A satellite-style map of South Eastern Europe, showing the Balkan Peninsula, the Aegean Sea, and the Black Sea. The land is depicted in shades of green and brown, while the water is a deep blue. The map is centered on the region of South Eastern Europe.

Climate Trends and Projections South Eastern Europe

World Bank

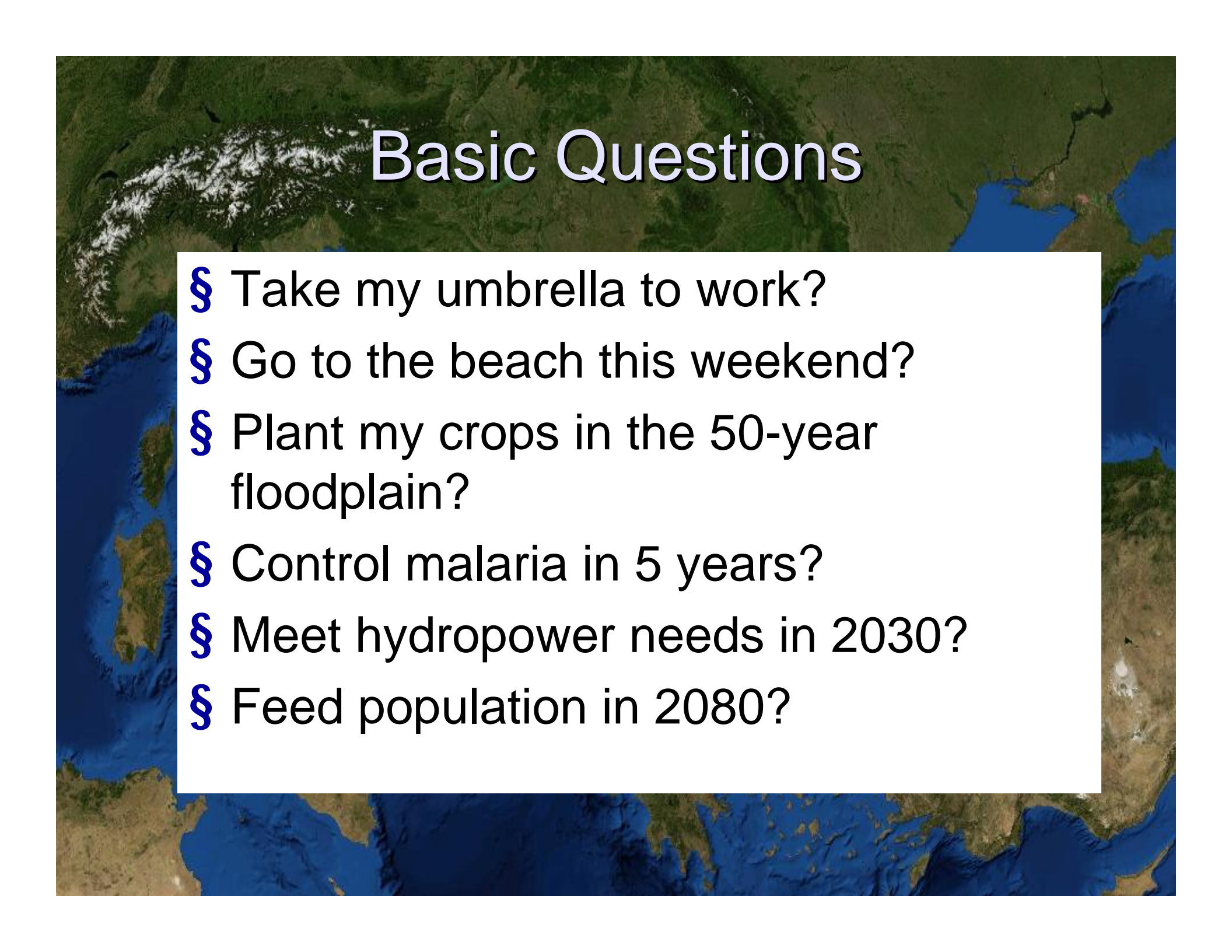
Europe and Central Asia Region

June 2008

A satellite-style map of the Mediterranean region, showing the sea, surrounding landmasses, and mountain ranges. The title 'Discussion Topics' is overlaid in white text with a drop shadow.

Discussion Topics

- § Basic questions and concepts
- § Climate trends in SEE cities
- § From cities to regional view
- § Trends for key parameters
- § Approach to climate projections
- § Projections for key parameters
- § A view towards the coast

A satellite-style map of the world, showing continents in green and brown and oceans in blue. The map is centered on the Atlantic Ocean, with North America on the left and South America on the right. The title 'Basic Questions' is overlaid in white text at the top center.

Basic Questions

- § Take my umbrella to work?
- § Go to the beach this weekend?
- § Plant my crops in the 50-year floodplain?
- § Control malaria in 5 years?
- § Meet hydropower needs in 2030?
- § Feed population in 2080?

Basic Concepts

Tirana
June 2008

← 10,000 BC 1850 1955 2009 2030 2100 →

Basic Concepts

***Tirana
June 2008***



10,000 BC

1850

1955

2009

2030

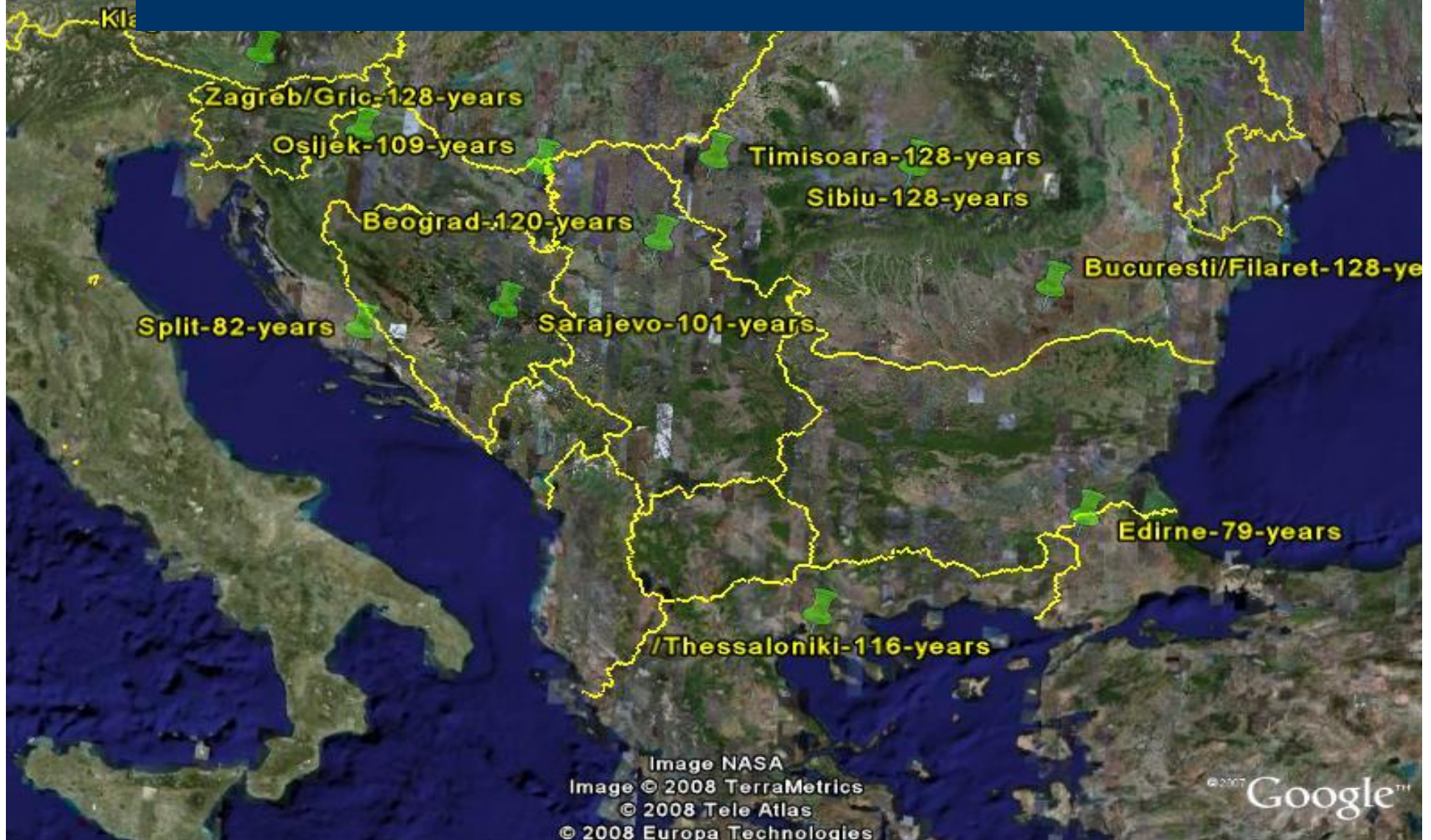
2100

paleo-climate - trends

forecast - projections

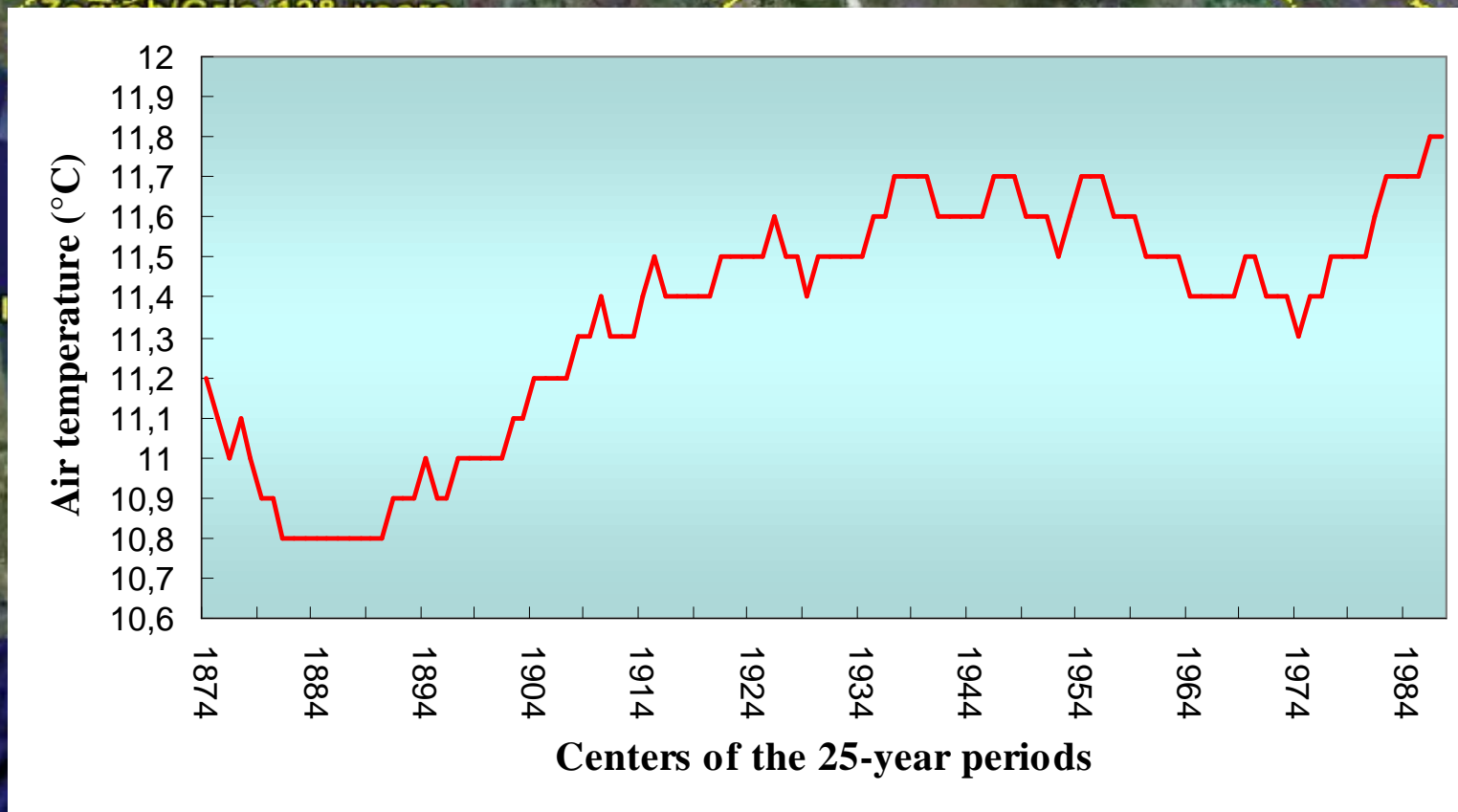
climate variability ----- climate change

SEE has long-term monitoring in or near several cities



Zagreb - Grič

Smoothed (25-yr) temperature trend 1862 - 2000

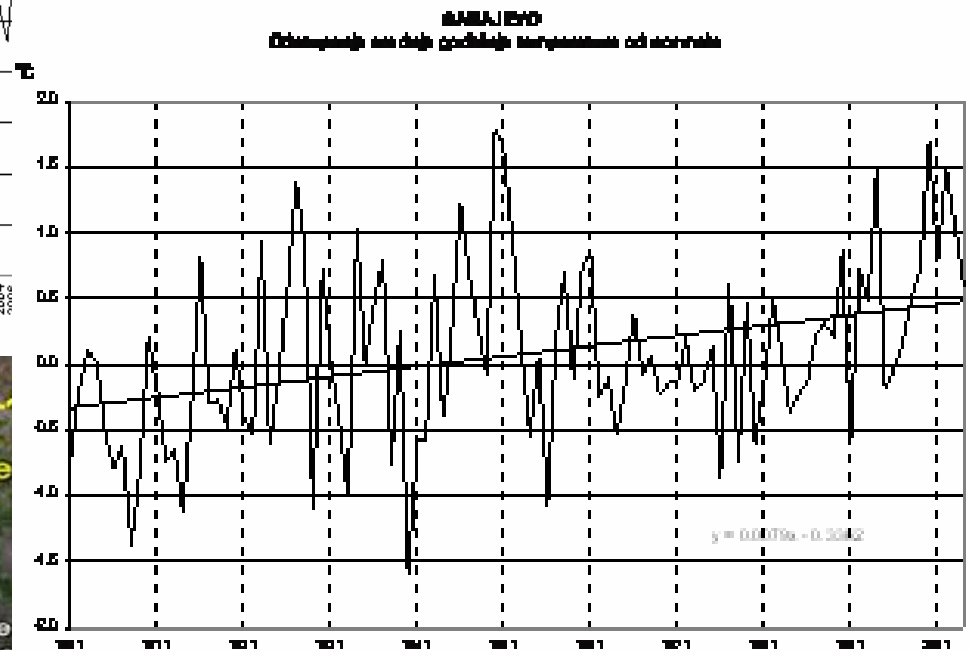
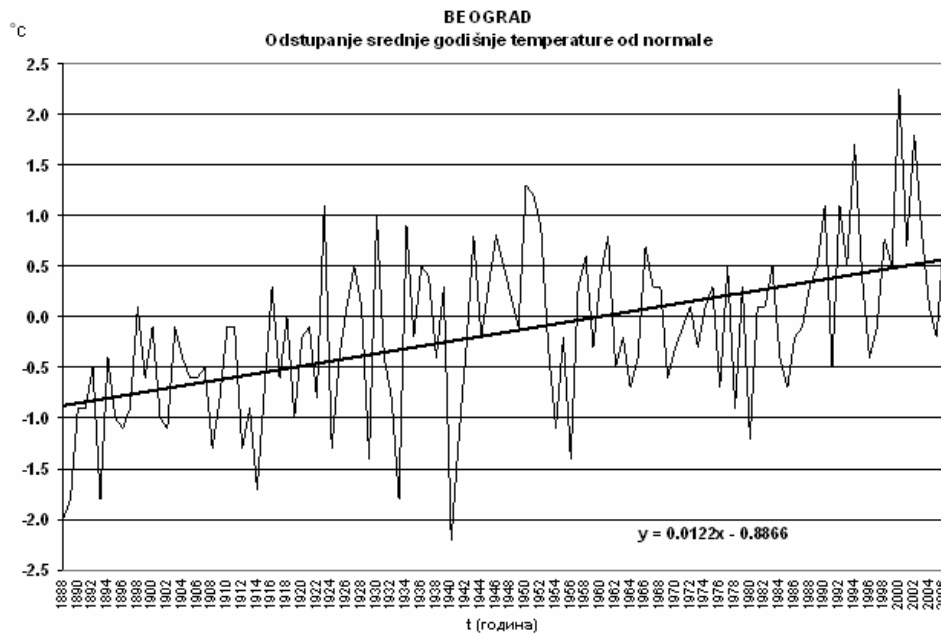


(after Pandžić and Likso, 2008)

Temperature Trends

Belgrade 1888-2006

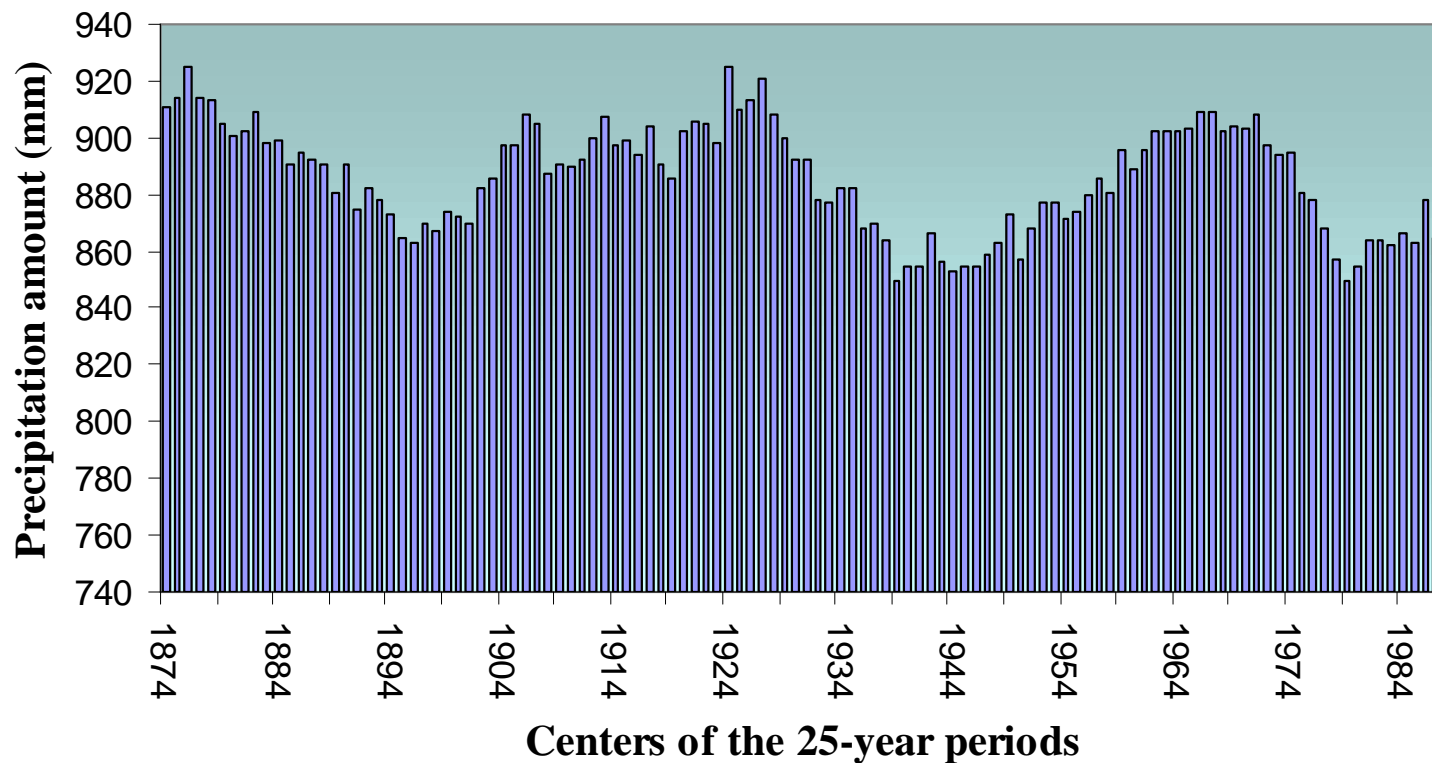
Sarajevo 1901-2001



(after Pandžić and Likso, 2008)

Zagreb-Grič

Smoothed (25-yr) precip trend data 1862 - 2000



Twenty-five year precipitation amount moving averages
for Zagreb-Grič and for the period 1862-2000

Zagreb

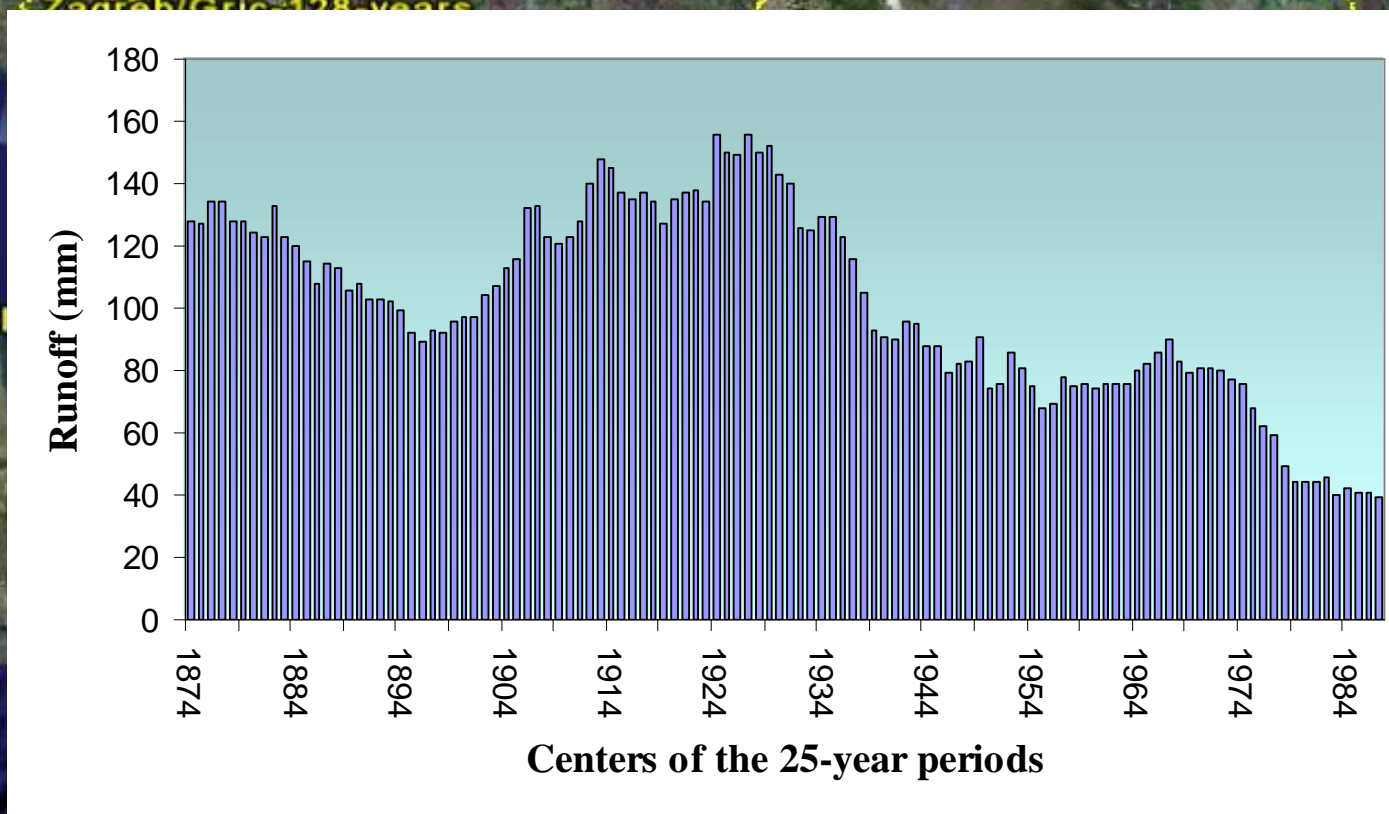
Smoothed (25-yr) soil moisture trend 1862 - 2000



Twenty-five year soil moisture content moving averages for Zagreb-Grič
and for the period 1862-2000

Zagreb Grič

Smoothed (25-yr) runoff trend 1862 - 2000



Calculated Palmer's 25-year moving average runoff amounts
for Zagreb-Grič and for the period 1862-2000

Zagreb

Smoothed (25-yr) trend in Sava discharge 1862 - 2000

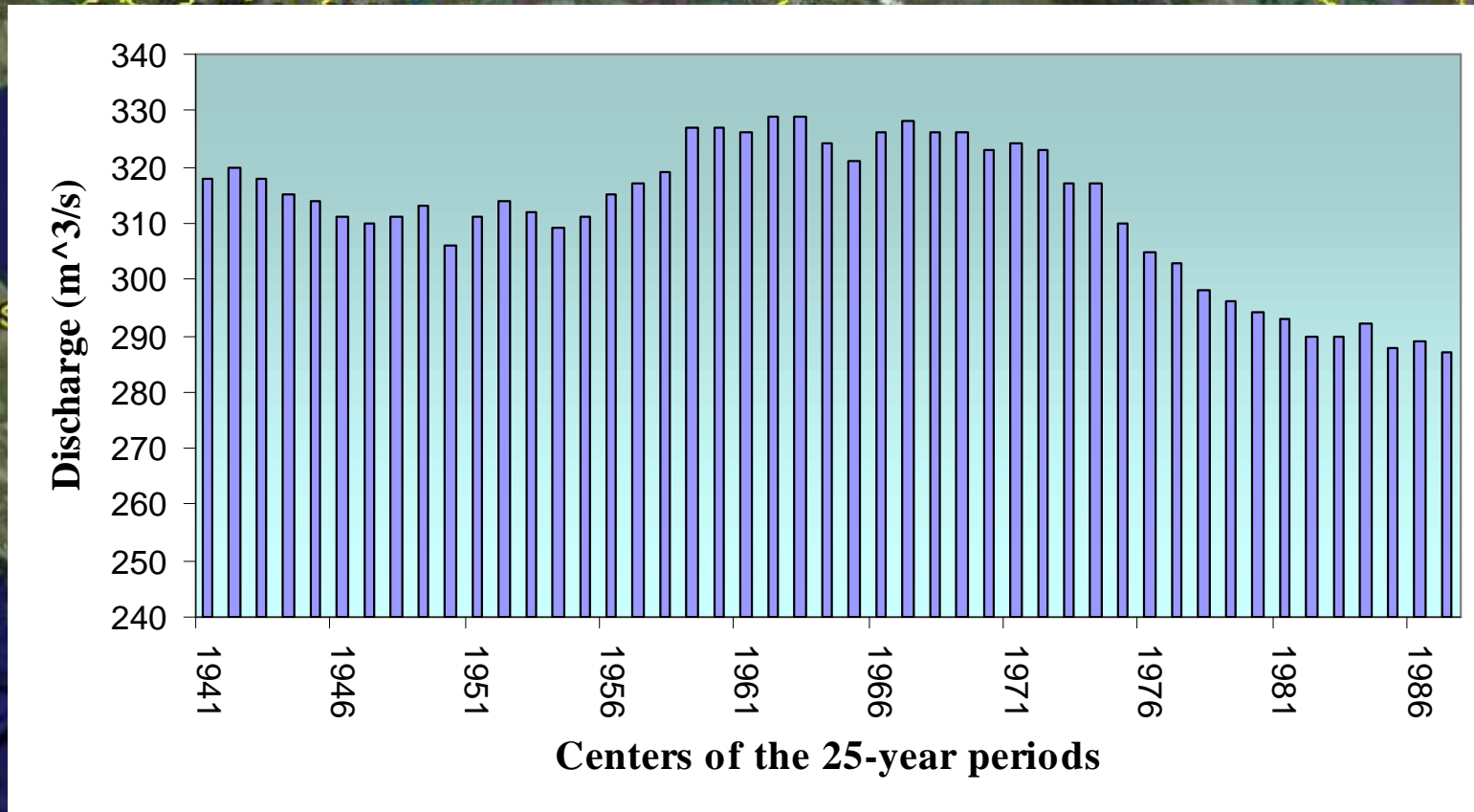
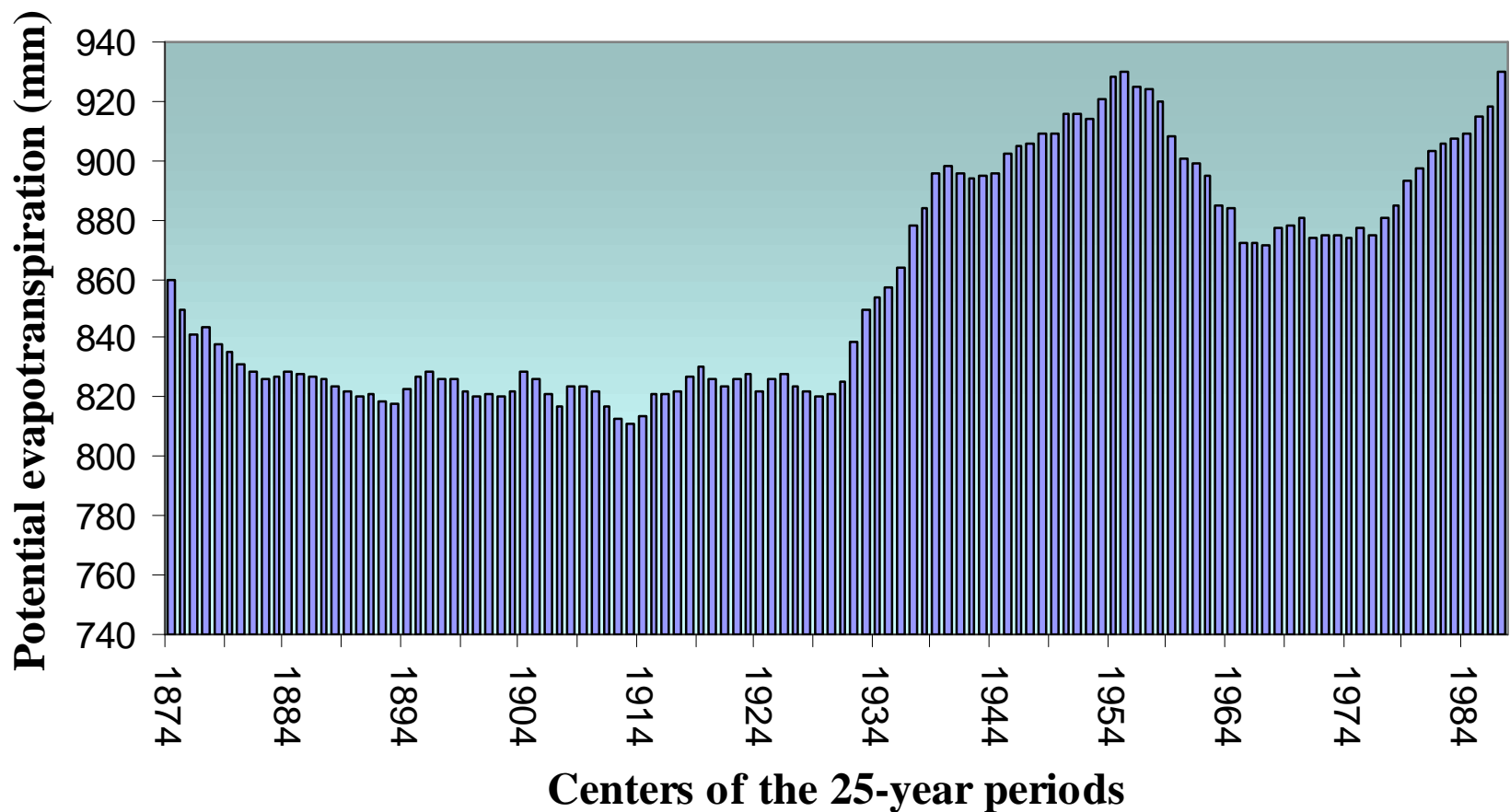


Figure 16 Twenty-five year moving averages of observed discharge amounts for the Sava River at Zagreb and for the period 1931-2000

Zagreb

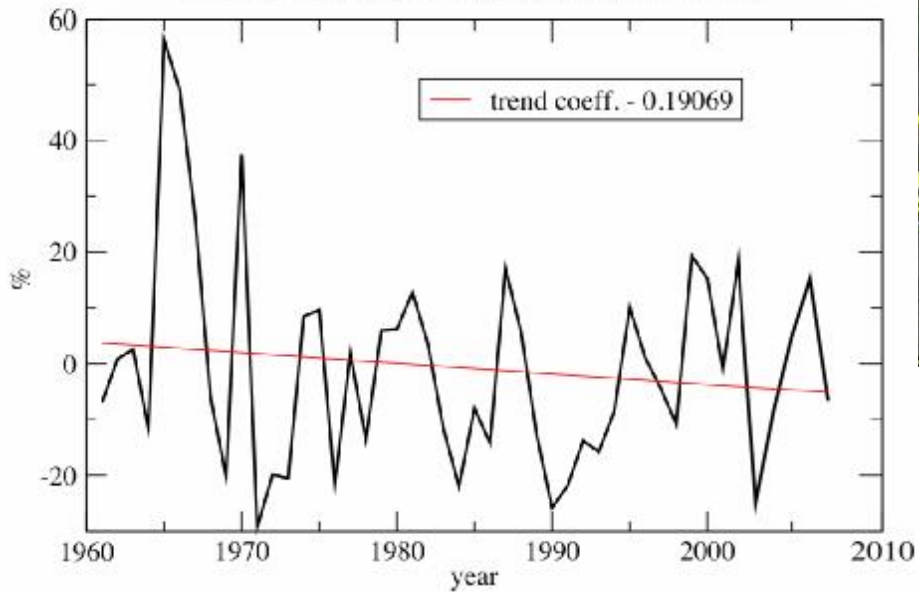
Smoothed (25-yr) potential ET trend 1862 - 2000



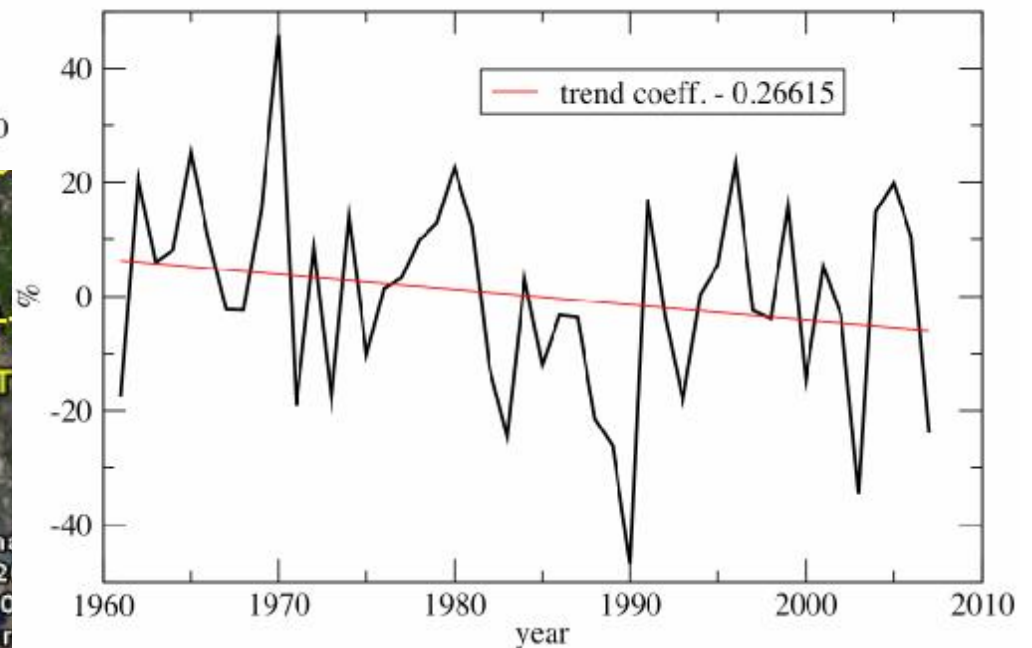
Runoff 1961-2007

Sava and Danube in Serbia

River: DANUBE; Station: BEZDAN



River: SAVA; Station: S. MITROVICA



A satellite-style map of North America, showing the continent in green and brown, with the oceans in blue. The title 'From Cities to Regions' is overlaid in white text.

From Cities to Regions

- § Long-term consistent data are mostly “points” in or near cities.
- § Urban climate “island effect”; adjustment
- § Regional averaging helps - drawing on all available station data
- § Interpolating needed in space and over time.
- § “*Re-analysis*” ...a physically realistic “hindcast” of weather as it was

Selected Stations in Croatia

Smoothed (25-yr) temperature trend 1951-2000

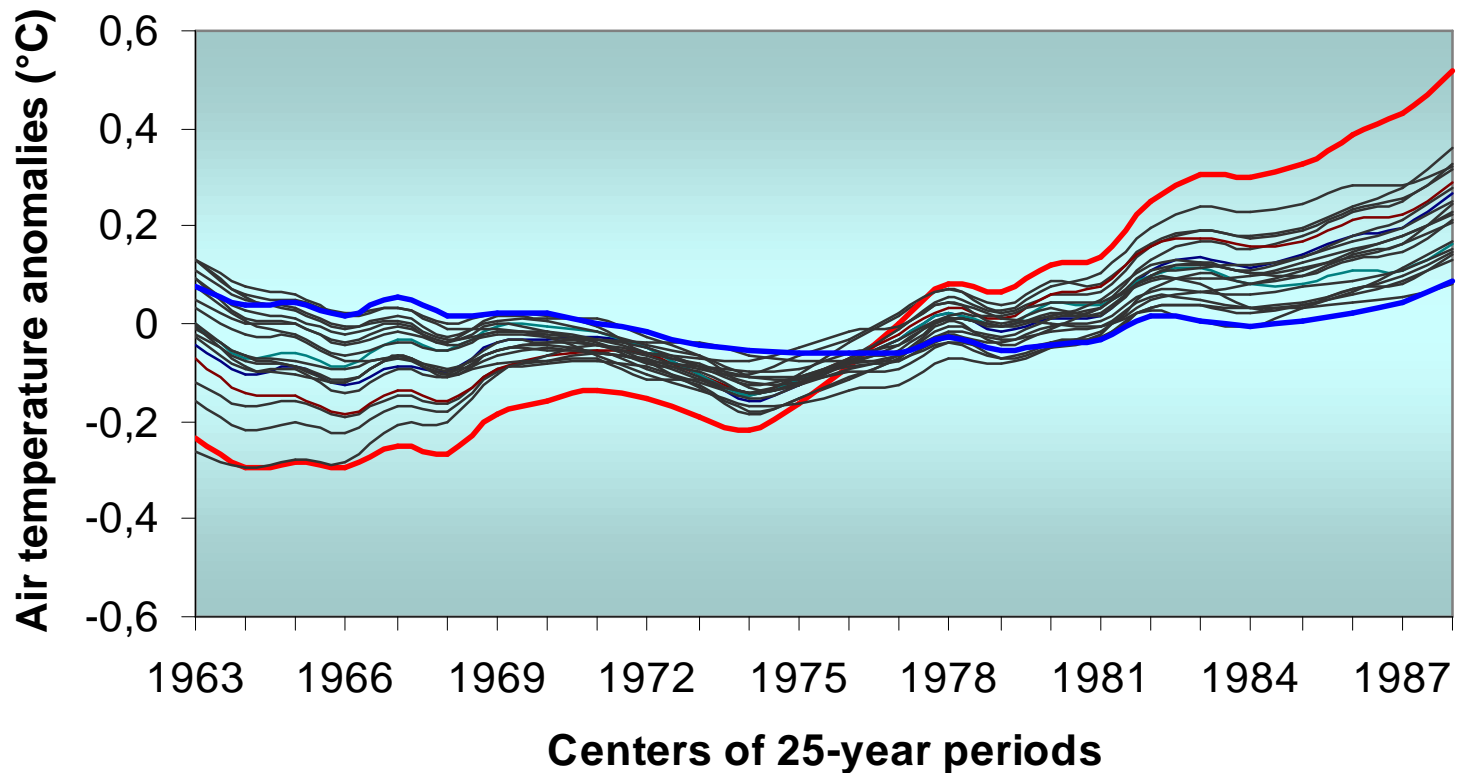


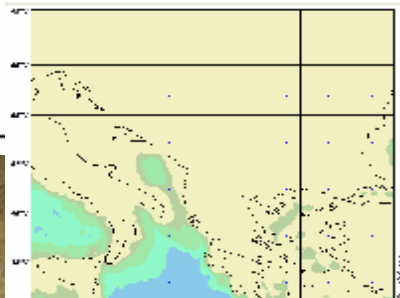
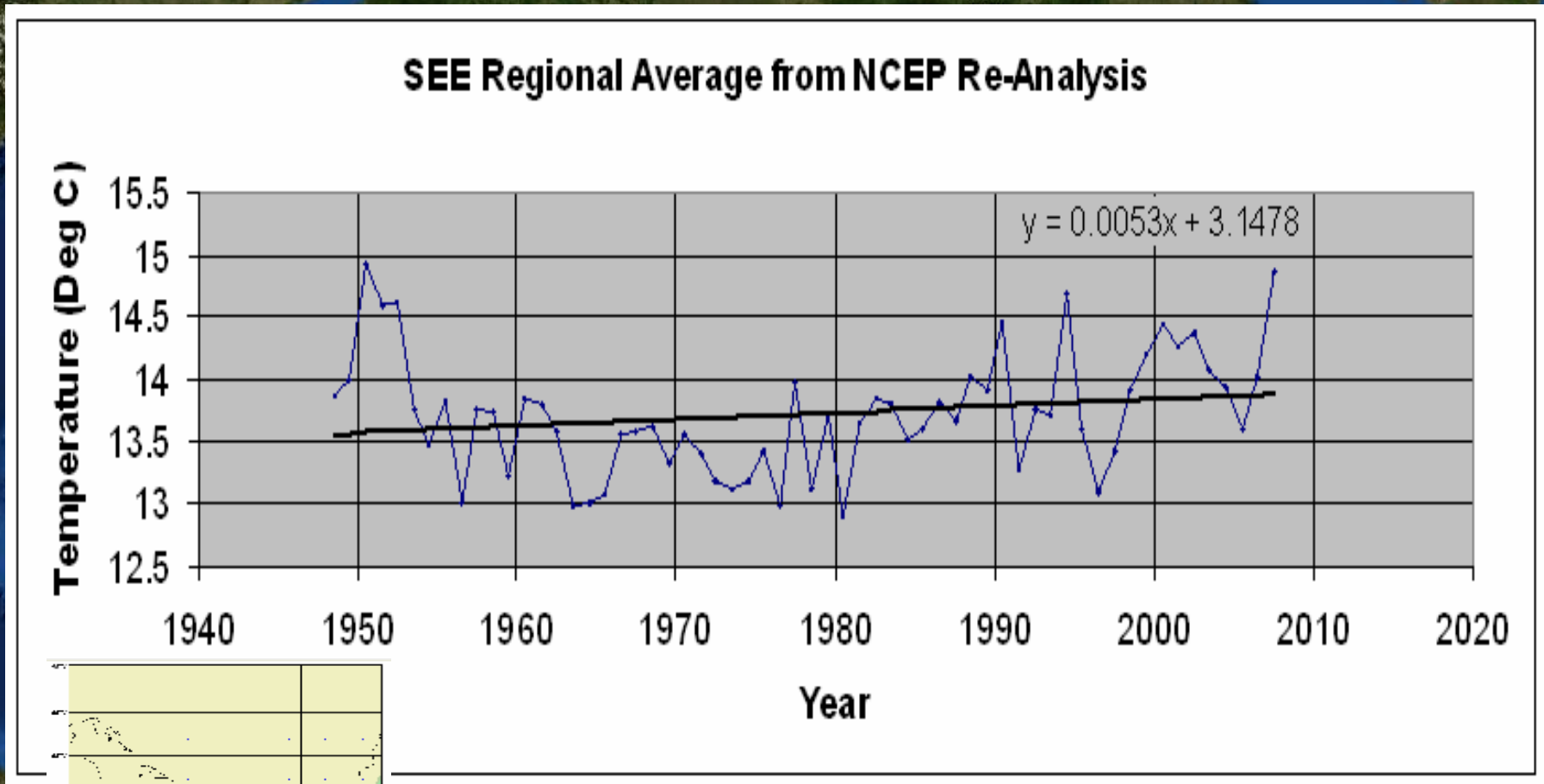
Image NASA
Image © 2008 TerraMetrics

(after Pandžić and Likso, 2008)

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Temperature 1948-2007

- average over SEE from re-analysis -

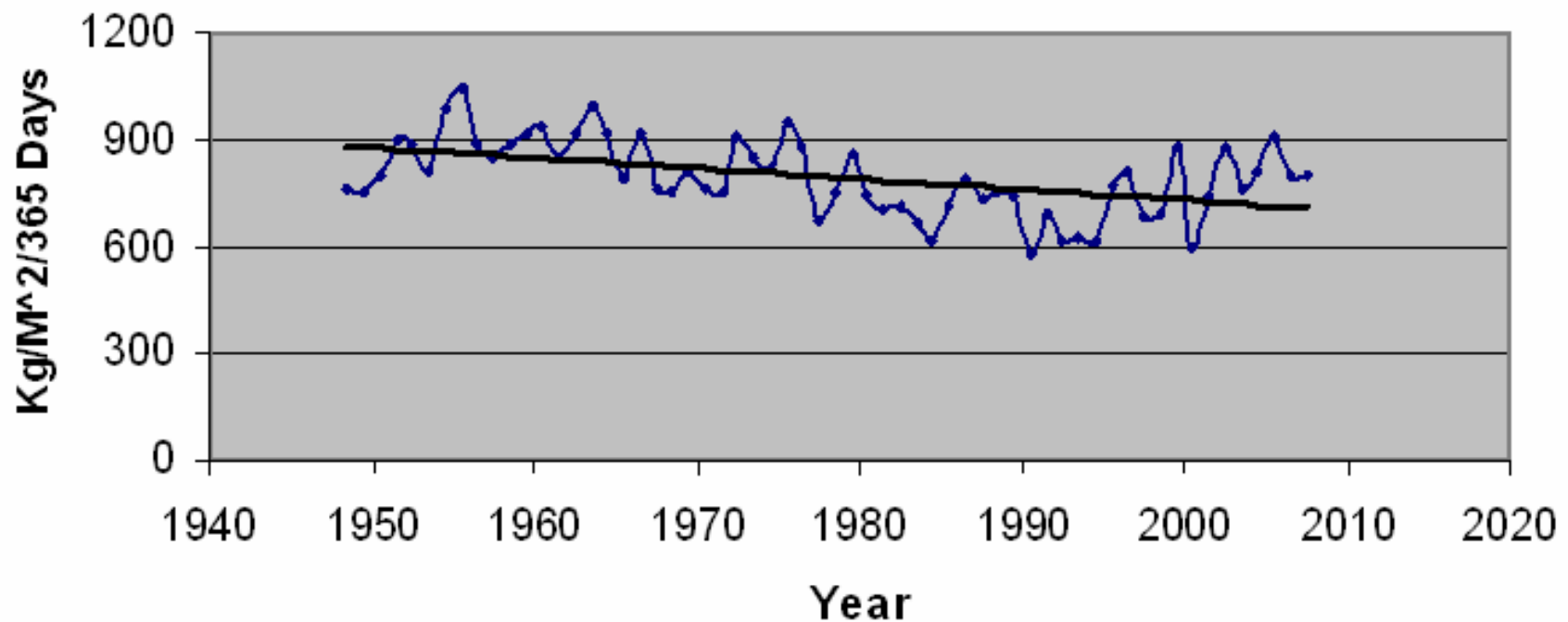


Precipitation 1948-2007

- average over SEE from re-analysis -

SEE Regional Average from NCEP Re-Analysis

$$y = -2.9417x + 6613.4$$



Palmer Drought Severity Index 1948-2007

- average over SEE from re-analysis -

Average Value over SEE

