Climate change researches at the Hungarian Meteorological Service, Past-present-future

Zita Bihari, Mónika Lakatos, Gabriella Szépszó
OMSZ, Climatology Division

Main activities

- Climate researches
  - Past, present: mathematical statistical methods
  - Future: dinamical methods

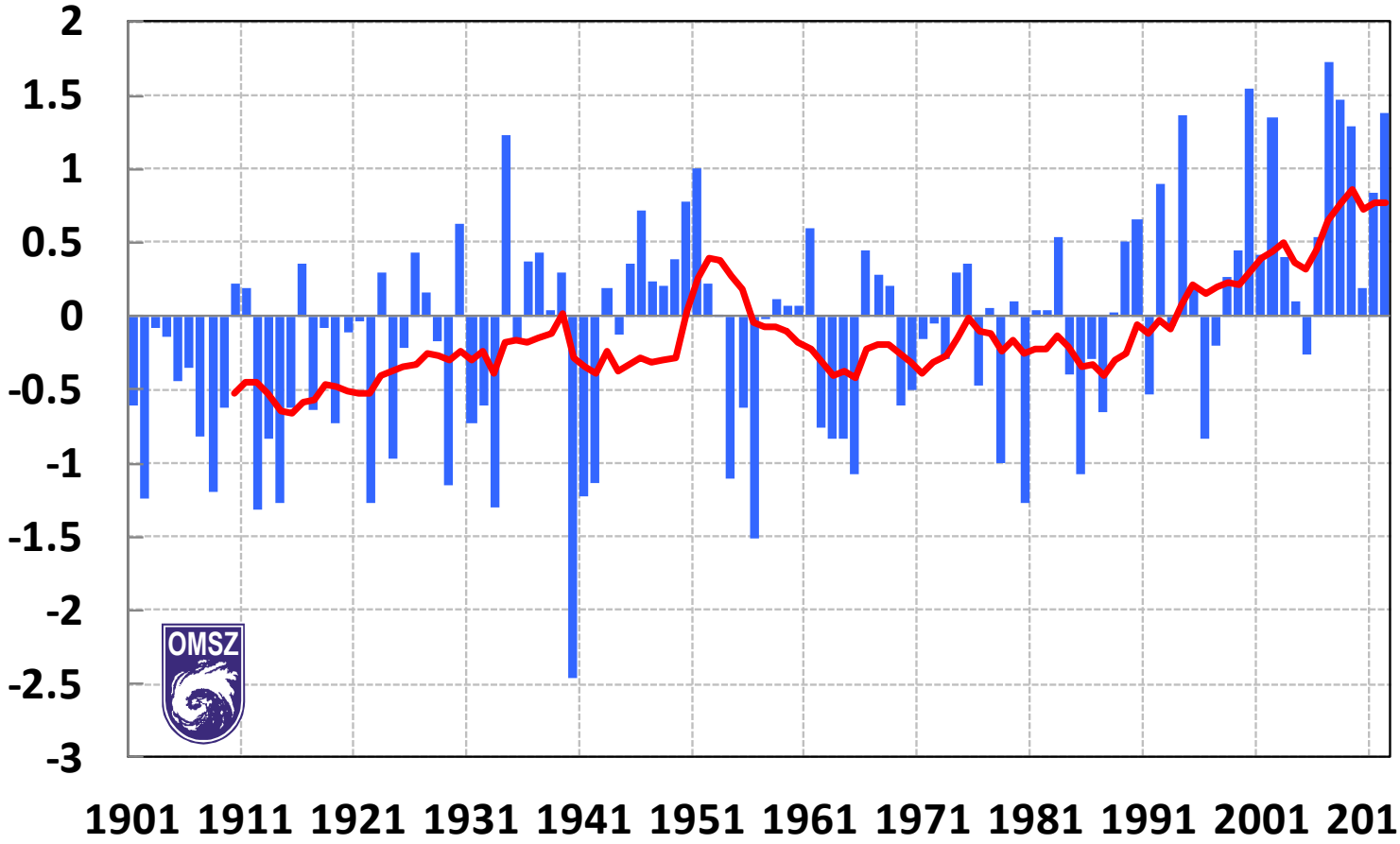
Monitoring of the past and present climate

- Hungarian Meteorological Service (OMSZ) has long data series
  - Meteorological measurements begun in the second half of 19th century
- Data processing with statistical methods
  - Developed at OMSZ
  - Accepted on international level
  - MASH – Multiple Analysis of Series for Homogenization (Tamás Szentimrey)
  - MISH – Meteorological Interpolation based on Surface Homogenized Data Basis (Tamás Szentimrey, Zita Bihari)

Application of methods

- Analysis of long time data series
- Creation of gridded databases
- Analysis of extreme values

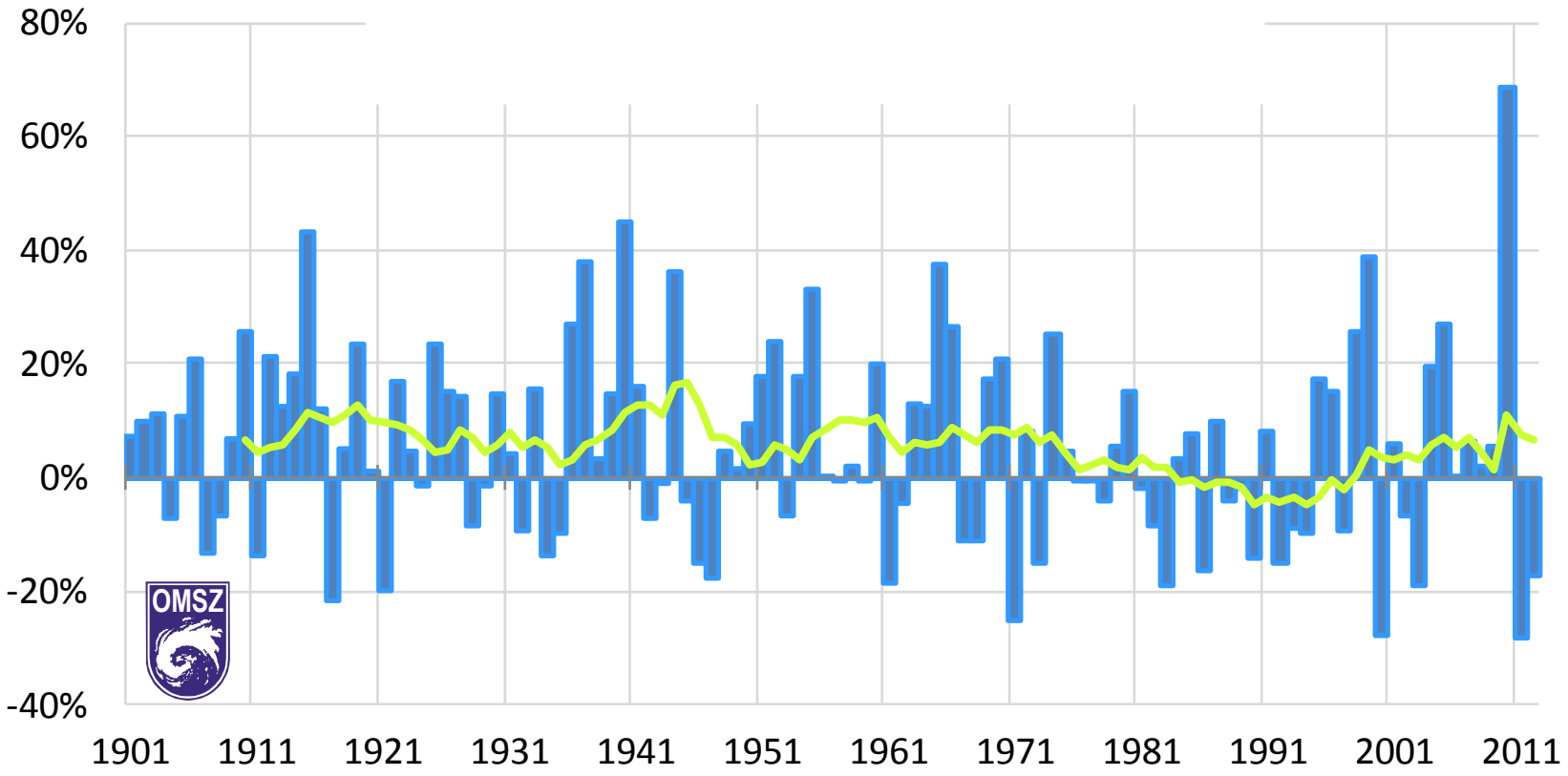
Annual mean temperature anomalies (°C) relative to 1971-2000, 1901-2012



Change between1901-2012 :1.08°C 90%-os confidence interval[0.71°C, 1.44°C]

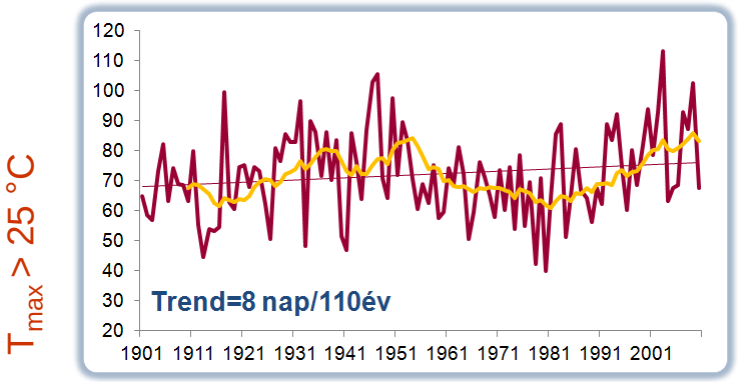
Change between1981-2012 :1.31 °C 90%-os confidence interval[0.69°C 1.93°C]

Annual precipitation anomalies (%) relative to 1971-2000, 1901-2012

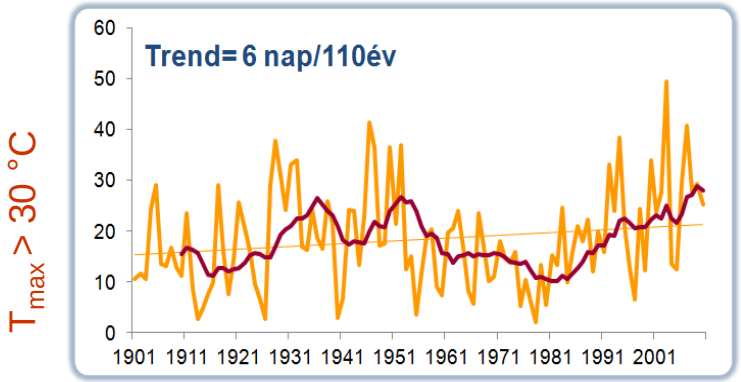


Change between1901-2012 : -7.3% 90%-os confidence interval [-15%, 1.01%]
Change between1981-2012 : 10.8% 90%-os confidence interval [-7.7%, 33%]

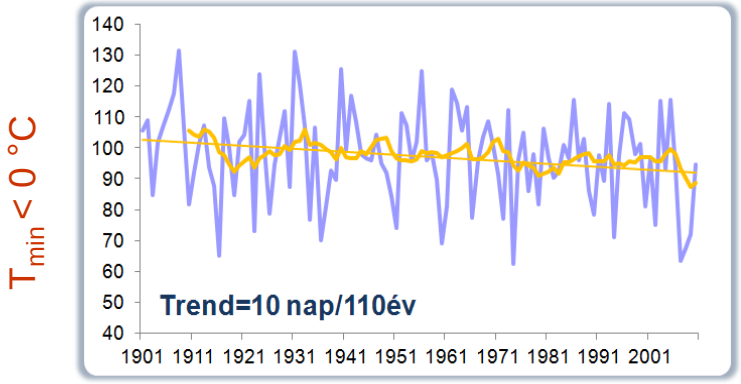
Observed temperature extremes



Summer days [day]

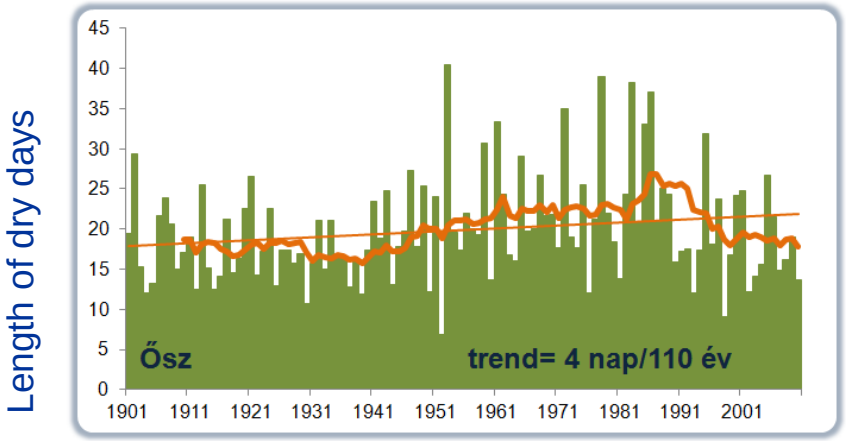


Heat days[day]

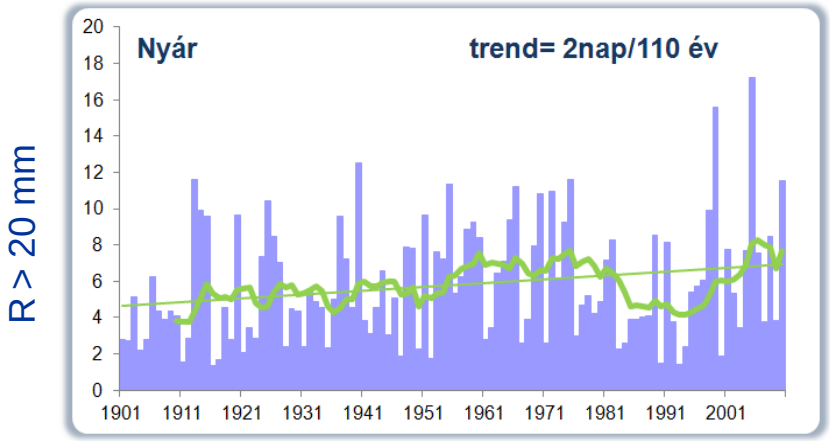


Frost days [day]

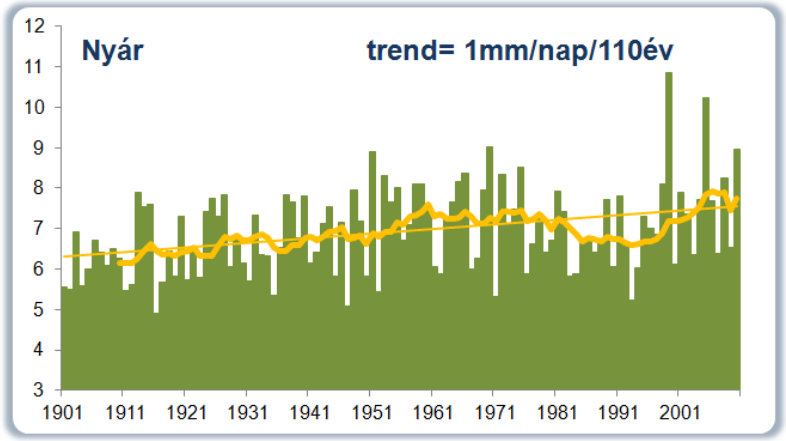
Observed precipitation extremes



Length of dry days [days], autumn



Number of days with precipitation> 20 mm [days], summer

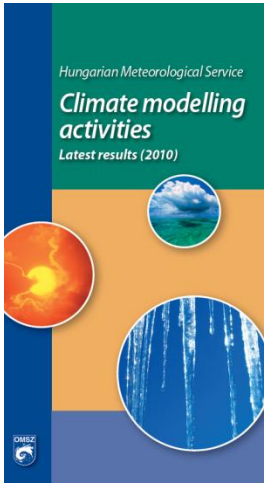


Intensity of precipitation [mm/days], summer

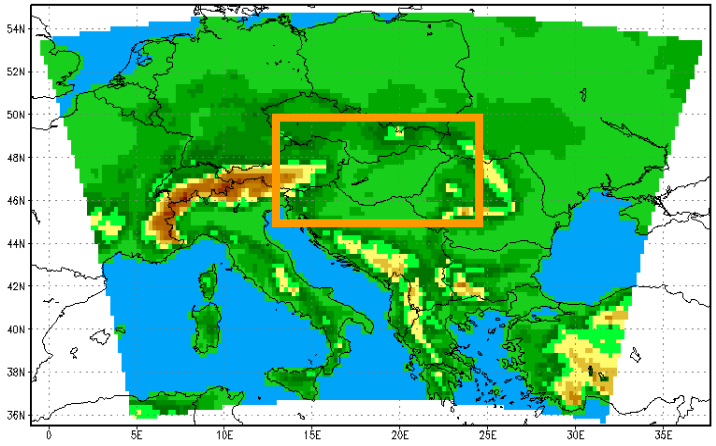
Climate dynamics activities

- Simulations with 2 adapted regional climate models (RCMs):

	ALADIN-Climate	REMO
Period	1961–2100	1951–2100
Resolution	10 km and 31 levels	25 km and 20 levels
Scenario	A1B	A1B



- Using European RCM results (from ENSEMBLES project, 25 km resolution)



Application of model results

- Quantitative impact studies based on RCM results in cooperations with other partners, e.g.:
  - Hydrology: rivers and lakes (CLAVIER EU FP6 project)
  - Inland waterway transportation (ECCONET EU FP7 project)
  - Vulnerability of urbanized areas (ORIENTGATE SEE)
  - Climate change impacts in context of nuclear power plant extension (Paks)
  - Urban and wind climatology (at OMSZ, next slide)
- National Adaptation Strategy: National Adaptation Geographical Information System – detailed sectoral and geographical information for adaptation

Urban and wind climatology

- Study of climatology over urbanized areas
  - Dynamical downscaling of raw RCM outputs with a town energy balance model to 1 km resolution
  - Test simulations and validation mainly for Budapest
- Preparation of high-resolution wind climatology information:
  - Wind climatology information are needed at higher atmospheric levels (75-100 m) before installation of power plants
  - Downscaling of coarse resolution re-analyses to 5 km resolution for Hungary using a numerical weather prediction model

Thank you for your attention!