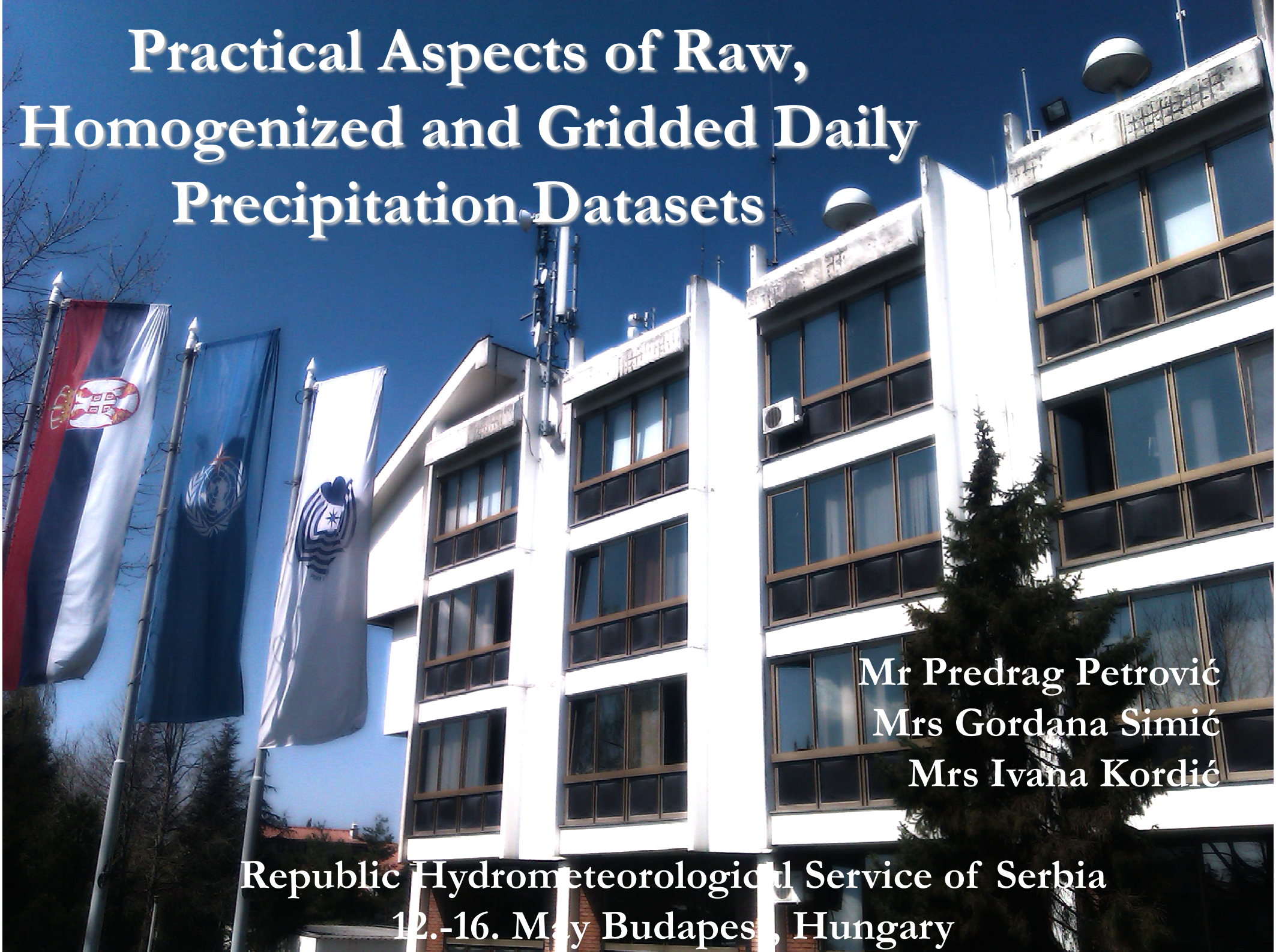
Practical Aspects of Raw, Homogenized and Gridded Daily Precipitation Datasets



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1. Practical Aspects of Raw, Homogenized and Gridded Daily Precipitation Datasets

- The use of daily data in climate assessments
- Types of available daily data
- Practical use of daily data in different studies
  - calculation of climate indices
  - calculation of extreme values for a return period
- An example of daily precipitation data

1.1 The use of daily data in climate assessments

- Obtaining the highest possible temporal resolution of climate data
- Homogenization and quality control as the first step
- Spatial interpolation as necessary step for mapping

1.2 Types of available daily data

- Raw (observed) data
  - feature gaps and inhomogeneities
- Homogenized data
  - gaps filled in, inhomogeneities (mostly) eliminated
  - spotty data, not representative for any wider area
- Gridded (spatially interpolated) data
  - any wider area uniformly covered with data
- How much do these data change in every step?

1.3 Practical use of daily data in different studies

- Calculation of climate indices
- Calculation of extreme values for a return period
- Example of daily precipitation data
- Data obtained through CarpatClim Project
  - raw data used for homogenization and gridding
  - homogenized and gridded data derived from raw series

1.4 Data used for the study

- Length of series is *50 years (1961-2010)*
- 73 stations from Serbia
- Homogenization performed using *MASH*
- Spatial interpolation performed using *MISH*
- Used nearest grid points to the measurement sites

Figure 1.4.1 Network of precipitation station

1.5 Calculation of climate indices

- Software RClimDex
- Indices recommended by WMO ETCCDMI and CLIVAR
- 11 indices referred to precipitation
- Comparison of the three types of datasets

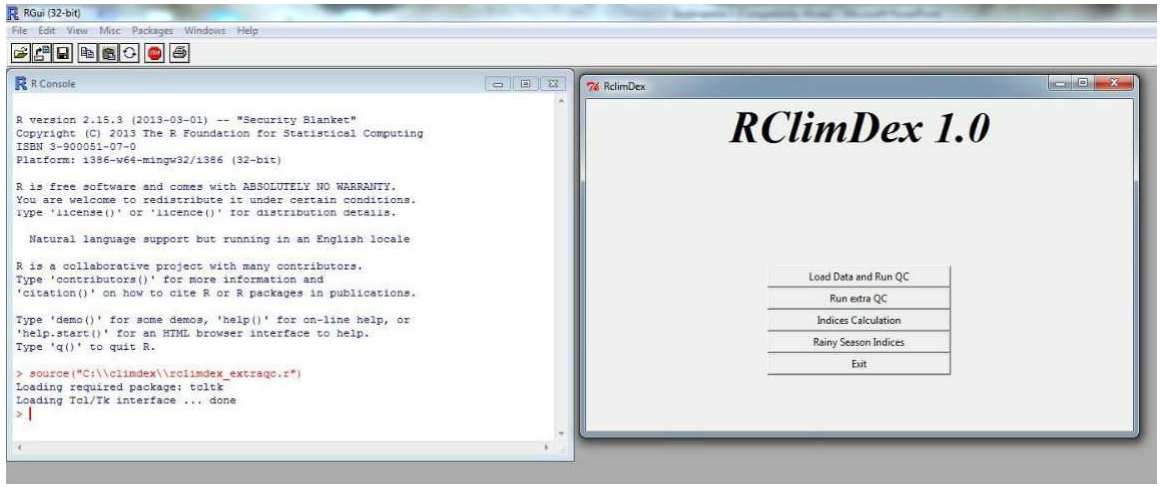


Figure 1.5.1 RClimDex software

Climate indices

Index		Definition	Unit
CDD	Consecutive dry days	Maximum number of conescutive dry days with RR<1mm	days
CWD	Consecutive wet days	Maximum number of conescutive wet days with RR>1mm	days
PRCPTOT	Annual total wet-day precipitation	Annual total PRCP in wet days (RR>=1mm)	mm
R10	Number of heavy precipitation days	Annual count of days when PRCP>10mm	mm
R20	Number of very heavy precipitation days	Annual count of days when PRCP>20mm	mm
R25	Number of days above 25mm	Annual count of days when PRCP>25mm	mm
R95p	Very wet days	Annual total PRCP when RR>95th percentile	mm
R99p	Extremely wet days	Annual total PRCP when RR>99th percentile	mm
Rx1day	Max 1-day precipitation amount	Monthly max 1-day precipitation	mm
Rx5day	Max 5-day precipitation amount	Monthly max 5-day conseutive precipitation	mm
SDII	Simple daily intensity index	Annual total precipitation divided by the number of wet days (defined by PRCP >=1mm) in the year	mm/day

Table 1.5.2 Climate indices definitions

CDD - Consecutive dry days

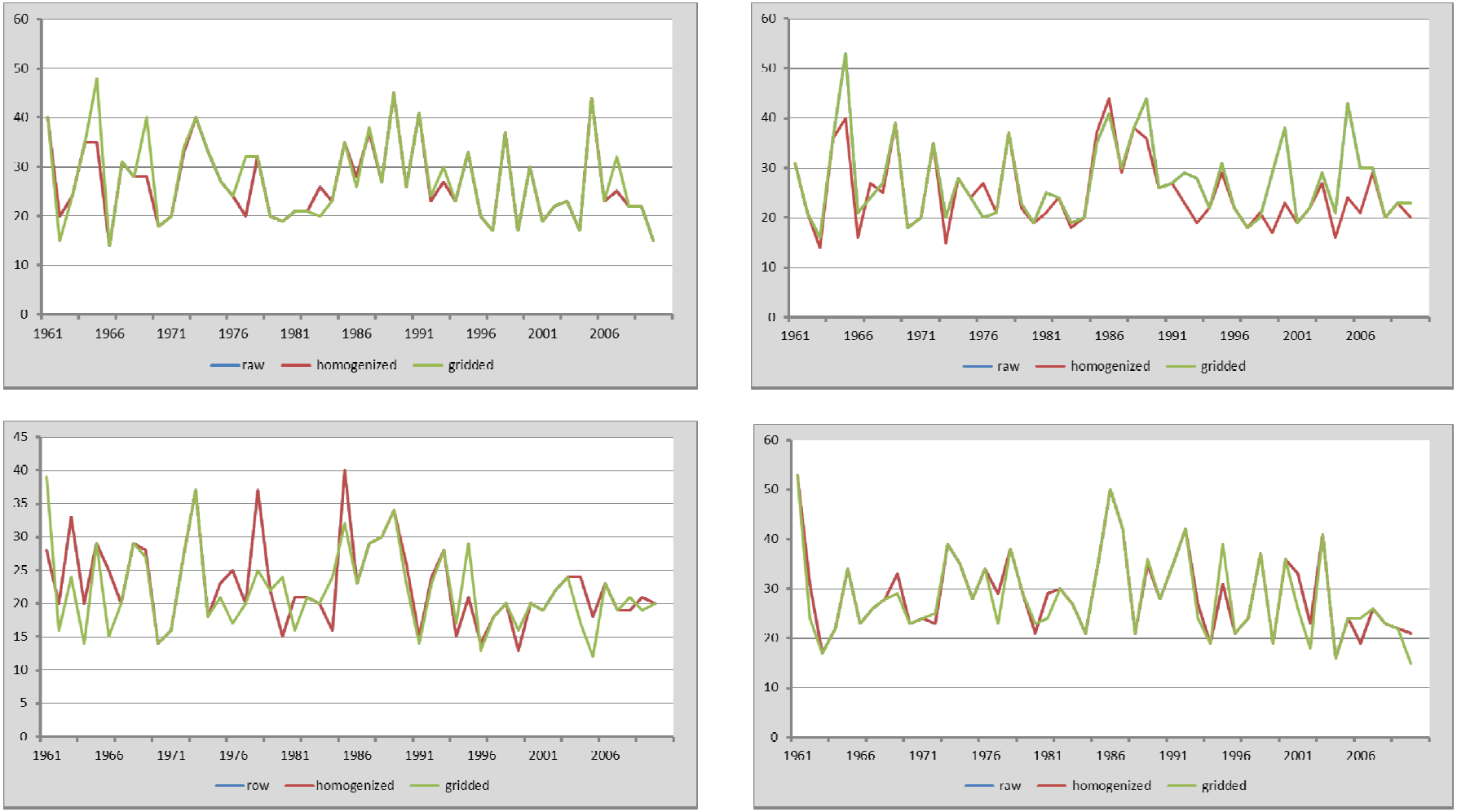


Figure 1.5.3

CDD (days) for Beograd, Kragujevac, Valjevo and Palić

CWD-Consecutive wet days

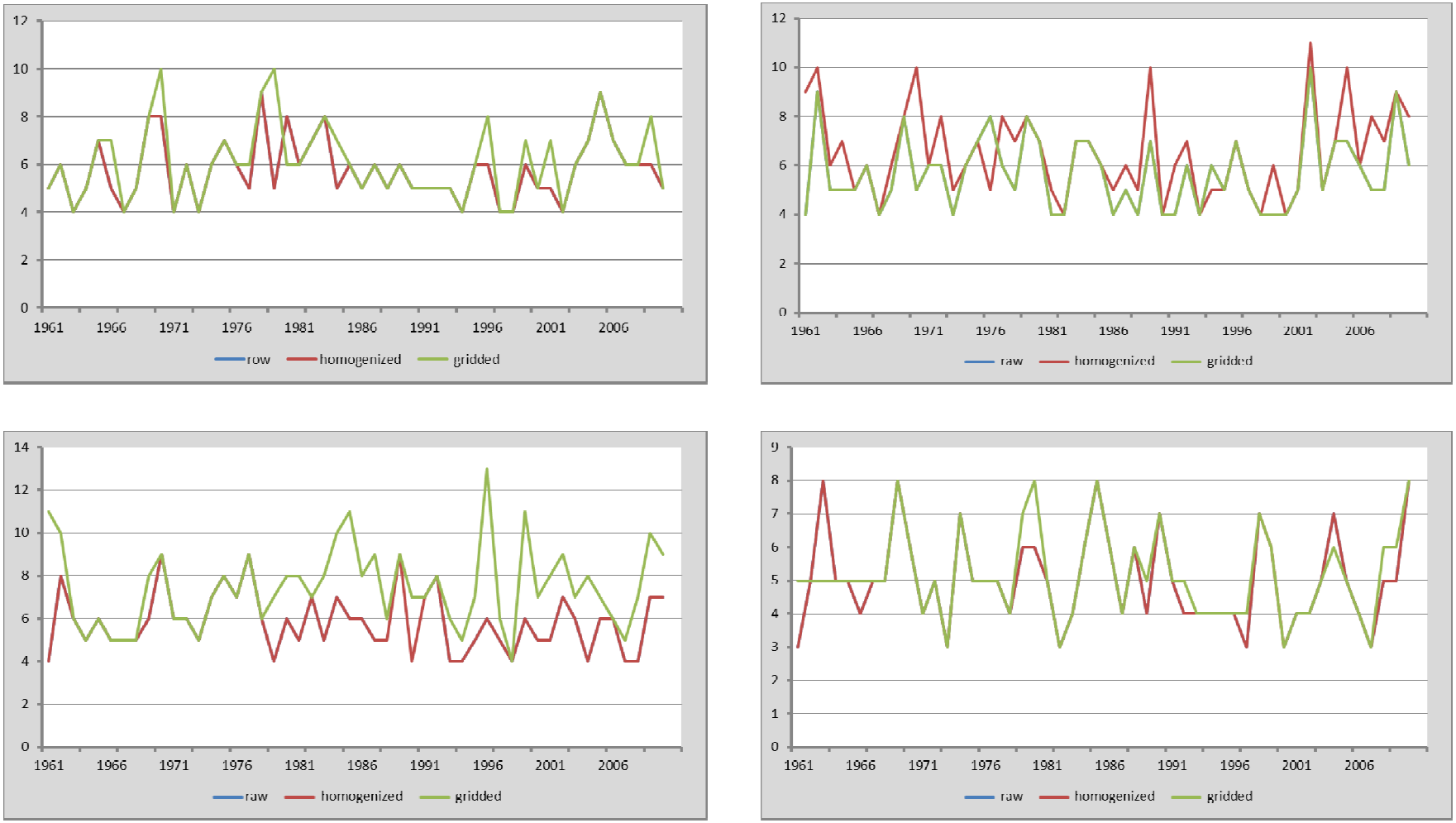


Figure 1.5.4

CWD (days) for Beograd, Kragujevac, Valjevo and Palić

PRCPTOT-Annual total wet day

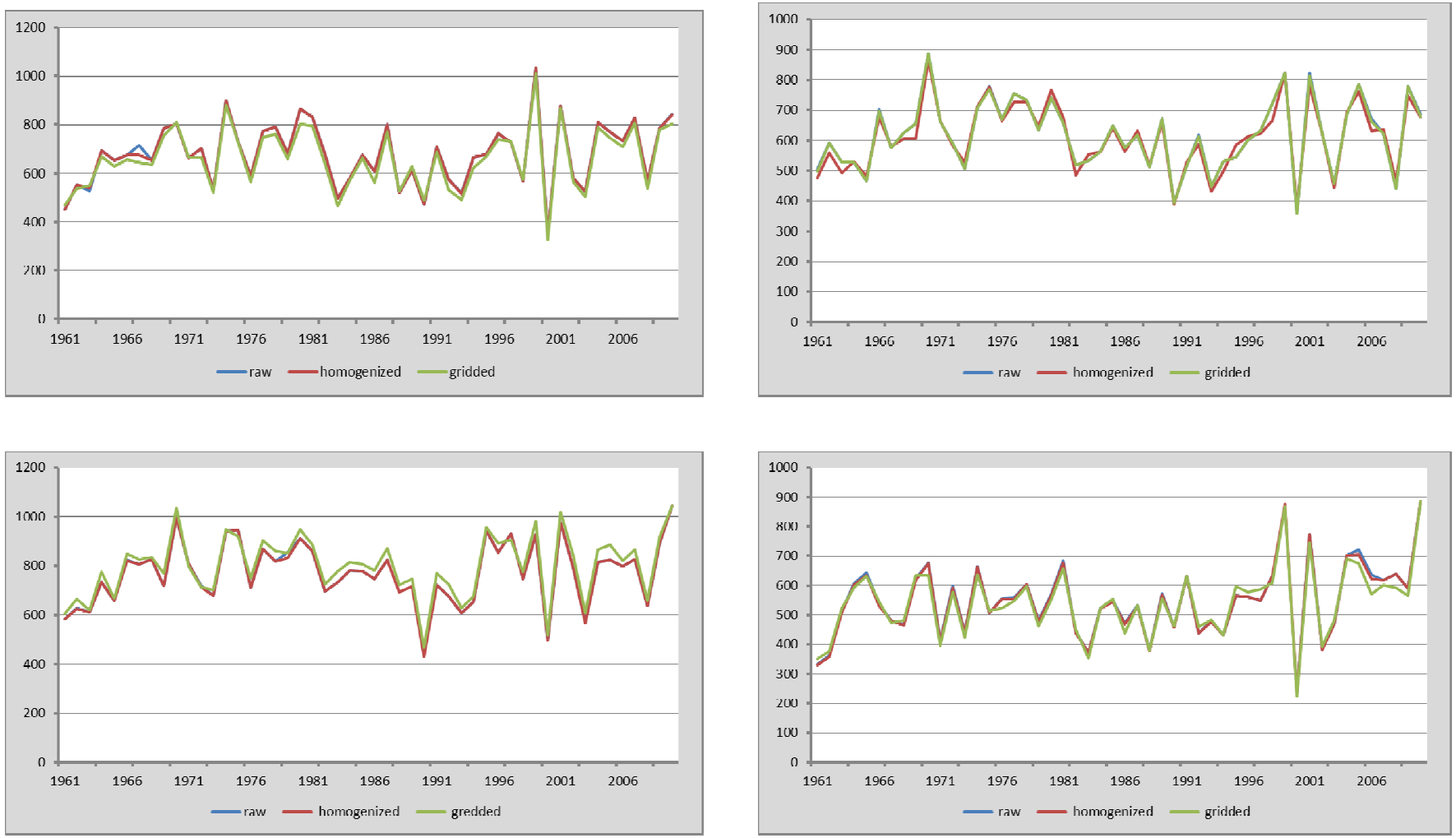


Figure 1.5.5

PRCPTOT (mm) for Beograd, Kragujevac, Valjevo and Palić

R10- Number of heavy precipitation days

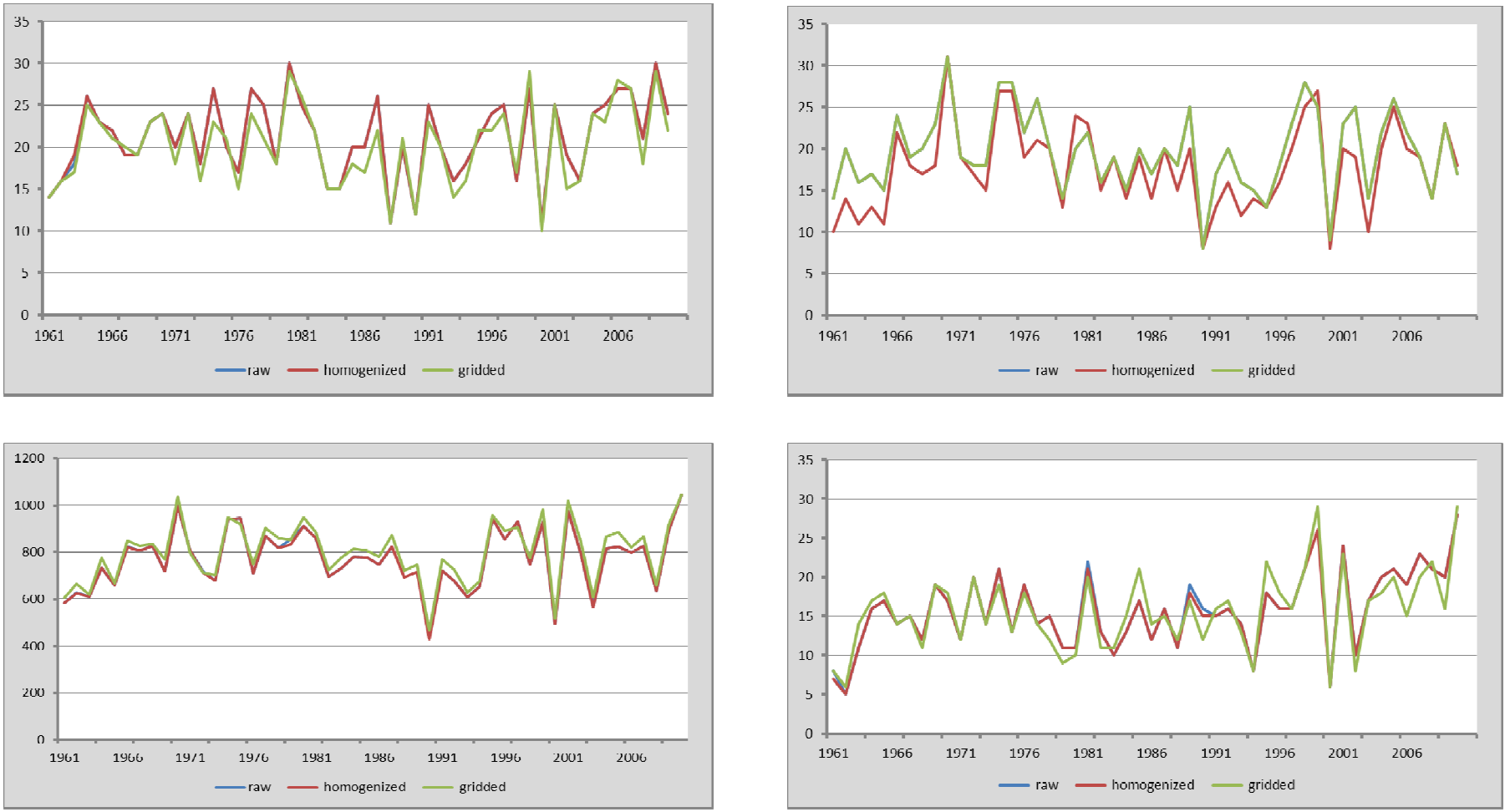


Figure 1.5.6

R10 (days) for Beograd, Kragujevac, Valjevo and Palić

R20-Number of very heavy precipitation days

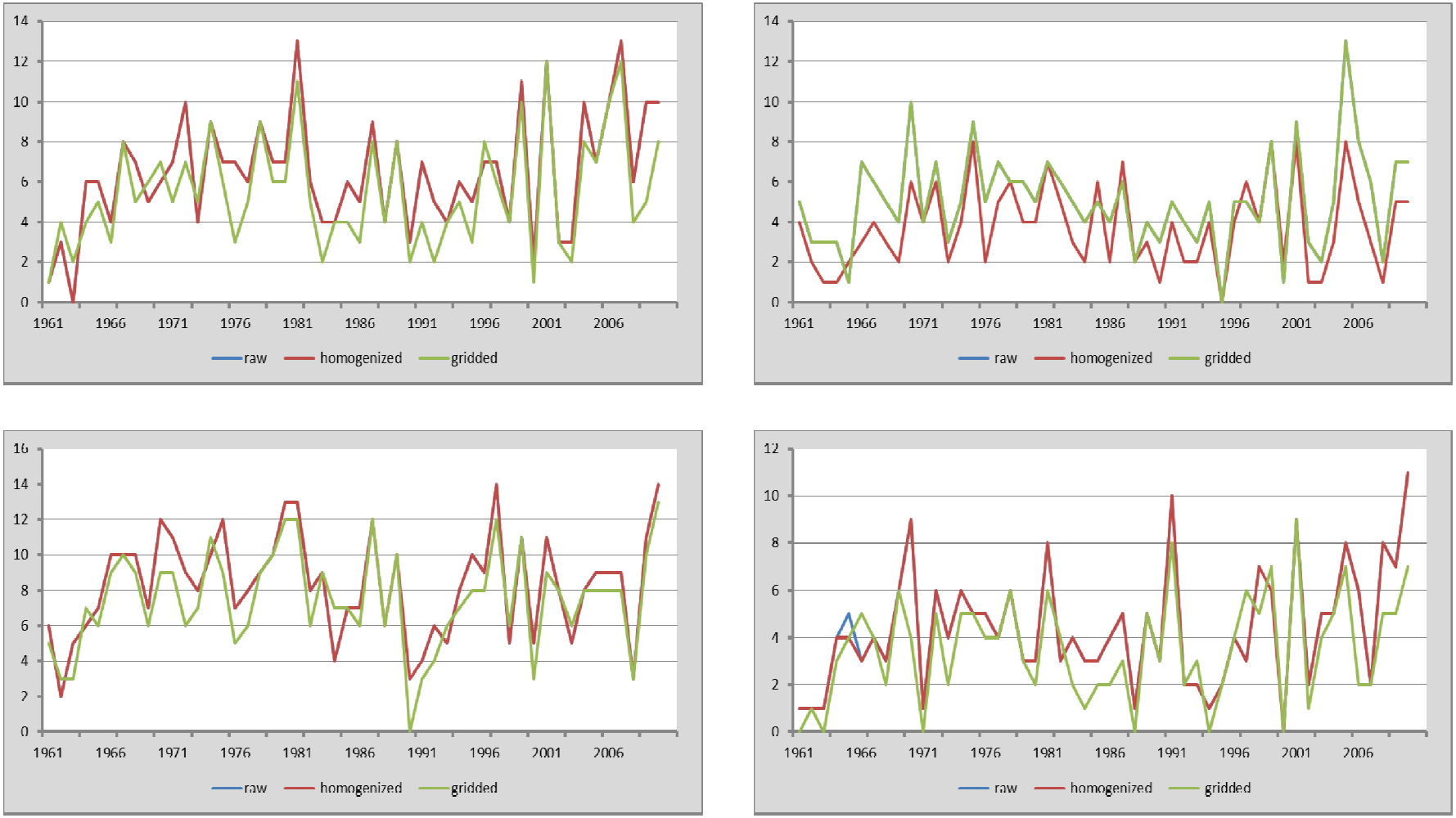


Figure 1.5.7

R20 (days) for Beograd, Kragujevac, Valjevo and Palić

R25-Number of days above 25 mm

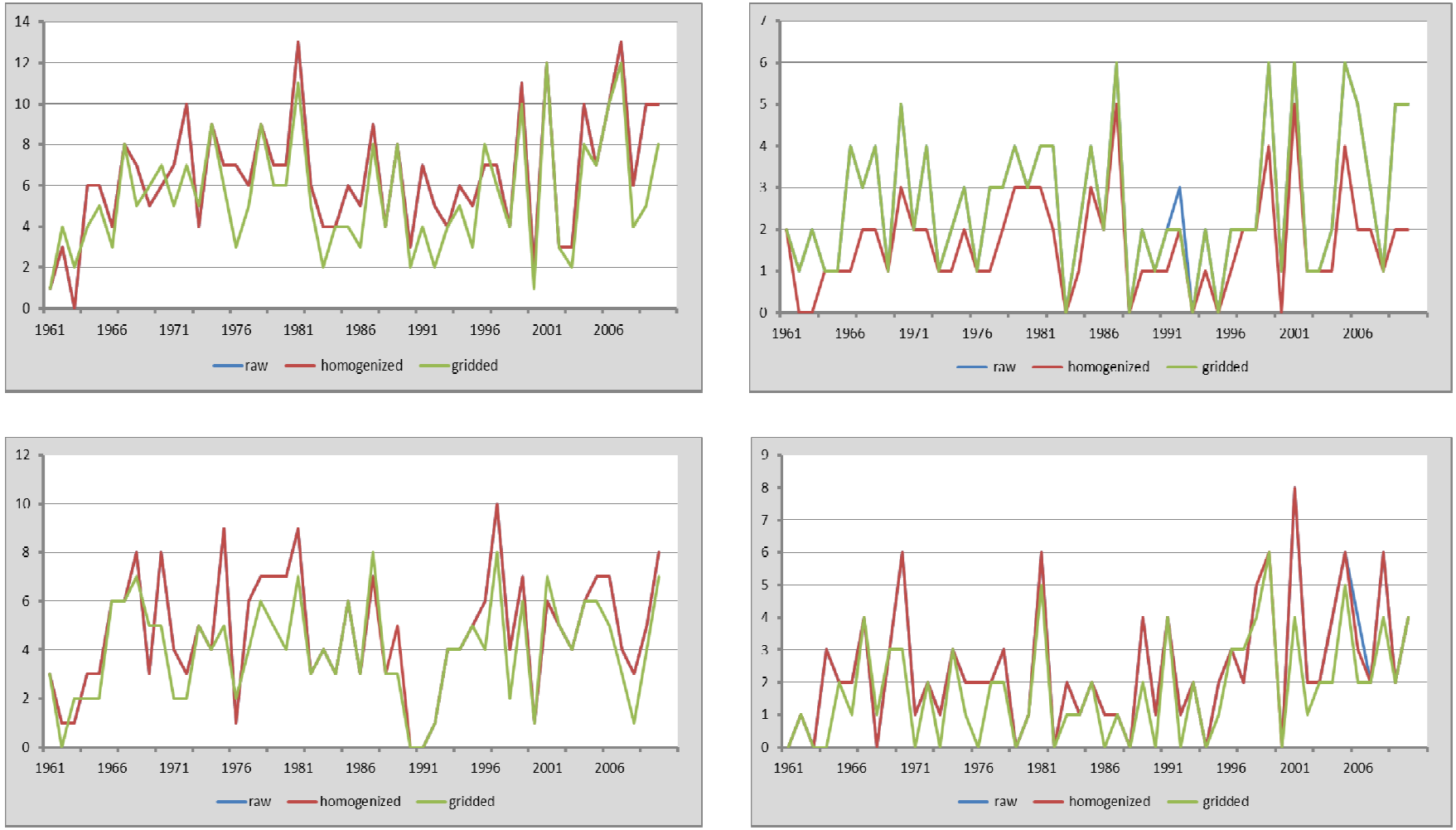


Figure 1.5.8

R25 (days) for Beograd, Kragujevac, Valjevo and Palić

R95p-Very wet days

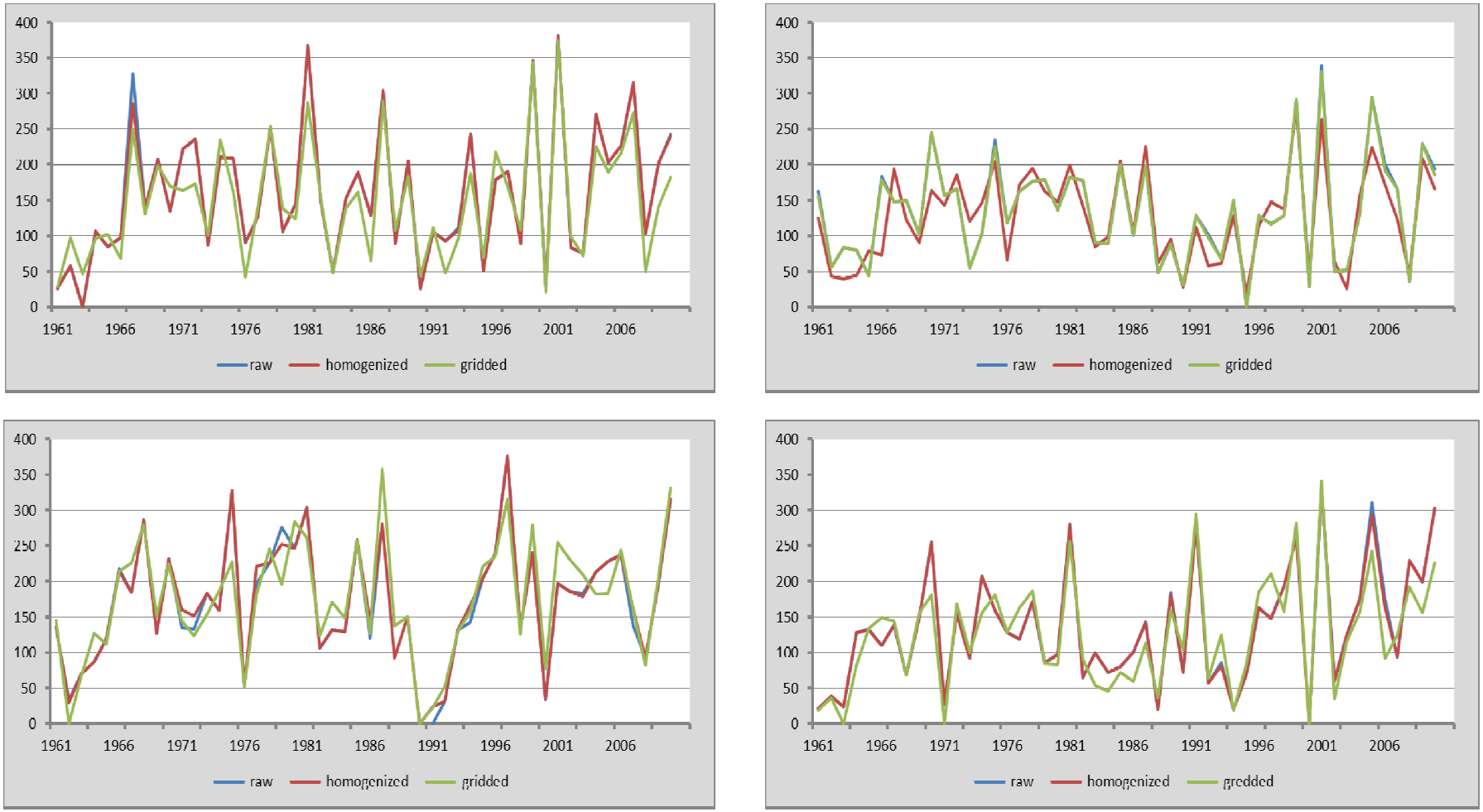


Figure 1.5.9

R95p (mm) for Beograd, Kragujevac, Valjevo and Palić

R99p-Extremely wet days

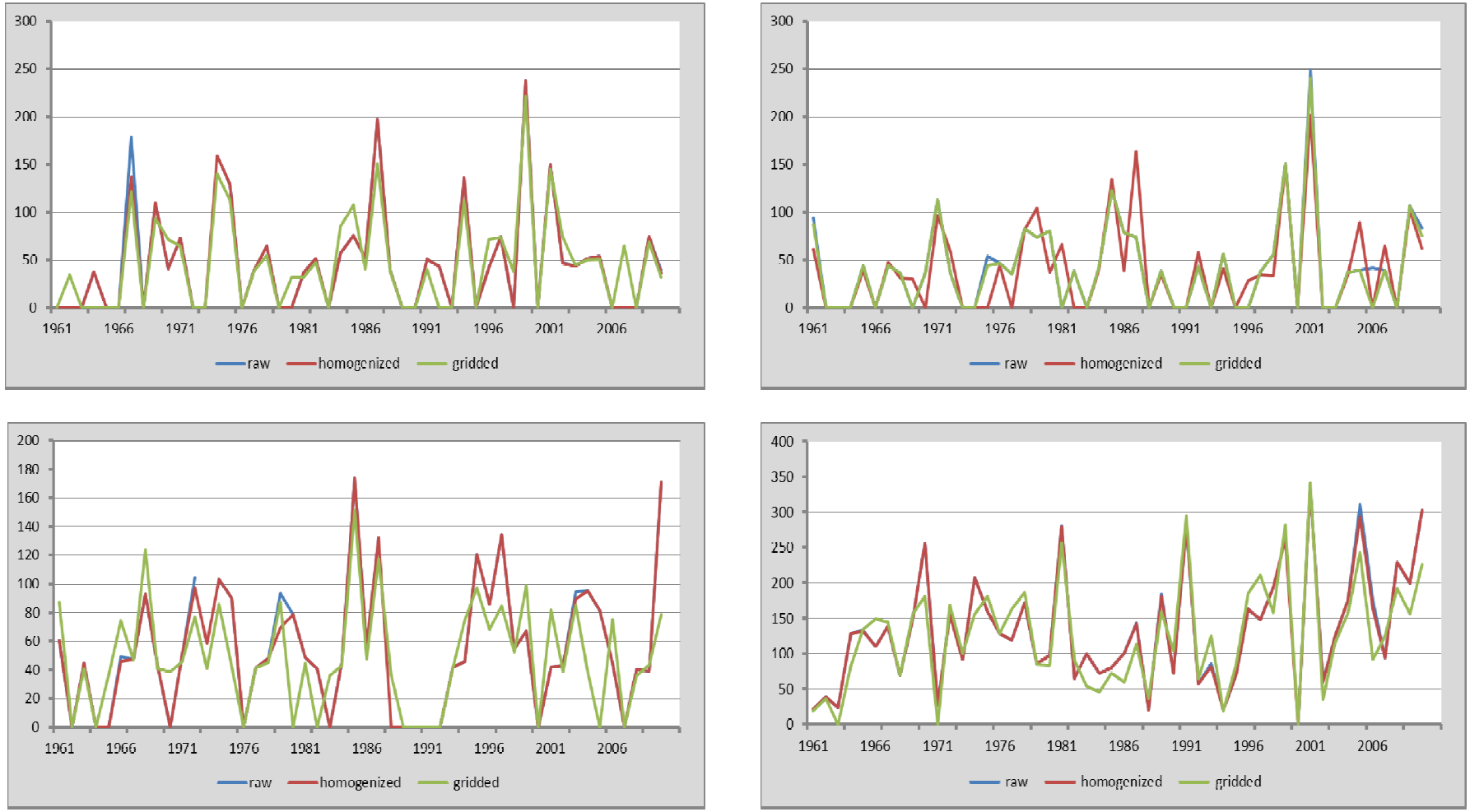


Figure 1.5.10

R99p (mm) for Beograd, Kragujevac, Valjevo and Palić

Rx1day- Max 1 day precipitation amount

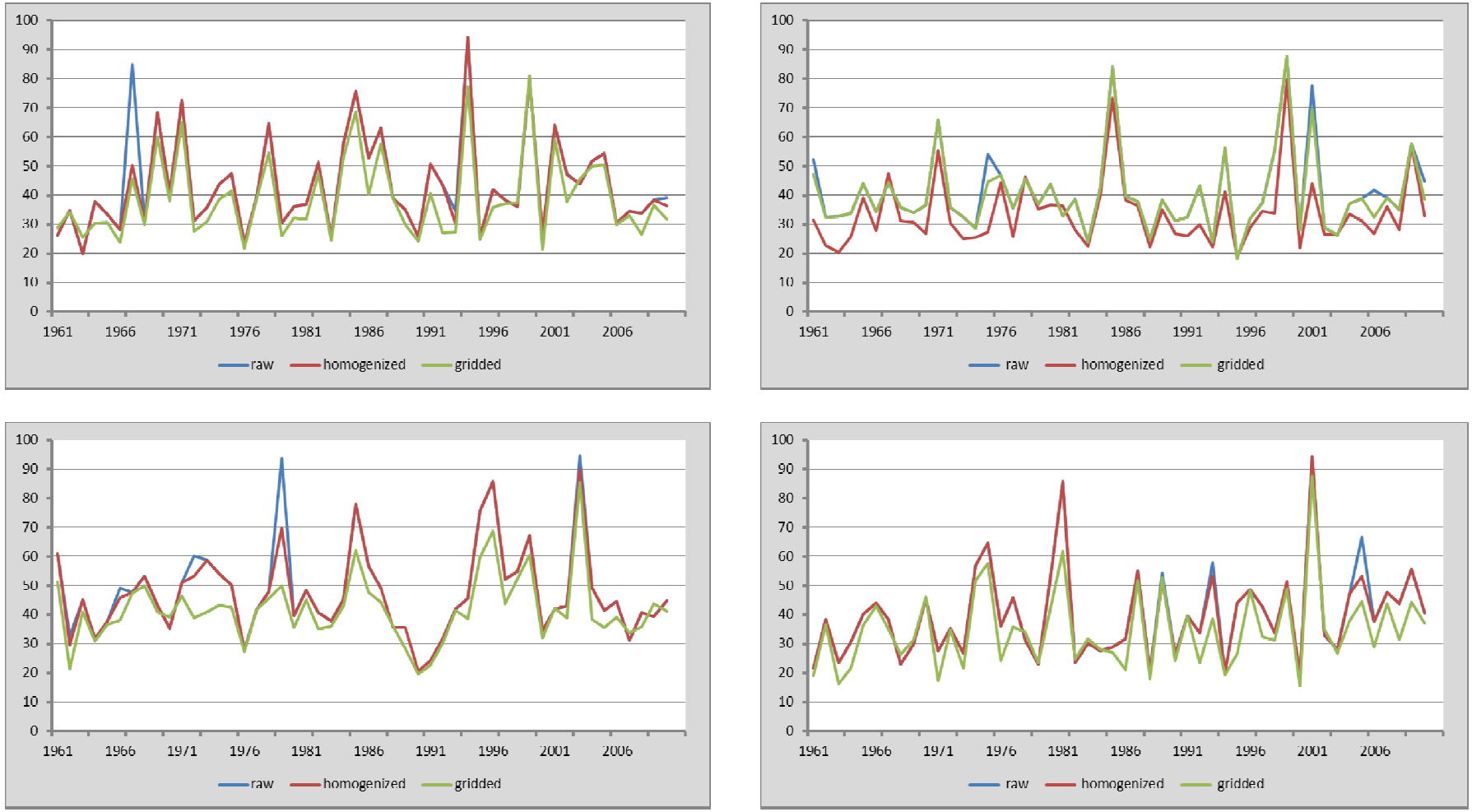


Figure 1.5.11

Rx1day (mm) for Beograd, Kragujevac, Valjevo and Palić

Rx5day- Max 5 day precipitation amount

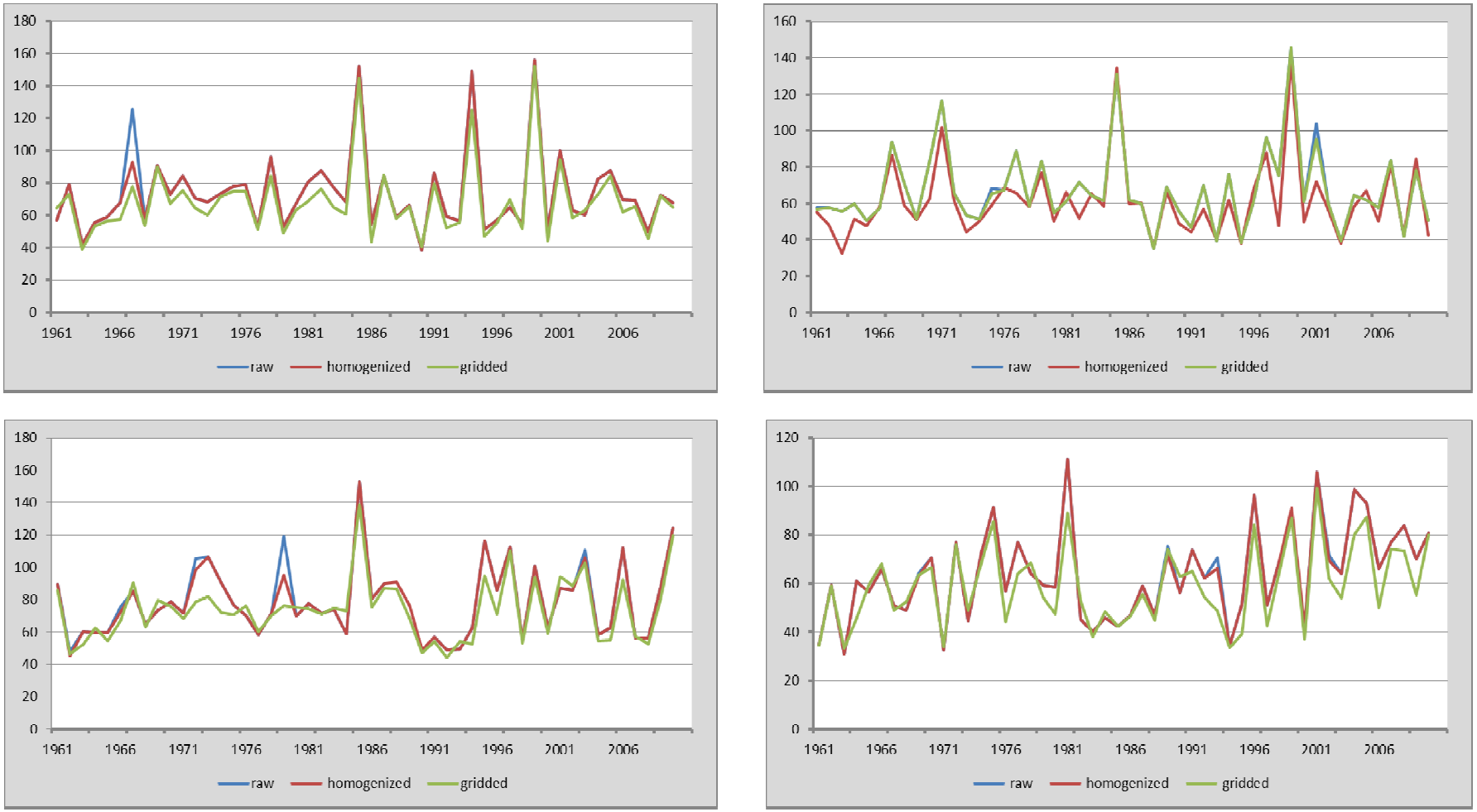


Figure 1.5.12

Rx5day (mm) for Beograd, Kragujevac, Valjevo and Palić

SDII-Simple daily intensity index

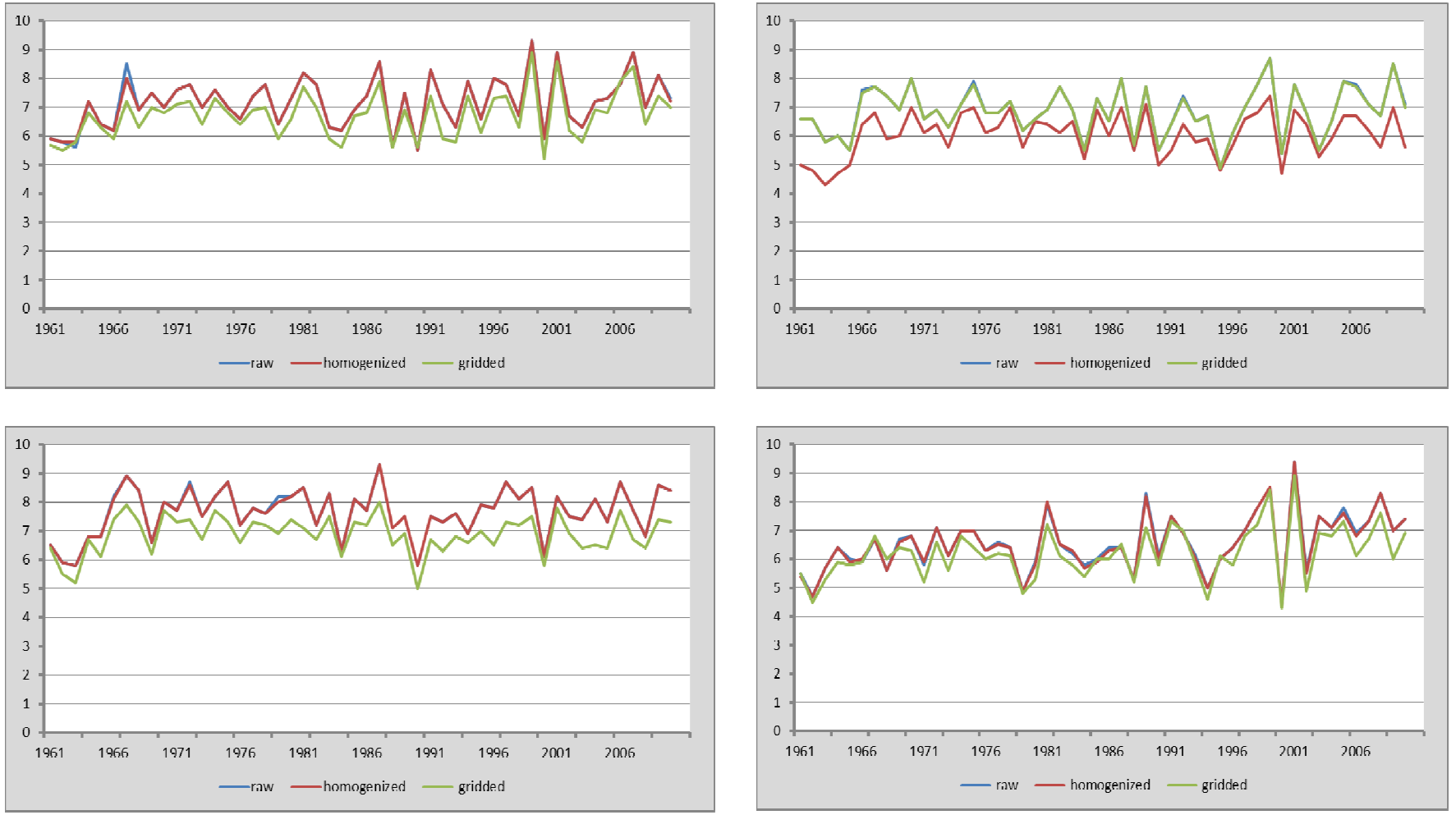


Figure 1.5.13

SDII (mm/day) for Beograd, Kragujevac, Valjevo and Palić

1.6 Conclusion about climate indices

- All three types of data can be used
- Larger differences featured in daily datasets
- Precipitation as variable meteorological parameter
- Recommended raw (quality controlled) and homogenized datasets

1.7 Calculation of extreme values for a return period

- Maximum daily precipitation for the return period of 100 years
- Gumbel method; software extRemes (R-platorm) used
- Discarded data with gaps longer than one calendar year
- Comparison of the results from raw, homogenized and gridded datasets
- Results given in proportion of one value vs. another (a dimensionless value, mm/mm)

1.8 Calculation of extreme values for 100-year return period – homogenized vs. raw series

- Homogenized series reduced maximum precipitation down to 77% of values from raw series
- Spatial pattern of changes seem to depend upon:
  - network density (example of Vojvodina vs. NE Serbia),
  - excessive values in series (example of Vršac)

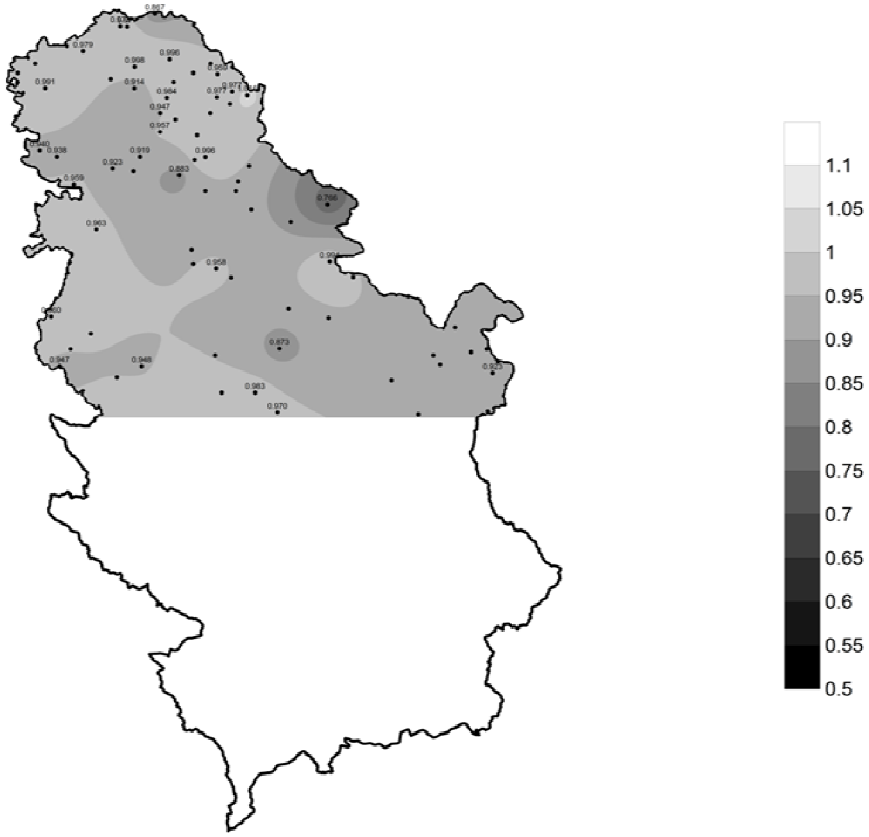


Figure 1.8.1 Extreme precipitation calculated for 100-year return period homogenized vs. raw series (mm/mm)

Calculation of extreme values for 100-year return period – gridded vs. homogenized series

- Gridded series reduced maximum precipitation down to 60% of values from homogenized series
- In seldom cases, gridded series **exceed** maximum precipitation values from homogenized series
- Smoothing effect of spatial interpolation techniques as a main cause of differences

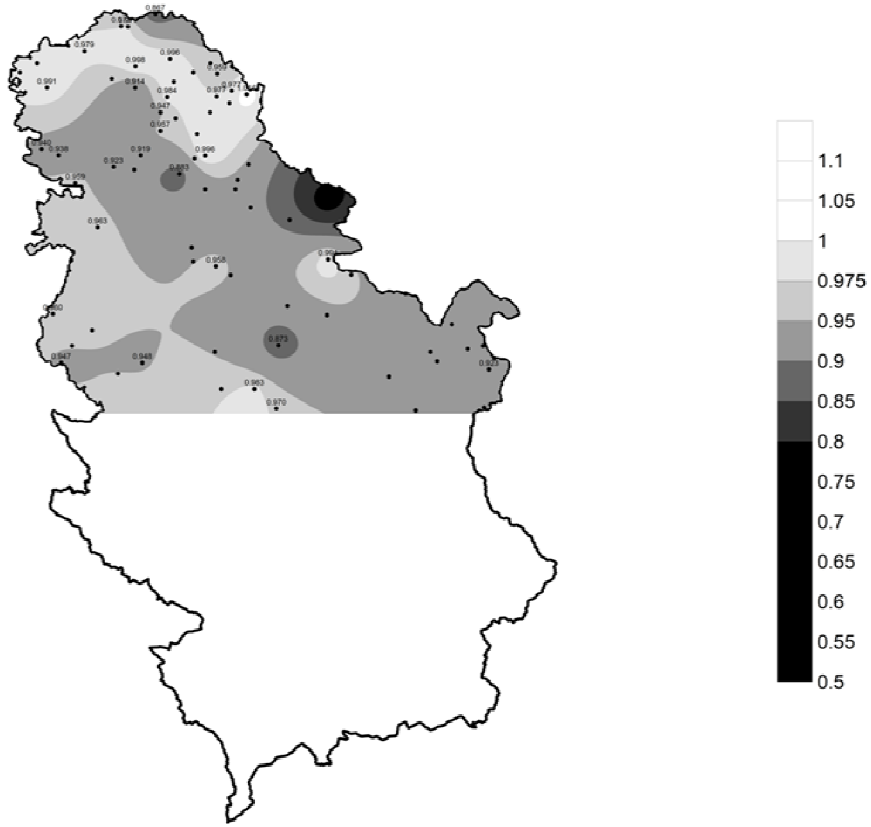


Figure 1.8.2 Extreme precipitation calculated for 100-year return period gridded vs. homogenized series (mm/mm)

Calculation of extreme values for 100-year return period – gridded vs. raw series

- Gridded series reduced maximum precipitation down to between 55% and 95% of values from raw series
- Features of both homogenization and gridding procedures
- Spatial pattern of original values is **not preserved!**

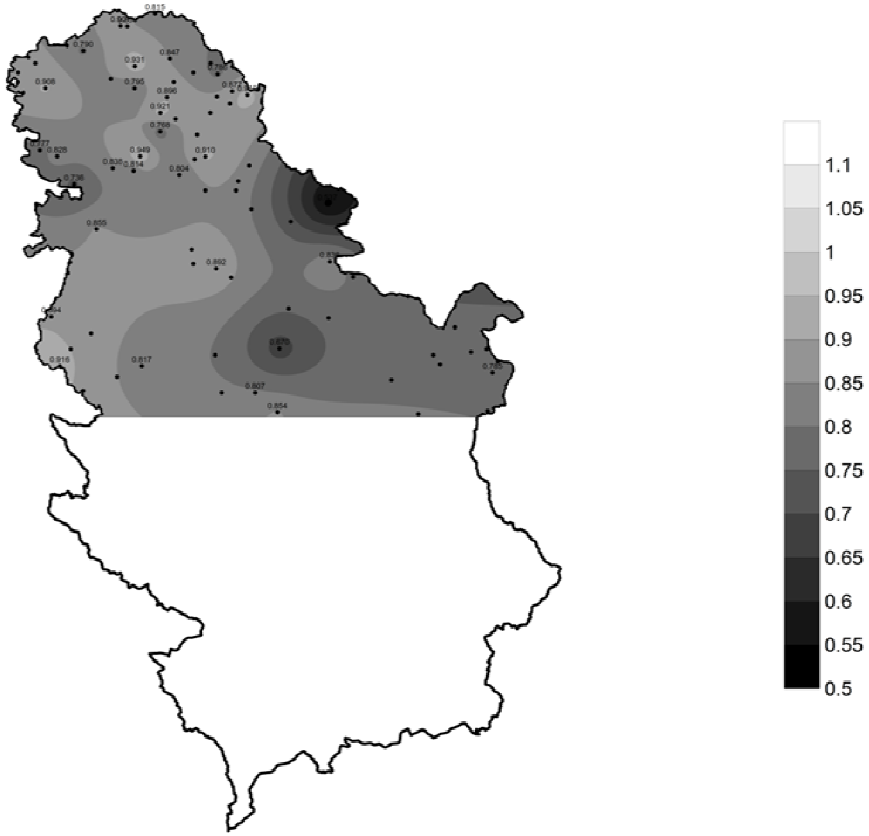


Figure 1.8.3 Extreme precipitation calculated for 100-year return period gridded vs. raw series (mm/mm)

Calculation of extreme values for 100-year return period – gridded vs. raw series

Figure 1.8.4 Extreme precipitation calculated for 100-year return period raw series (mm)

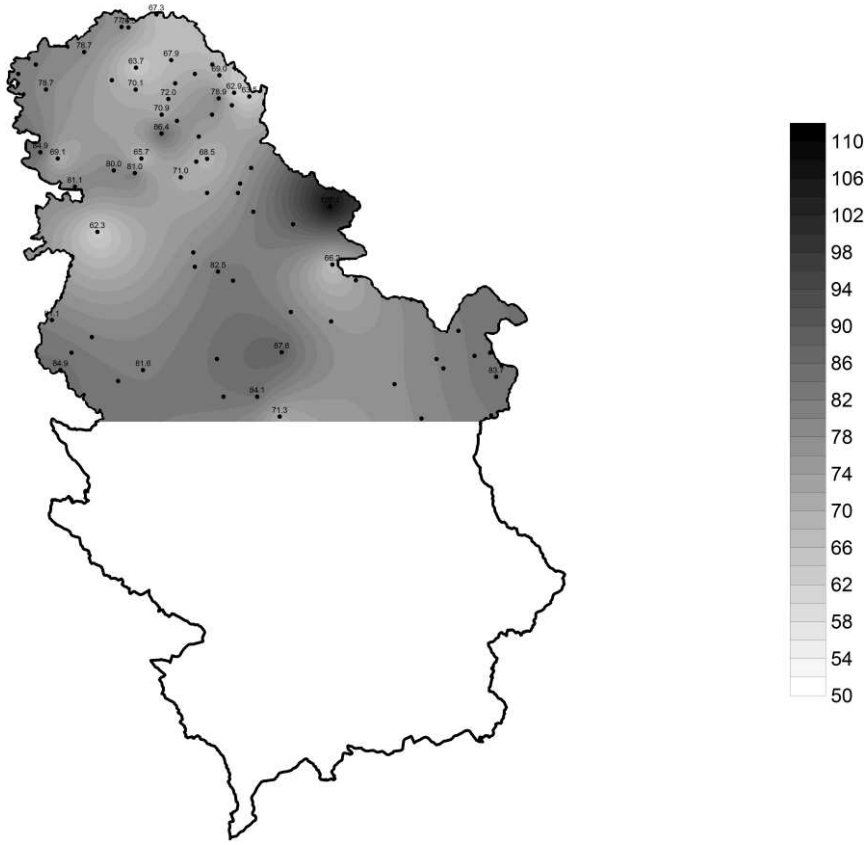
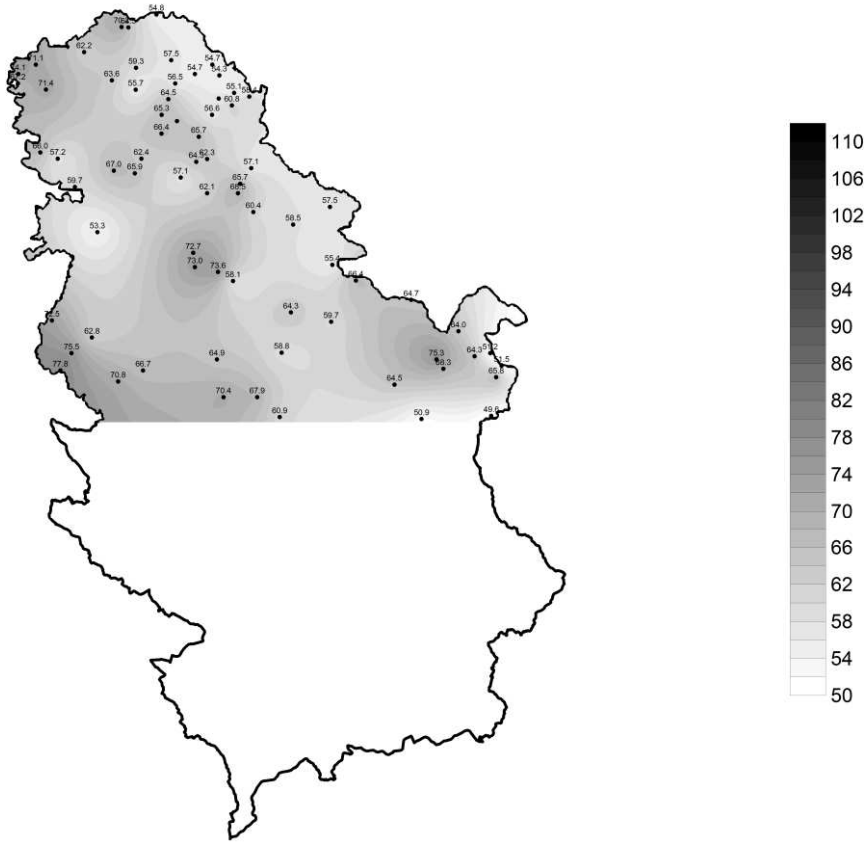


Figure 1.8.4 Extreme precipitation calculated for 100-year return period gridded series (mm)

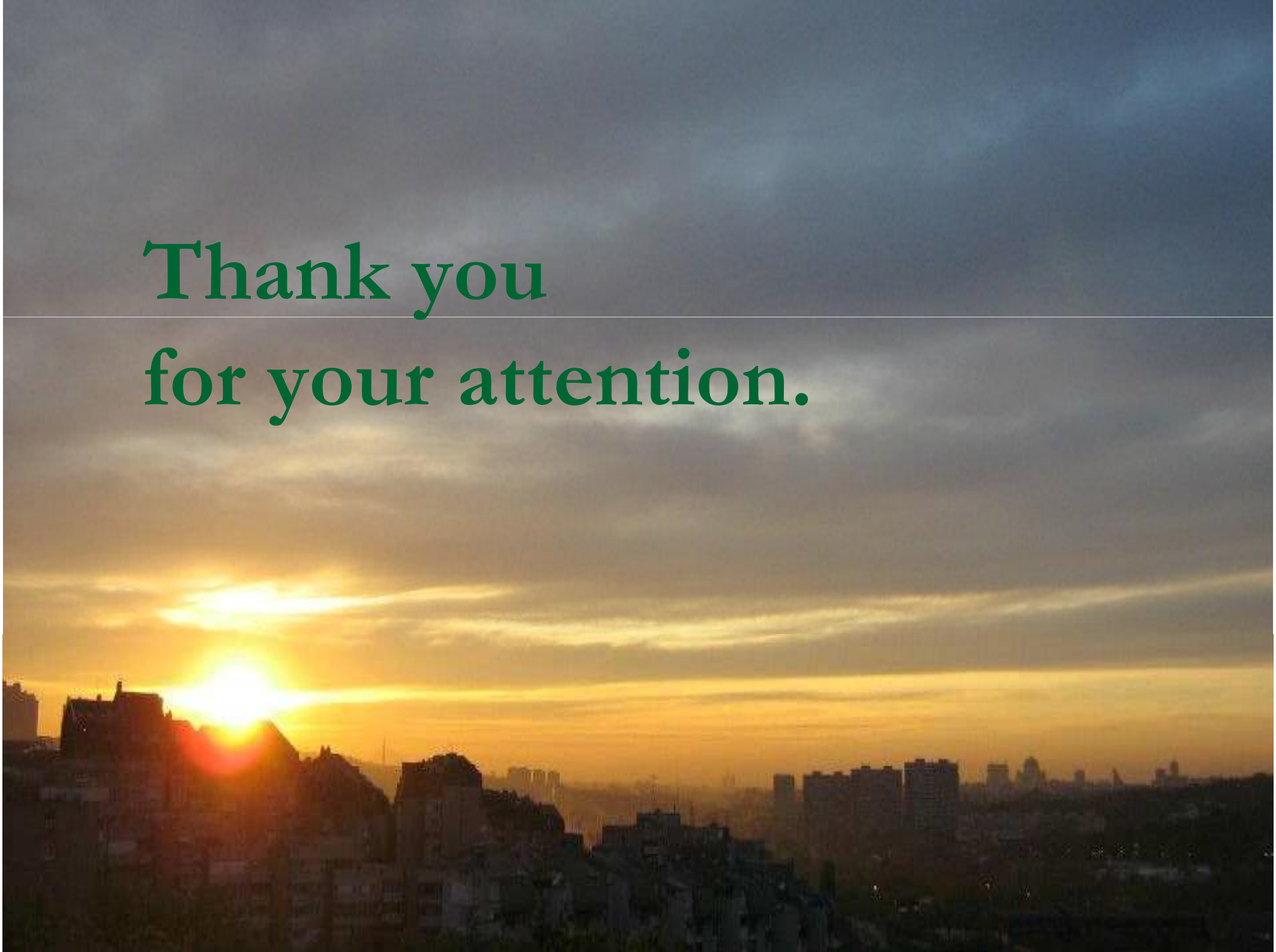


Calculation of extreme values for 100-year return period – review of the results

- Both homogenization and gridding cut extreme values
- Main causes of these changes:
  - *Elimination of outlying values (not necessarily errors, but real values) during homogenization*
  - *Smoothing effects in spatial interpolation*
  - *Sparse networks feature the highest magnitude of changes*
  - *Dense networks suffer minor losses*
- Homogenized and gridded data are not recommended for this purpose

Pros and cons for calculation of extreme precipitation

- Best results are derived from raw series
- Calculation of extreme values for a return period is **not recommended** from homogenized or gridded datasets
- User must make his own choice in using data according to purposes of studies


Thank you
for your attention.

Questions, comments…