Simulation of extremely hot events in Croatia with RegCM4.2

Lidija Srnec, Ksenija Cindrić, Mirta Patarčić, Ivan Güttler, Čedo Branković

lidija.srnec@cirus.dhz.hr

DHMZ

Challenges in meteorology 3: EXTREME WEATHER AND IMPACT ON SOCIETY
21-22 November 2013., KRAŠ Auditorium, Zagreb

Outline:

1. Introduction
2. Data and methods
3. Results
4. Conclusions and next steps

Introduction

-In a large number of cases, the extreme climate change has been 5-10 times of the mean climate change (Yan and Yang, 2000)

-A lot of public concern about possible increase in the frequency end enhancement of extremely hot weather under global warming (because they may exert a greater impact on human health than any other form of severe weather) (Changnon et al, 1996)

-Around 30000 deaths in summer 2003 can be attributed to the heatwave over Europe (WHO, 2004)

RegCM 4.2 (ICTP):

Projection: Lambert conformal
Convective scheme: Emanuel (1991)
Boundary layer scheme: Holtslag PBL (1990)
Vertical levels: 23 σ-levels, model top at 50 hPa

2 experiments:

1) exp: Domain: European
Horizontal resolution: 50km
Central lat,lon: 49.68° N, 9.75° E
No. Grid points: 142x142
2) exp: Horizontal resolution: 12.5km
Domain: Mediteranean
Central lat,lon: 44° N, 16° E
No. Grid points: 222x182

Boundary and initial condition:

ERAInterim (1989-2008) at 1.5° x 1.5° resolution
Frequency of atmospheric BC 6 hr
SST were updated every 6 hr

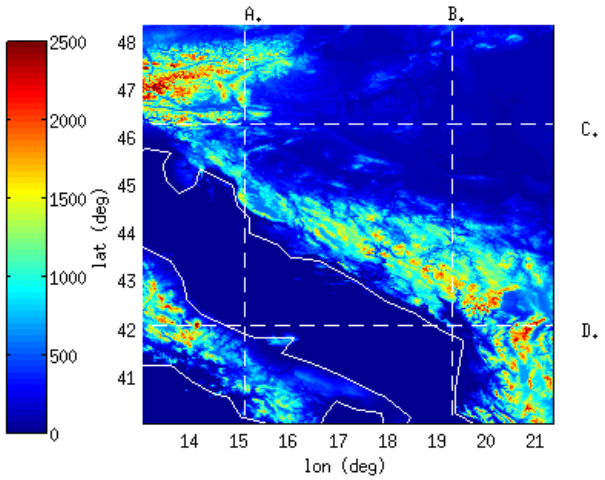
AIM: to investigate the benefits of using a high spatial resolution in regional climate modeling

Period: 1989-2008

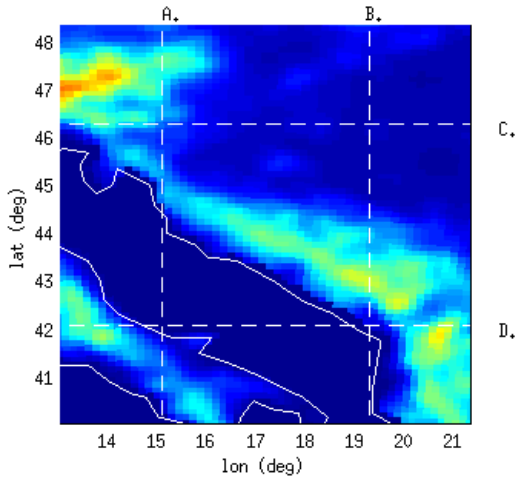
Parameters:
- Mean number of days with tmax > 25 deg
- Mean number of days with tmax > 30 deg
- Mean number of days with tmax > 35 deg

Verification:
E-OBS data set – 0.22° regular latitude-longitude resolution
Observed data from Croatian meteorological stations

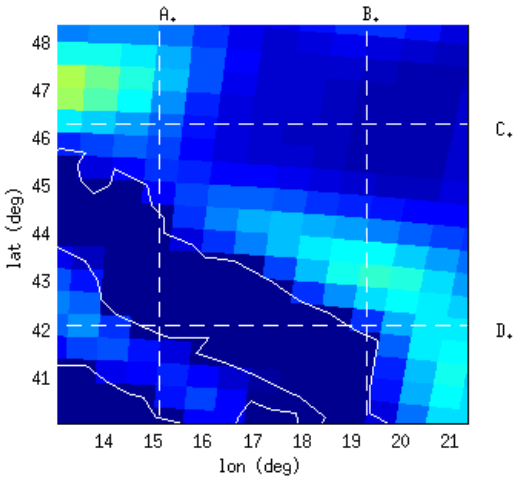
GTOPO(~1km)



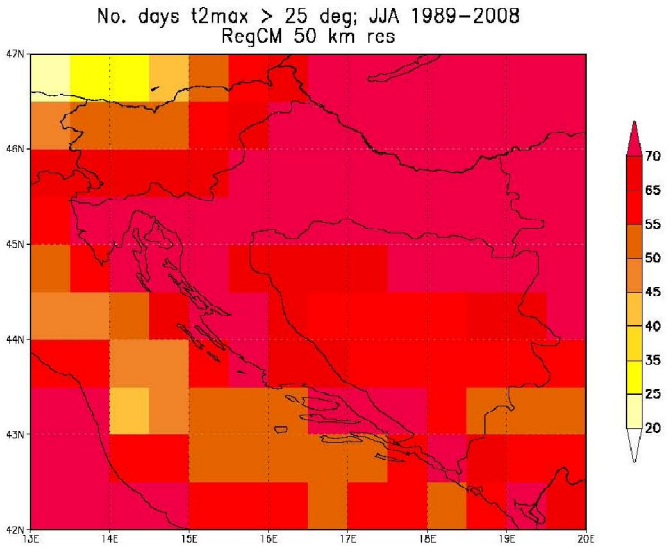
RegCM(12.5 km)

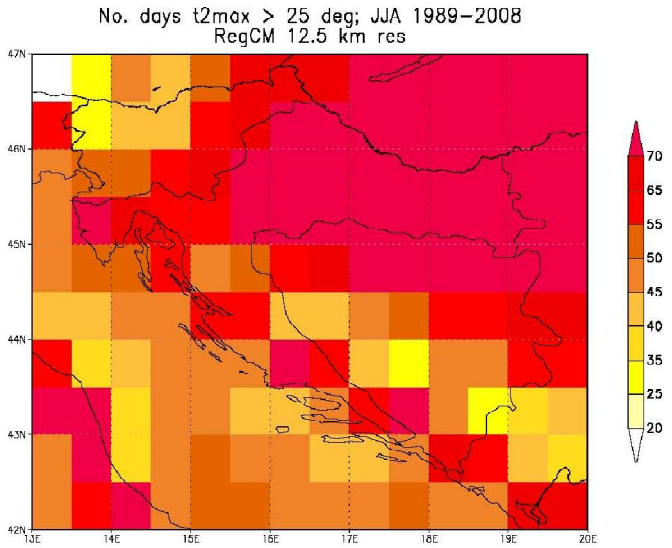


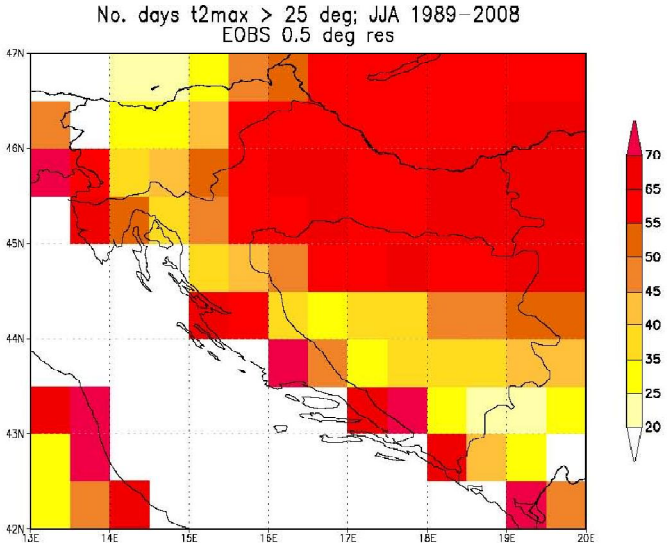
RegCM(50 km)

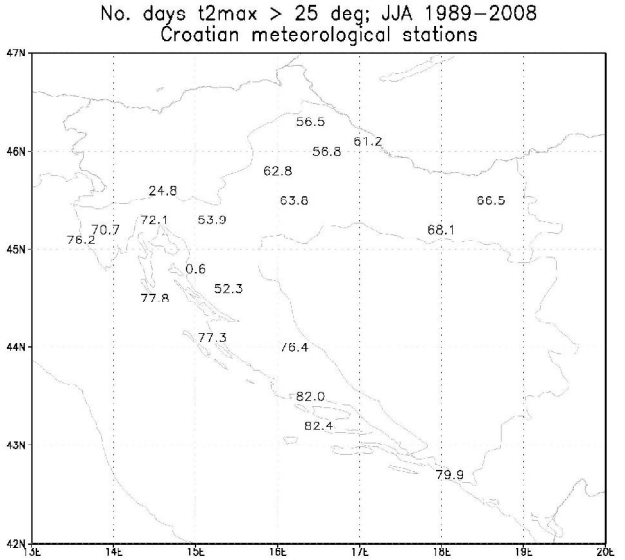


Mean No. Days t2max > 25 deg

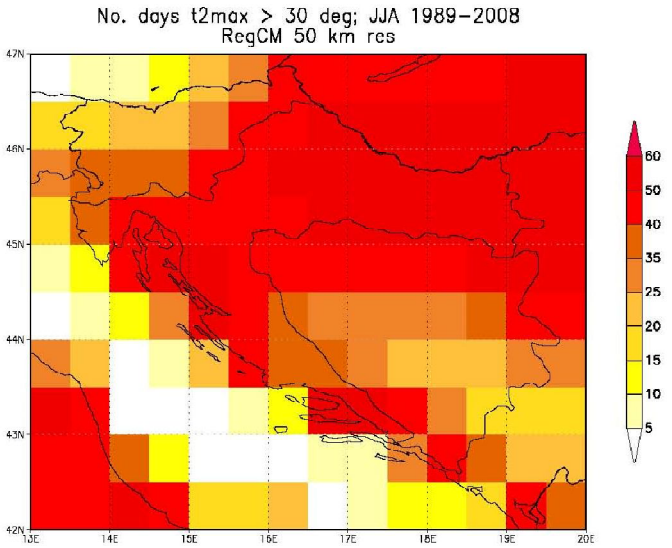


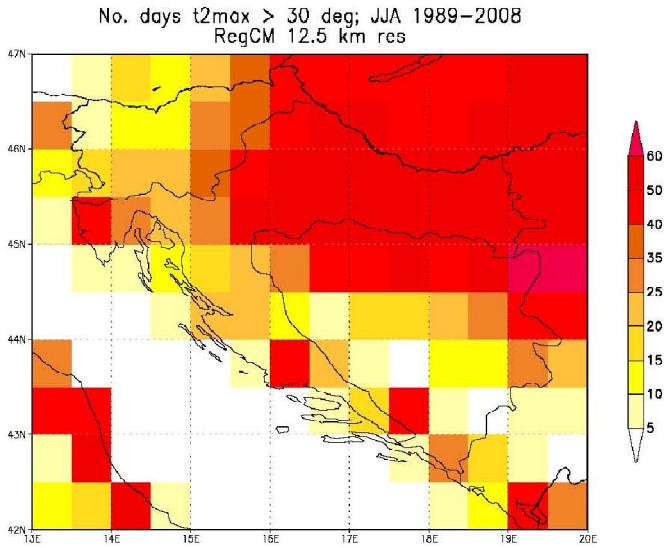


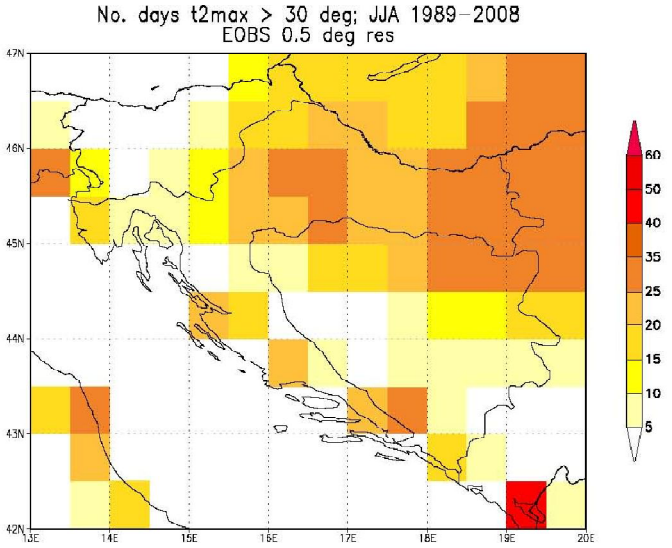


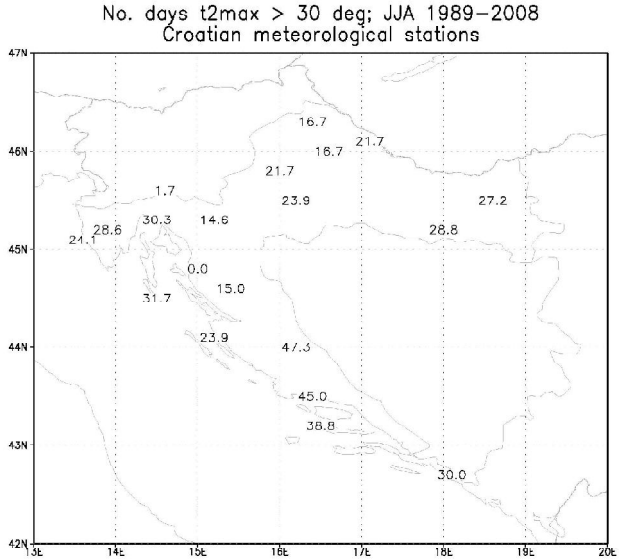


Mean No. Days t2max > 30 deg

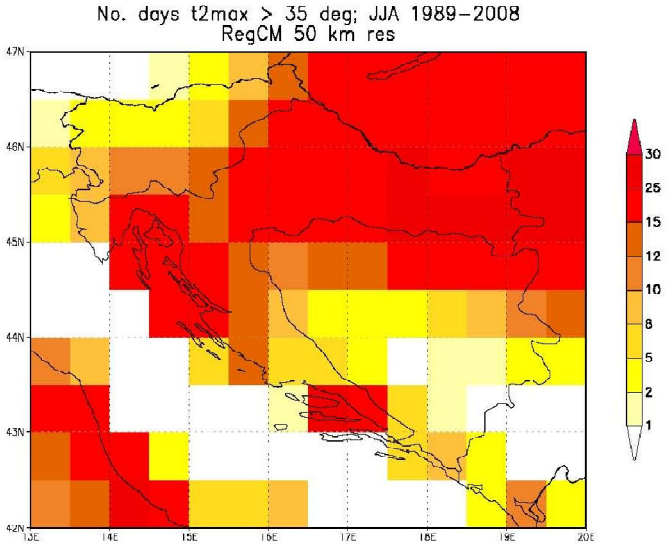


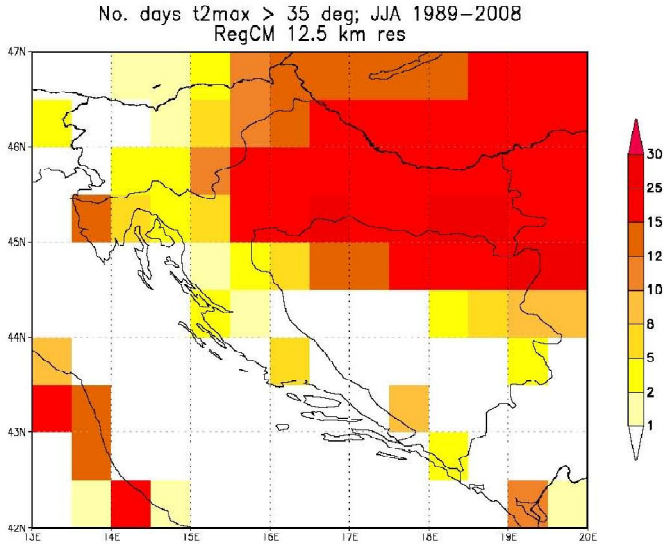


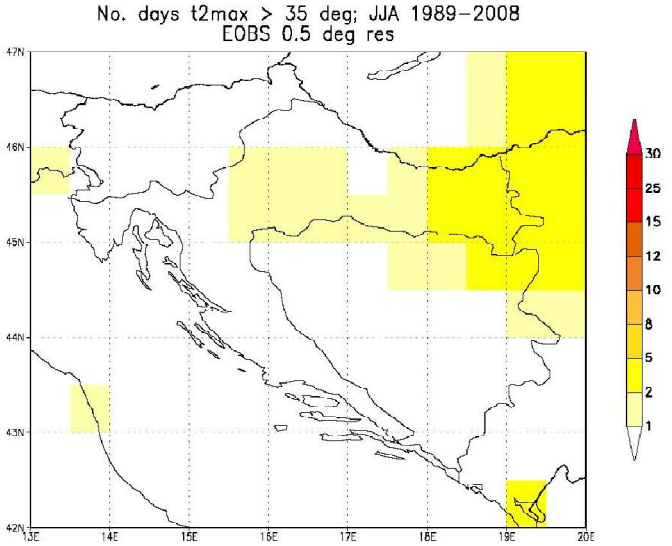


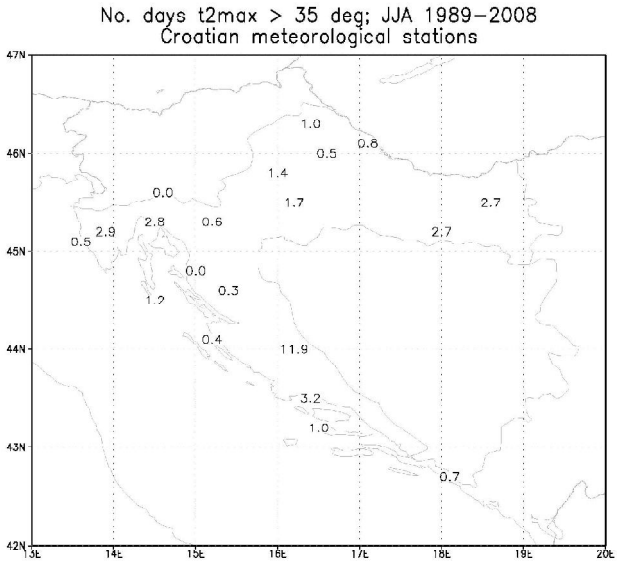


Mean No. Days t2max > 35 deg









Conclusions:

RegCM overestimates number of “warm” days for both resolutions.
The percentage of overestimation increase for higher thresholds (see. No. Days t2max > 35 deg).

But, the spatial distributions of “warm” days is better represented in simulations with 12.5 km horizontal distribution.

Next step:

-Look into persistance of “warm” and “hot” days (Number of consecutive days)
-Definition of “warm” and “hot” days according to 10^{th} an 90^{th} percentiles

-Look into future scenario of temperature extremes

Thank you!