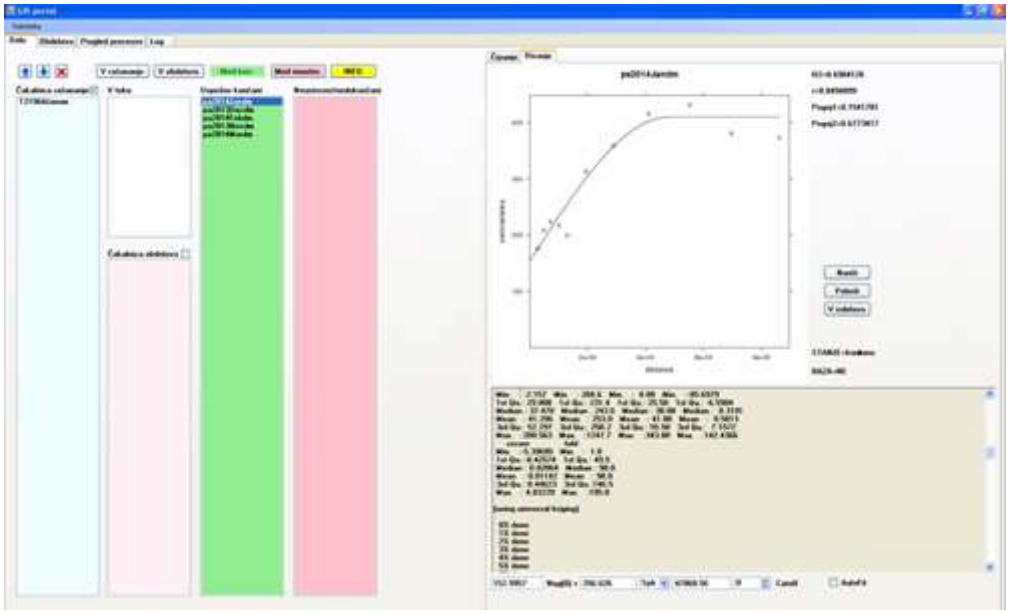




High resolution monthly temerature climatology for Slovenia

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 → NetCDF

Thank you for your attention!