



INTERNATIONAL WORKSHOP: BIOWETMAN - wetlands management and conservation,

19 February 2009, INSTITUTE OF BIOLOGY BUCHAREST, ROMANIAN ACADEMY

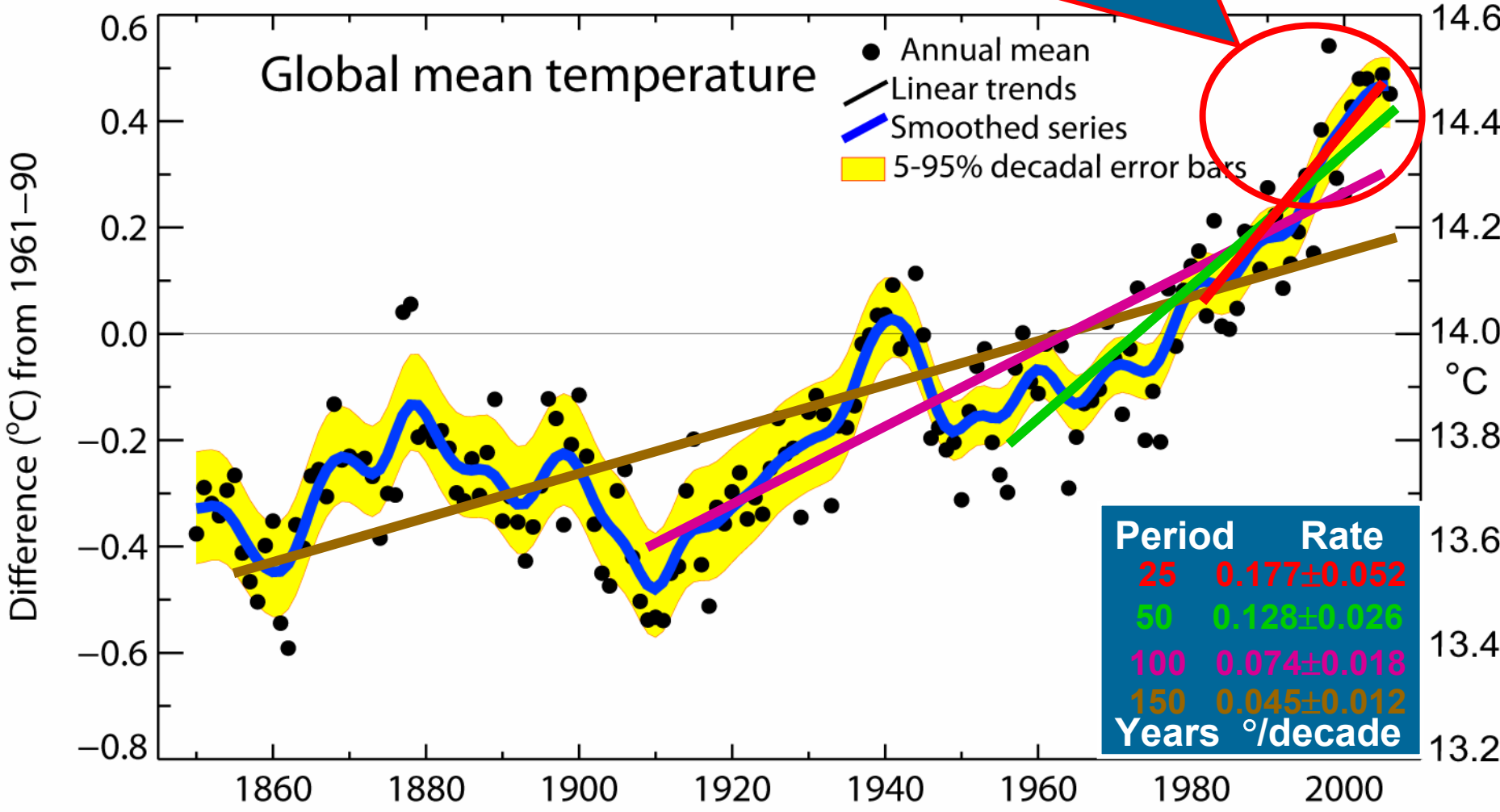
Observed and near future projections of weather extremes in Romania

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Global mean temperature

Warmest 12 years:
1998, 2005, 2003, 2002, 2004, 2006,
2001, 1997, 1995, 1999, 1990, 2000



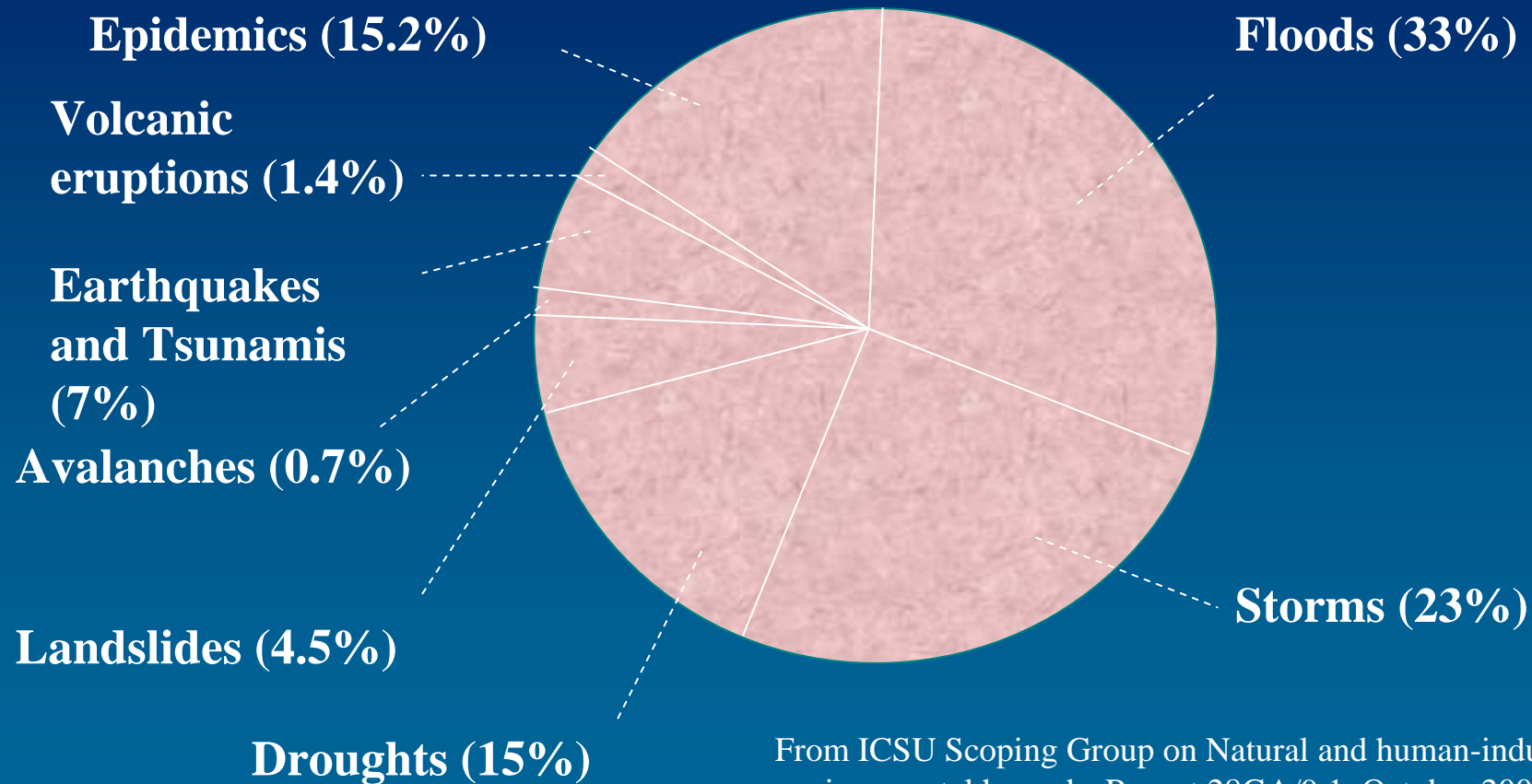
Potential Impact of CC

IPCC Assessment - 2 February, 2007

Phenomenon ^a and direction of trend	Likelihood that trend occurred in late 20th century (typically post 1960)	Likelihood of a human contribution to observed trend ^b	Likelihood of future trends based on projections for 21st century using SRES scenarios
Warmer and fewer cold days and nights over most land areas	<i>Very likely</i> ^c	<i>Likely</i> ^d	<i>Virtually certain</i> ^d
Warmer and more frequent hot days and nights over most land areas	<i>Very likely</i> ^e	<i>Likely (nights)</i> ^d	<i>Virtually certain</i> ^d
Warm spells / heat waves. Frequency increases over most land areas	<i>Likely</i>	<i>More likely than not</i> ^f	<i>Very likely</i>
Heavy precipitation events. Frequency (or proportion of total rainfall from heavy falls) increases over most areas	<i>Likely</i>	<i>More likely than not</i> ^f	<i>Very likely</i>
Area affected by droughts increases	<i>Likely in many regions since 1970s</i>	<i>More likely than not</i>	<i>Likely</i>
Intense tropical cyclone activity increases	<i>Likely in some regions since 1970</i>	<i>More likely than not</i> ^f	<i>Likely</i>
Increased incidence of extreme high sea level (excludes tsunamis) ^g	<i>Likely</i>	<i>More likely than not</i> ^{f,h}	<i>Likely</i> ⁱ

Virtually certain > 99%, very likely > 90%, likely > 66%, more likely than not > 50%

Most disaster losses, whether measured in terms of the number of events (here averaged across the world, 1994-2003), the lives lost or material destruction, stem from extreme atmospheric events and weather –related natural hazards

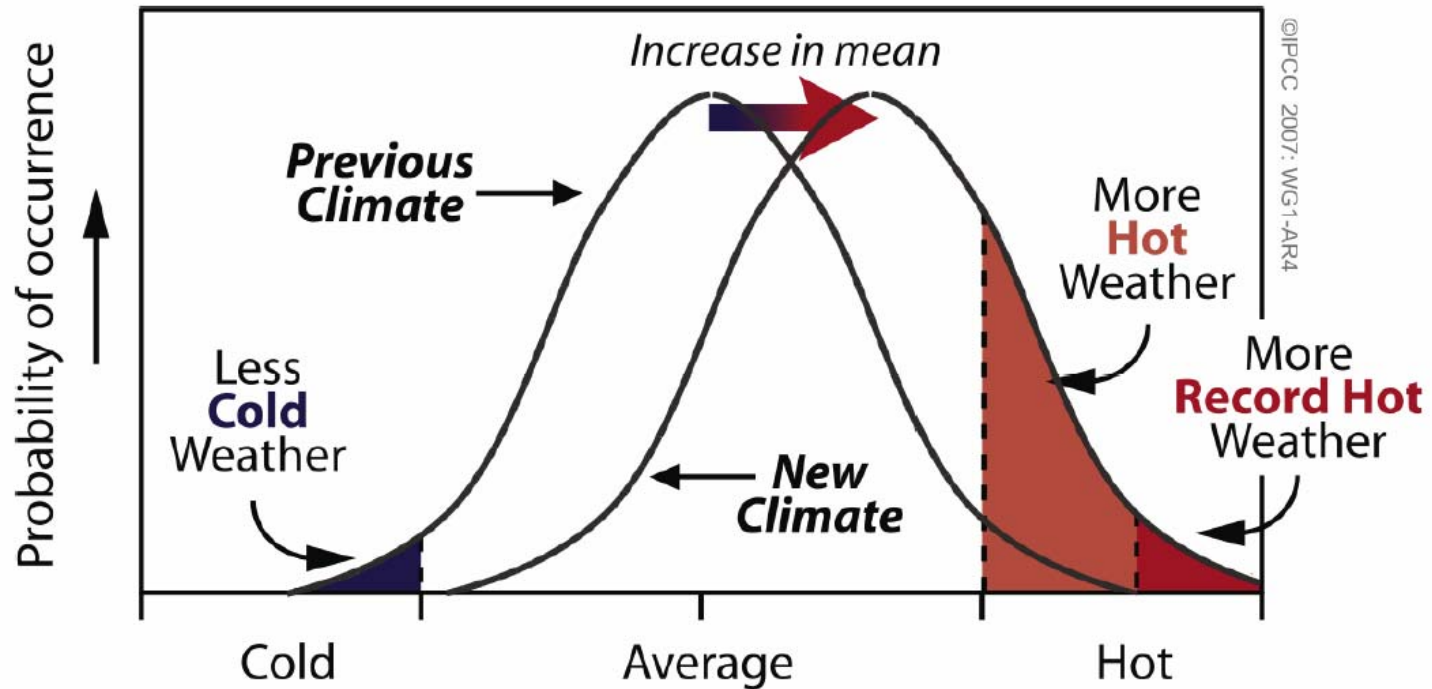


From ICSU Scoping Group on Natural and human-induced environmental hazards. Report 28GA/9.1, October 2005.

What are extreme events?

We define extreme events as occurrences that, relative to some other class of related occurrences, are either notable, rare, unique, profound, or otherwise significant in terms of their impacts, effects, or outcomes.

Extreme Events



Data and Methods

- Daily observations at 100 stations in Romania (1961-2008)
- 10-km simulations with RegCM (1961-1990; 2021-2050)
- Extreme indices for temperature and precipitation
- Weather and climate extremes – case studies

FP6 project: CECILIA

Central and Eastern Europe Climate Change Impact and
VulnerabiLity Assessment



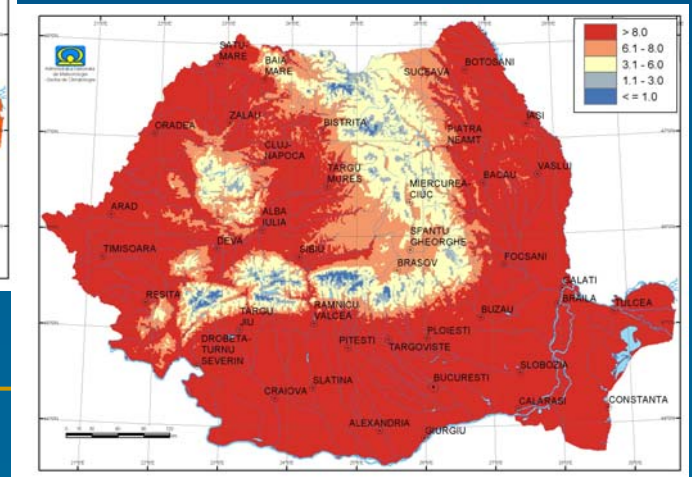
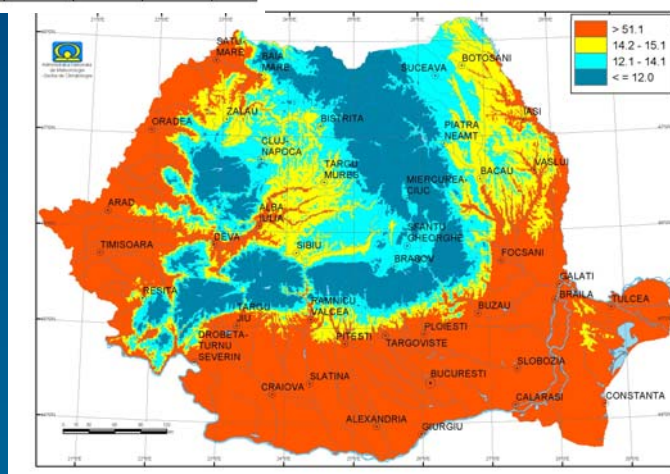
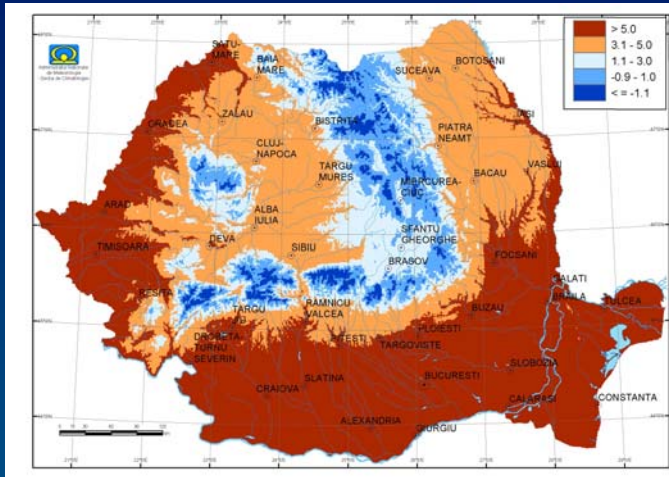
Objectives:

- Quantification (based on appropriate regional modelling and downscaling approaches) of specific climate change impacts in central-eastern Europe. Probable changes over the next decades to a century should be considered including changes of weather patterns, extreme events, water resources, and associated consequences on e.g. agriculture, forestry and air pollution levels.

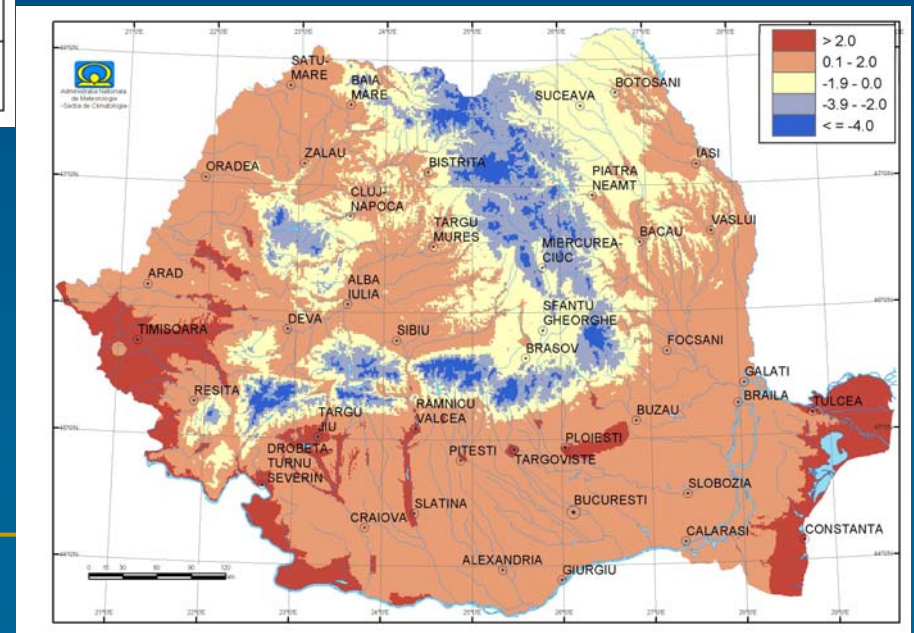
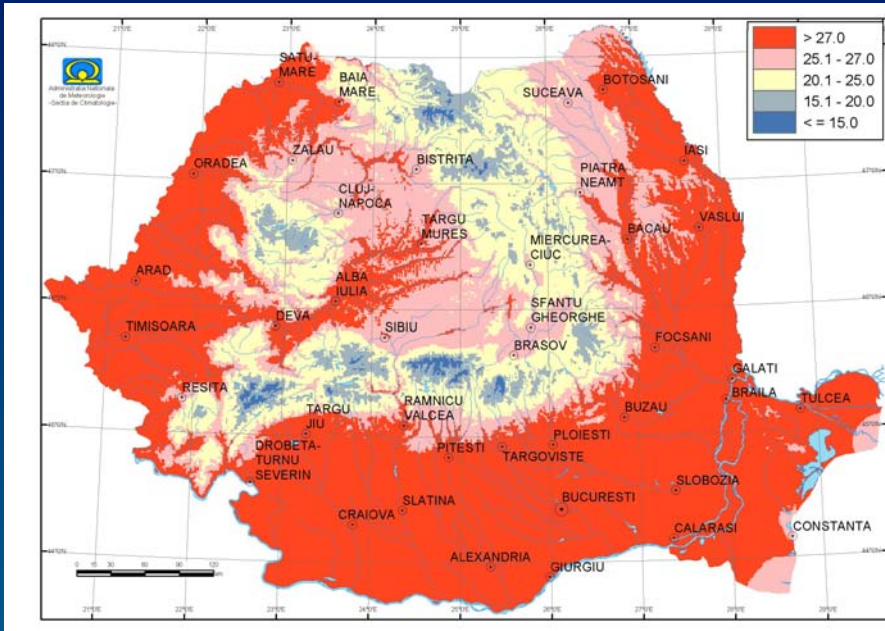


- **Observation data**

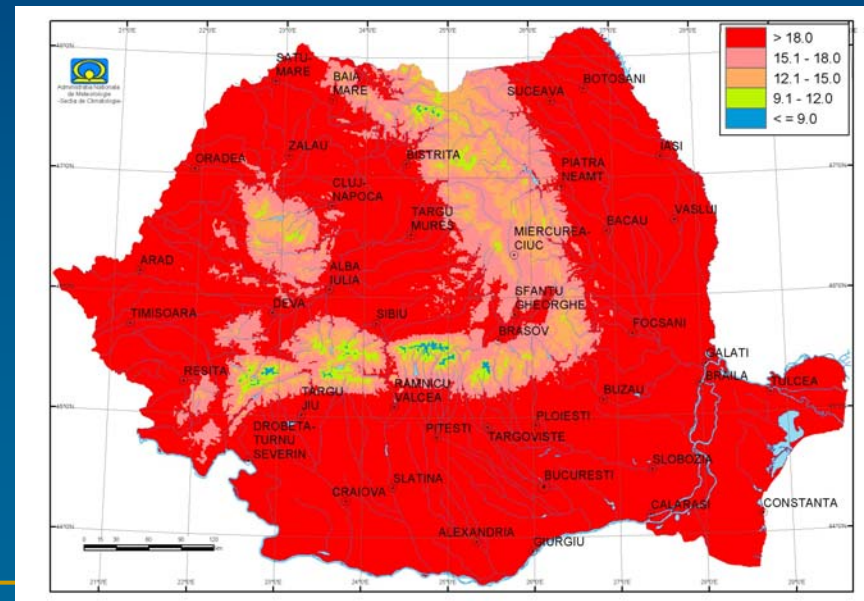
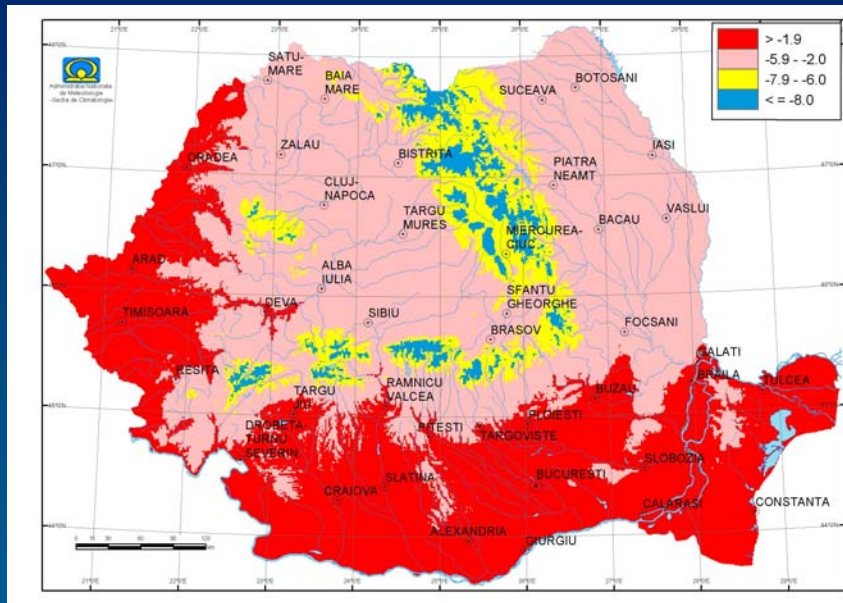
Annual mean of daily Tmean, Tmax, Tmin 1961-2007



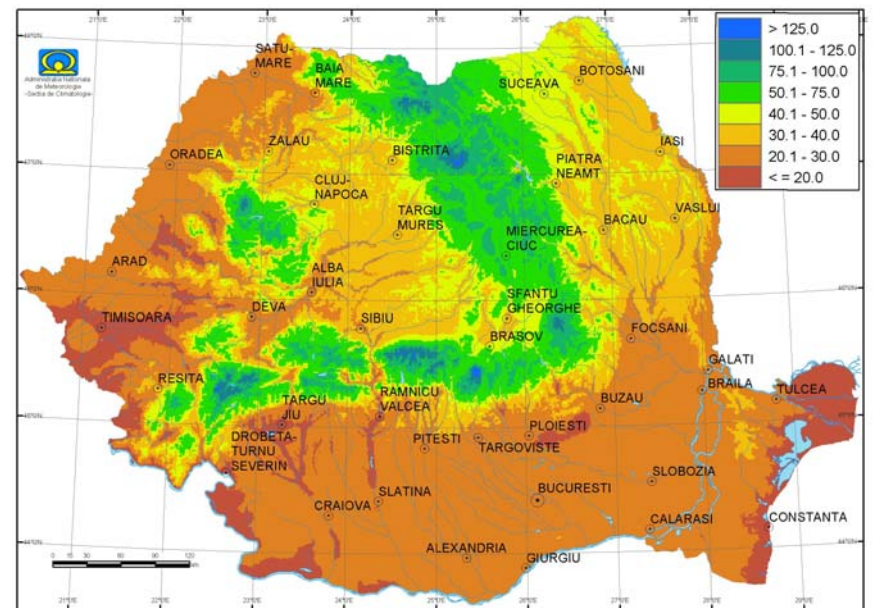
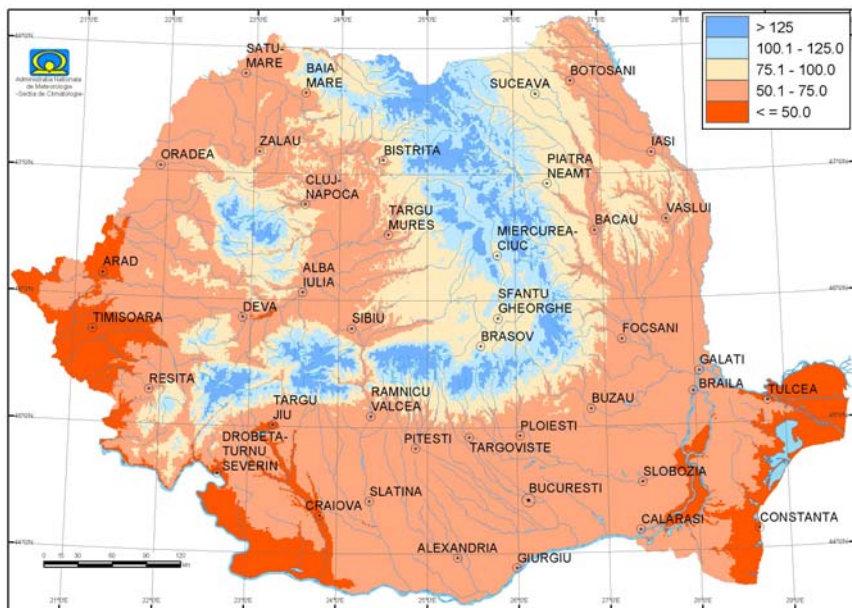
Annual Tmax 90th and 10th percentiles



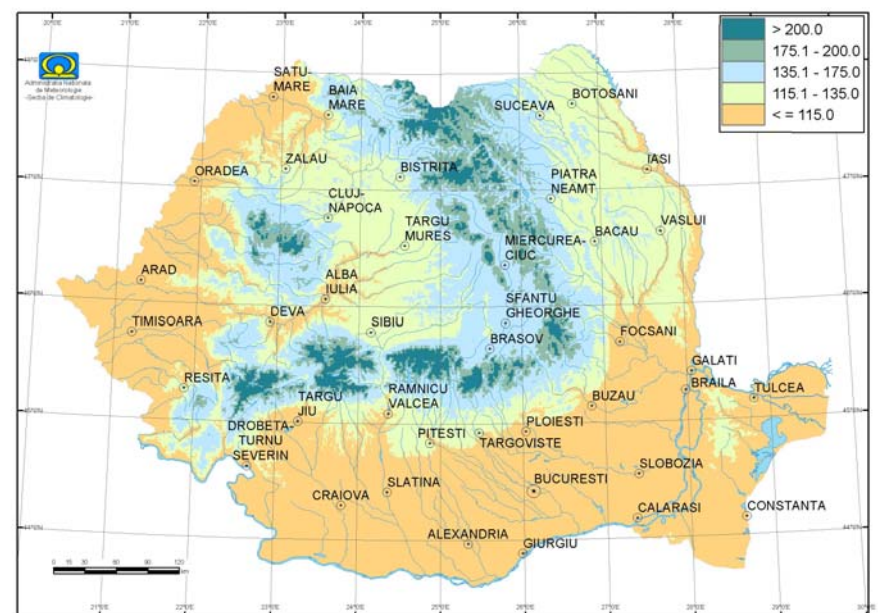
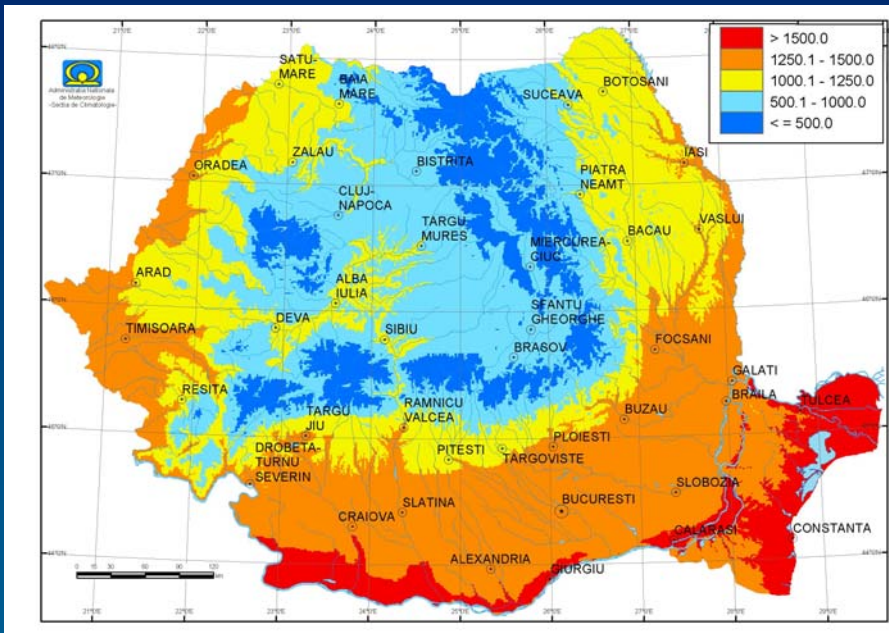
Annual Tmin 10th and 90th percentiles



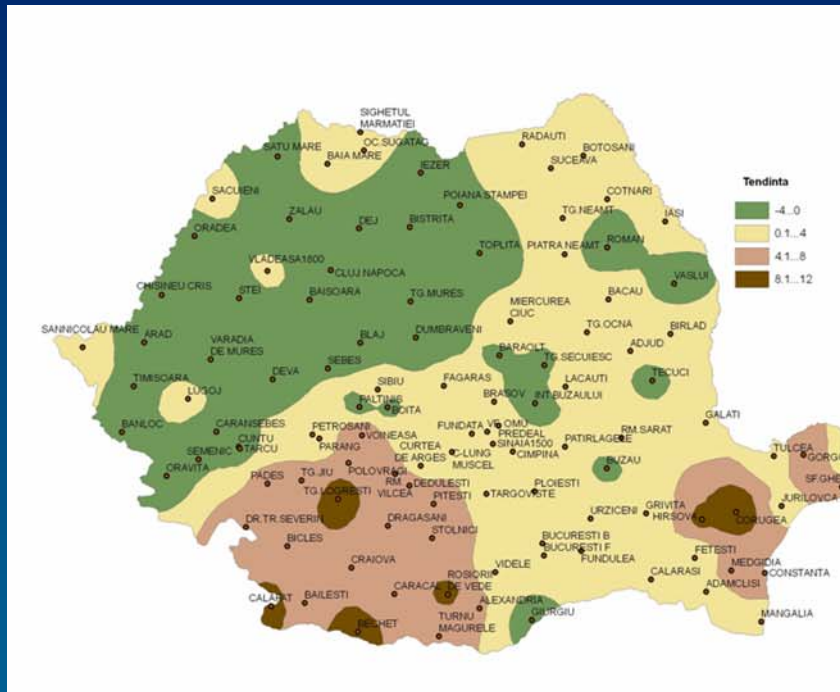
Annual no. of frost days ($T_{min} < 0^{\circ}C$) and no. of days without defrost ($T_{max} < 0^{\circ}C$)



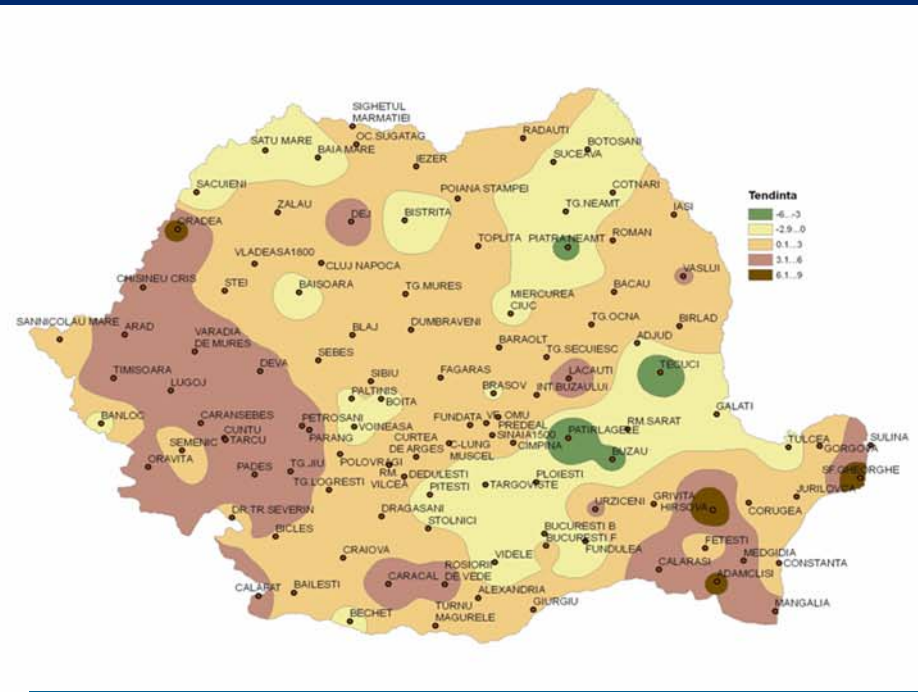
Annual no. of growing degree days ($> 5^{\circ}\text{C}$); and frost season length ($T_{\text{min}} < 0^{\circ}\text{C}$)



Trends of maximum duration of dry days (1961-2000)



Winter-significant increase over the south-western regions



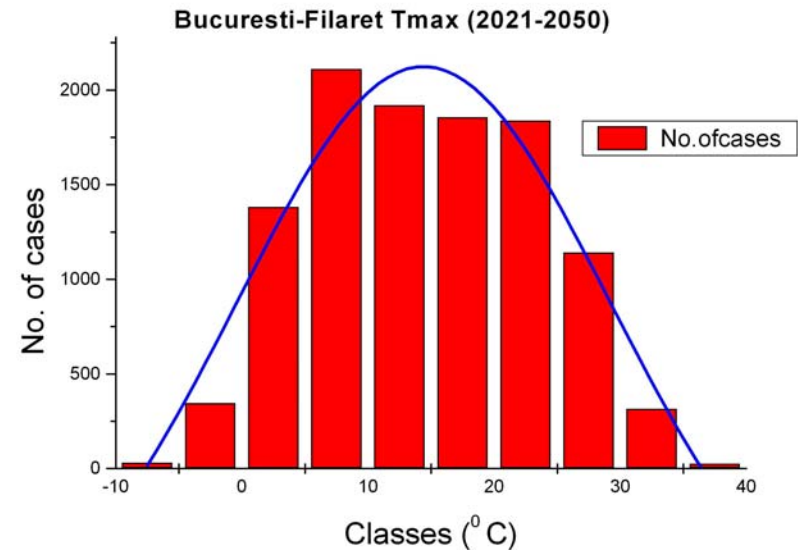
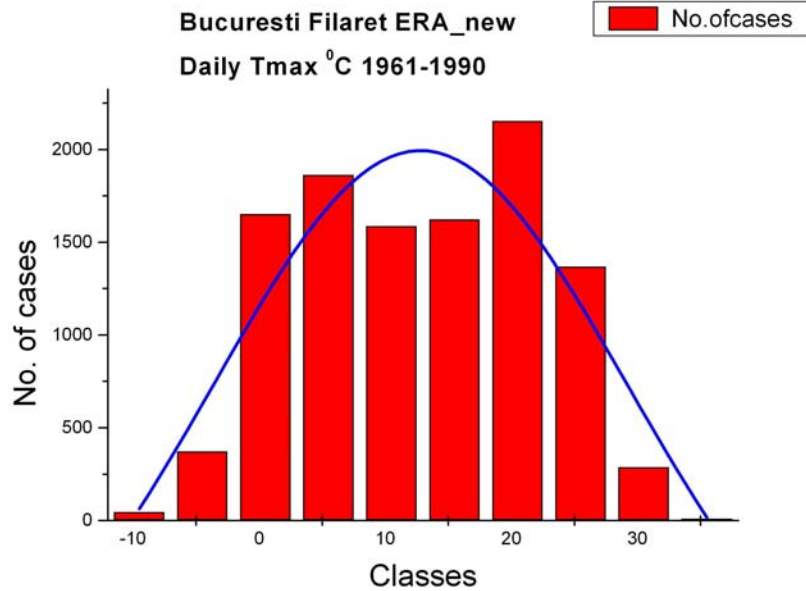
Summer- significant increasing over the western regions

- **Simulated data**

Frequency distribution of daily Tmax RegCM simulations

ERA40

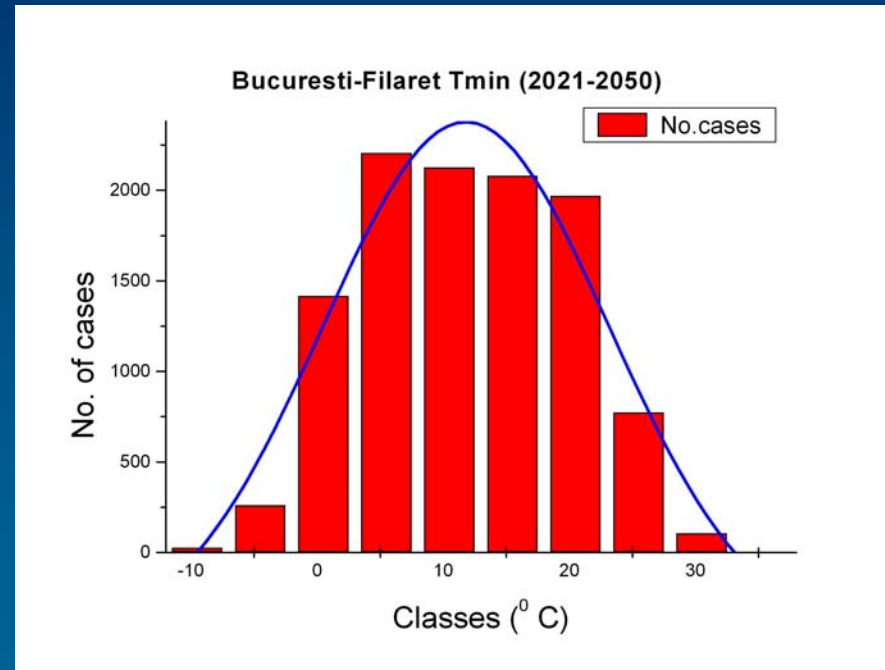
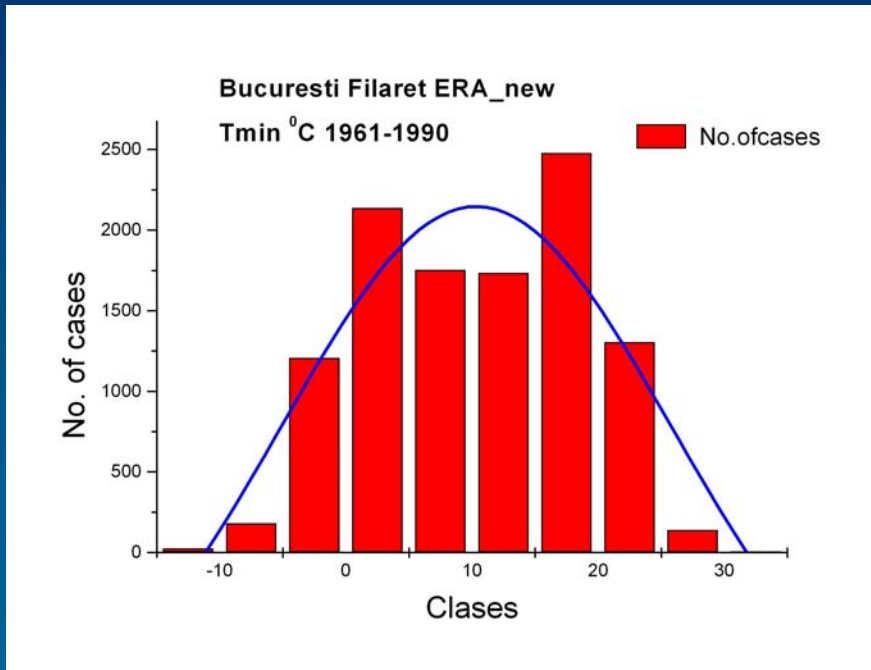
A1B scenario



Frequency distribution of daily Tmin RegCM simulations

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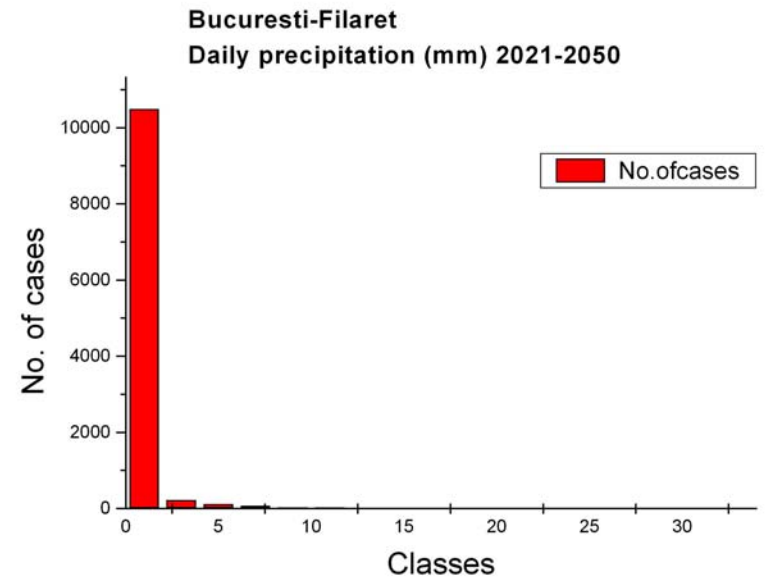
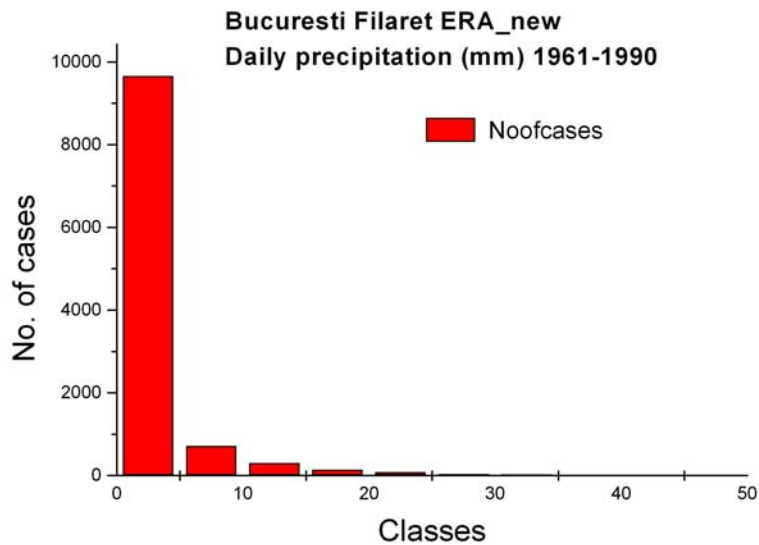
A1B scenario



Frequency distribution of daily precip RegCM simulations

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A1B scenario



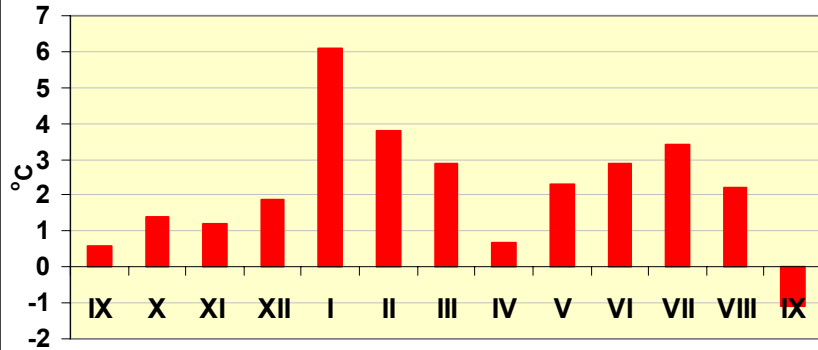
Extreme events

- Case studies

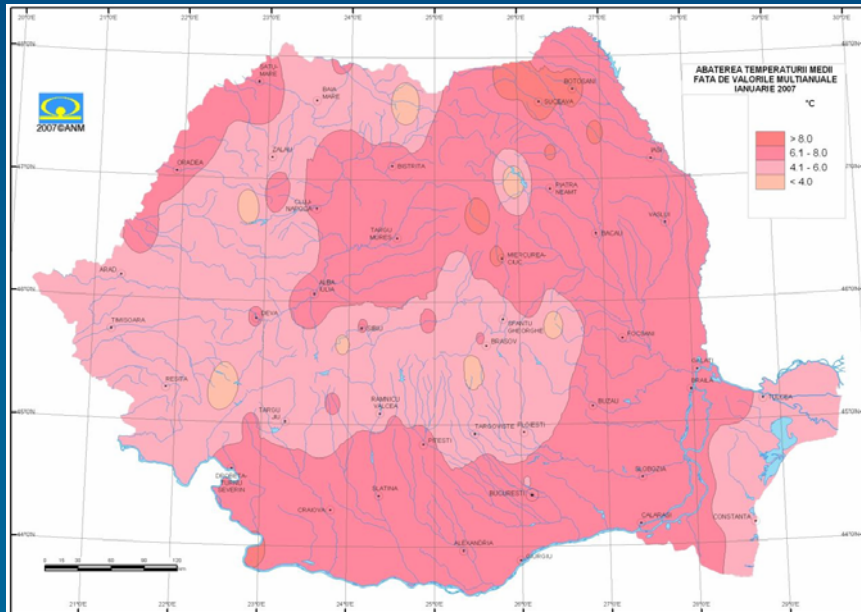
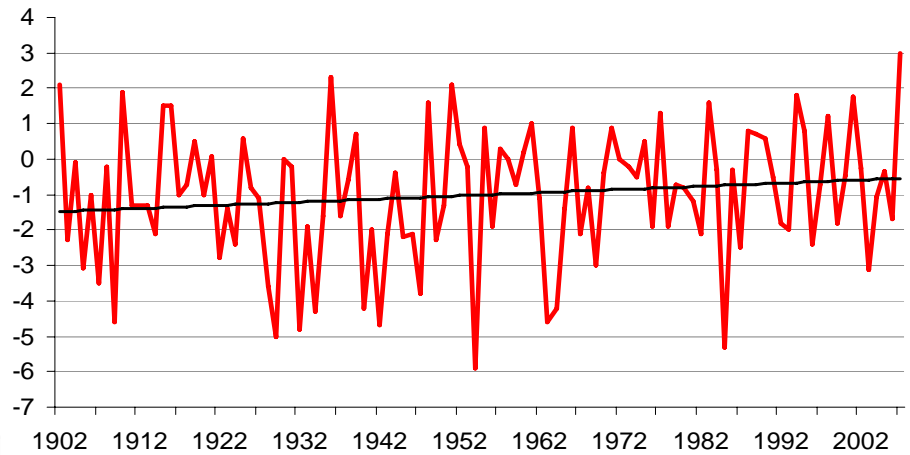
Weather extremes of 2007

Winter 2006-2007- the warmest of the last century

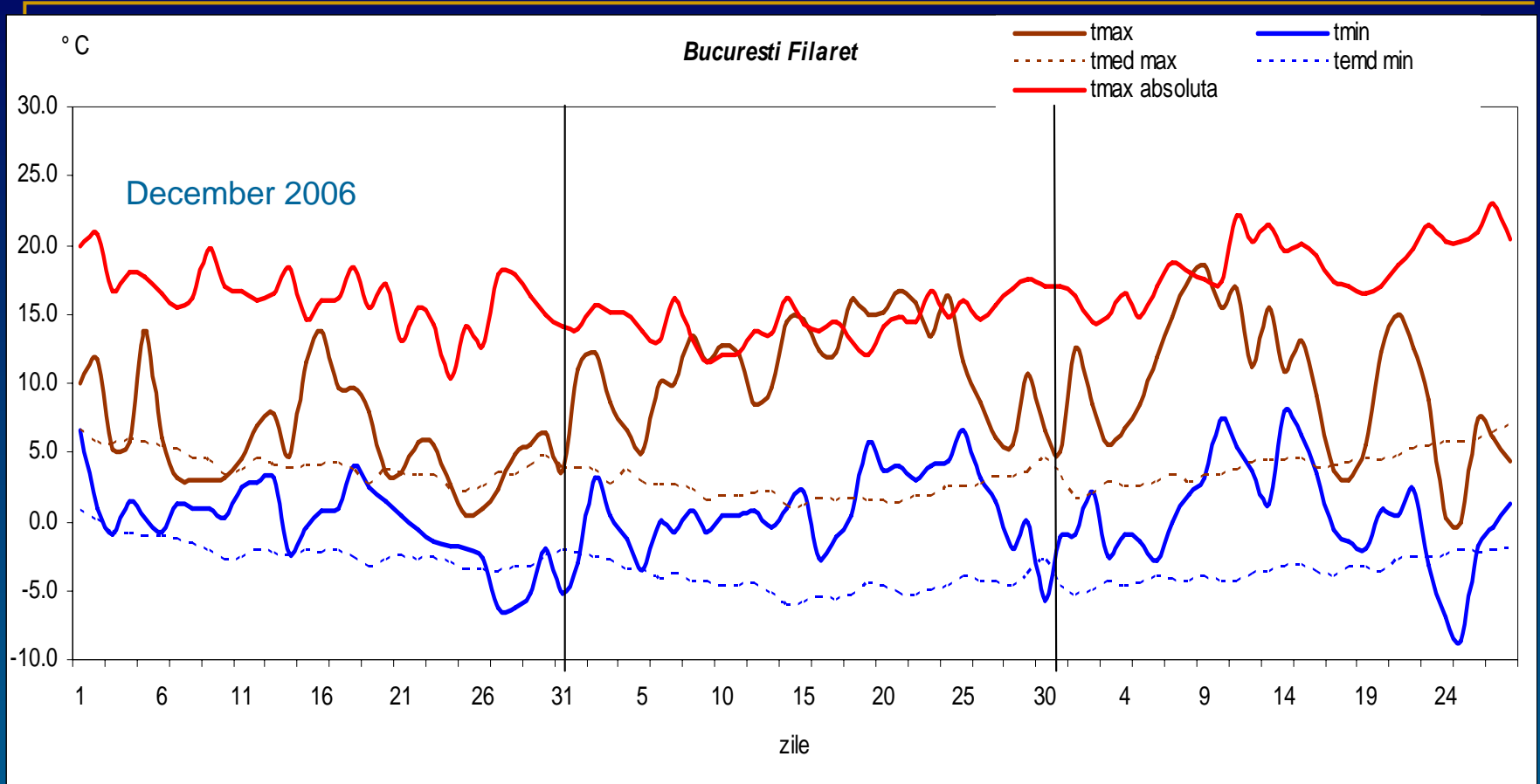
Abateri ale temperaturii medii lunare fata de normala climatologica, sept.2006-sept. 2007



Temperatura medie a aerului din timpul iernii-
media pe tara



- ▶ January 2007 – the warmest month of the winter 2007; the monthly temperature anomalies vs climatological normal ranged between 6.1 °C and 8.0 °C.
- ▶ The absolute maximum temperature records of the month have been broken at 24 station in Romania.

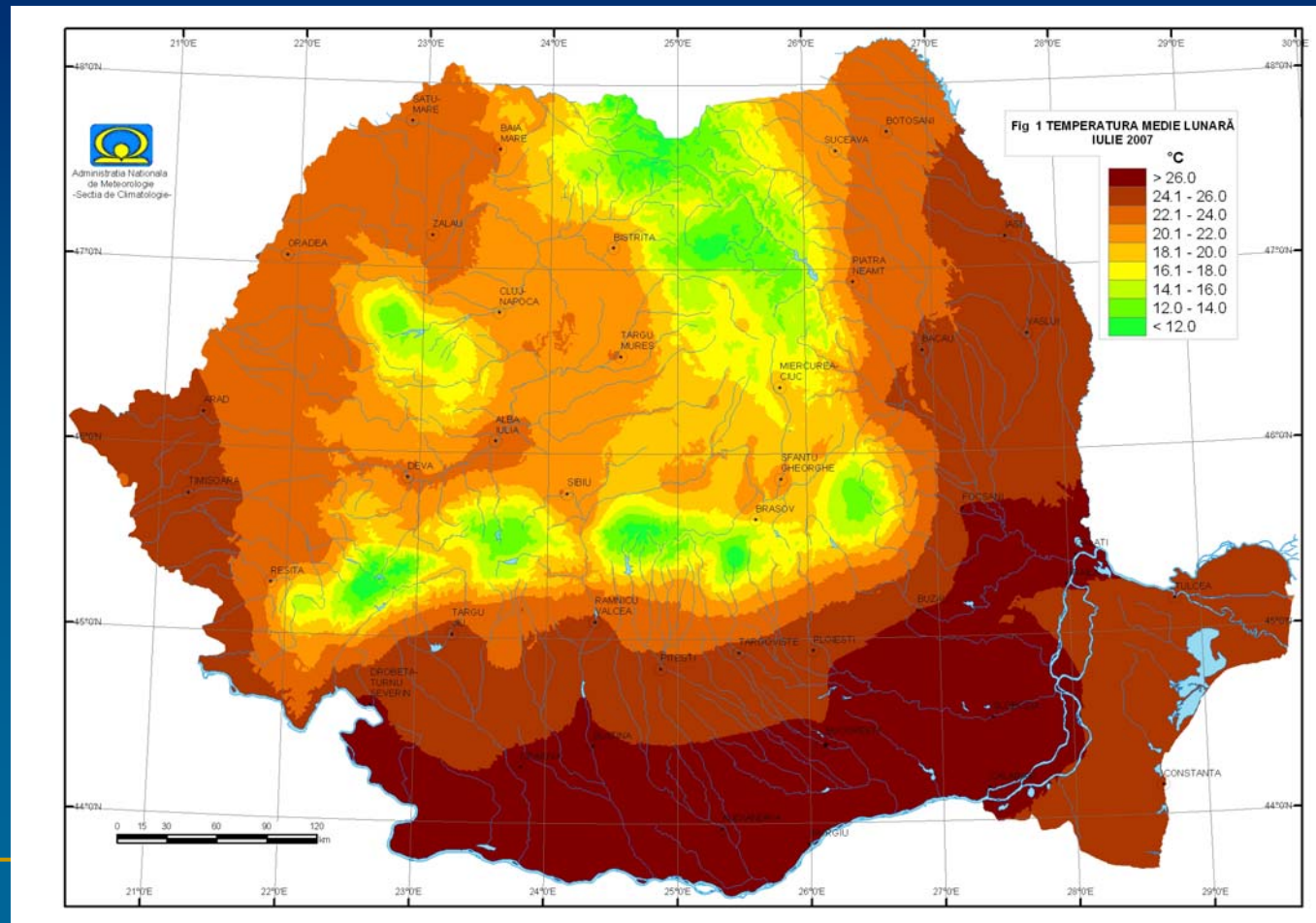


The evolution of daily maximum and minimum temperature in comparison with their multiannual means and absolute records of daily extreme temperature at Bucuresti Filaret station during December 2006-February 2007.

► Number of the days with daily Tmax $\geq 40.0^{\circ}\text{C}$ (total over the country during July)

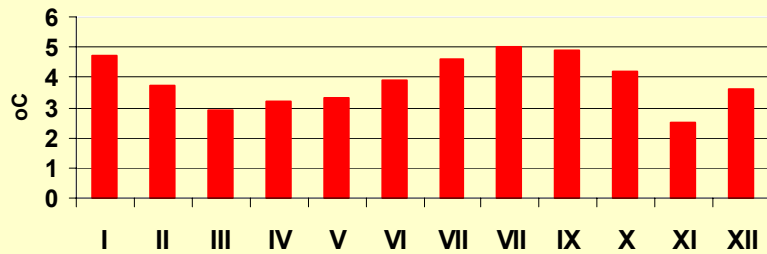
1909	1916	1927	1938	1945	1950	1965	1968	1985	1987	1988	1996	1998	2000	2002	2004	2007
1	12	2	2	2	2	2	1	24	44	19	2	4	100	1	2	148

Monthly mean /
JULY 2007

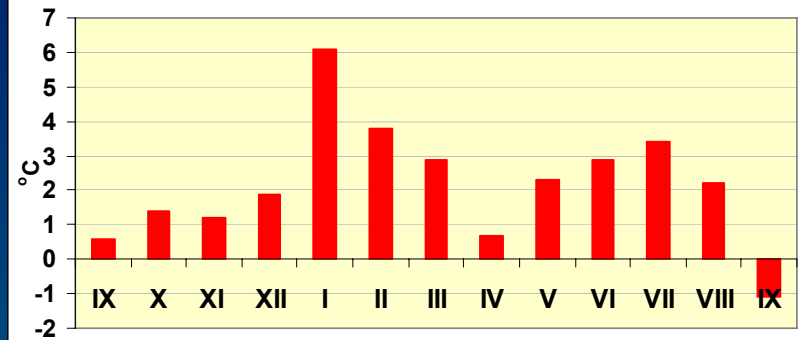


Monthly temperature anomalies during 2007 vs. the projected temperatures of A2 scenario for the end of 21st century

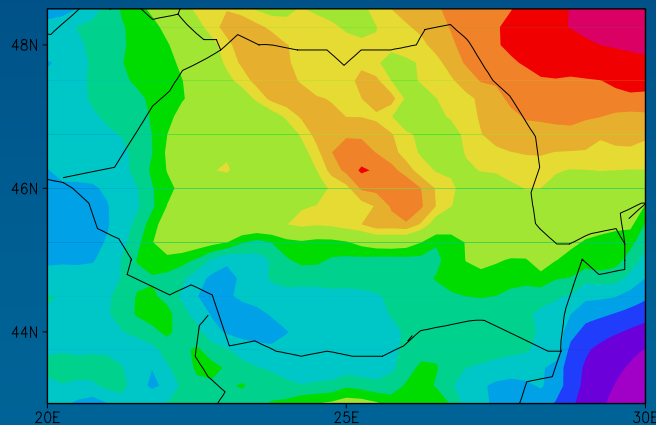
Schimbari in media lunara a temperaturii pentru perioada 2070-2099, RegCM3, medie spatiala, Scenariul A2



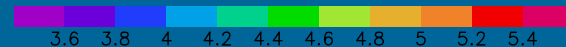
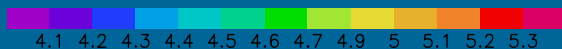
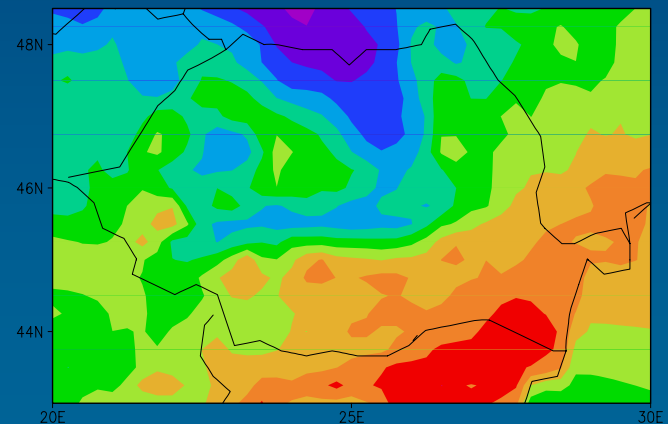
Abateri ale temperaturii medii lunare fata de normala climatologica, sept.2006-sept. 2007



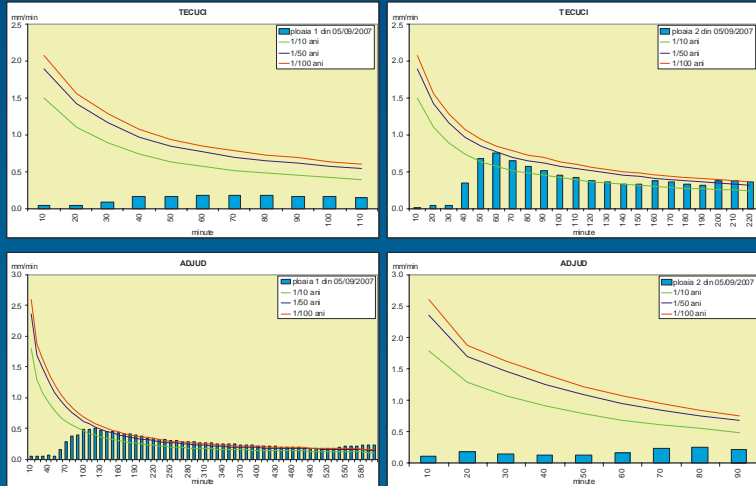
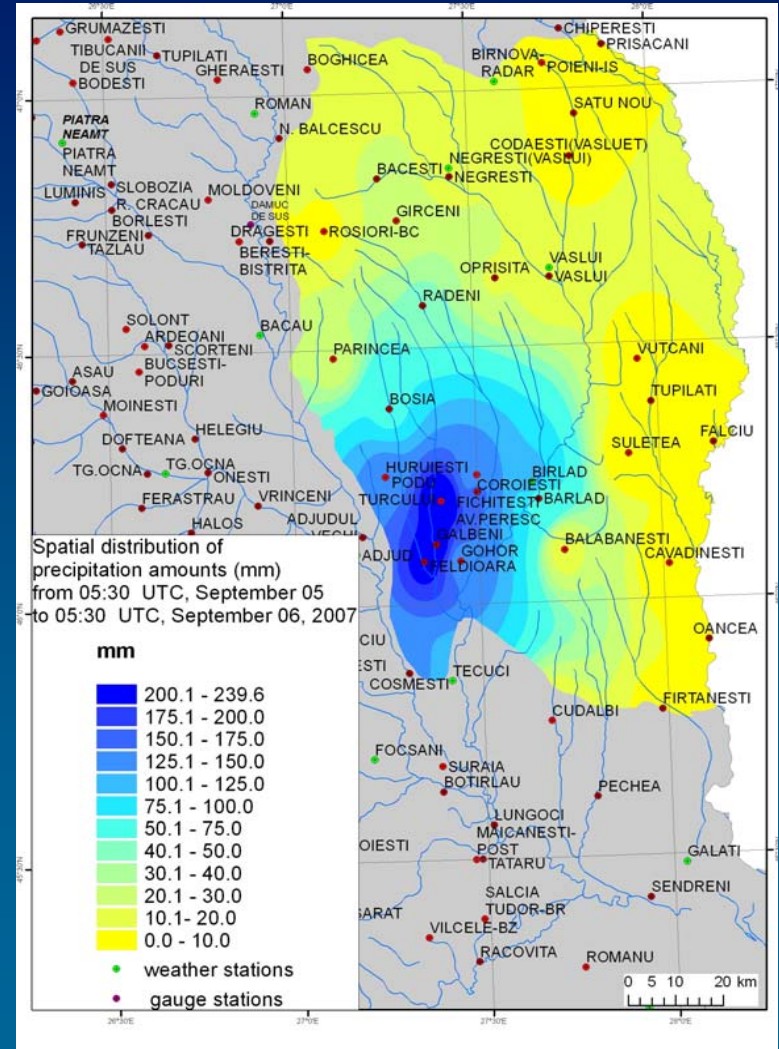
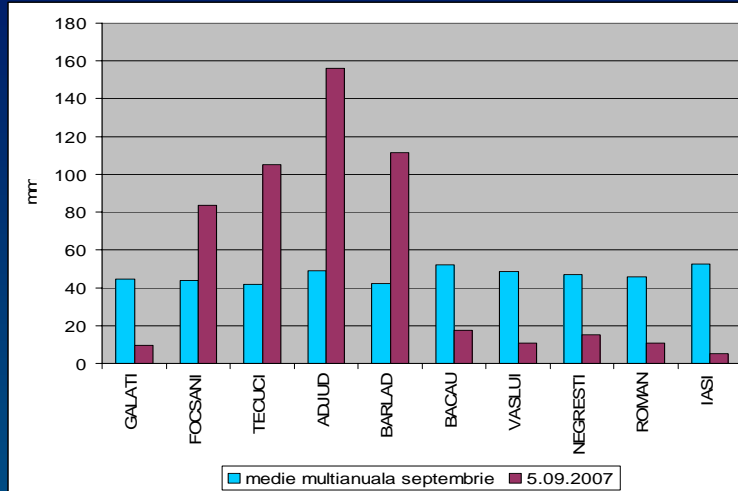
Schimbari in tmed-01 A2 2070-2099



schimbari temp. 07 A2 2070-2099



Heavy precipitation



Monthly temperature and precipitation totals January-October 2008 vs multiannual means

