CENTER FOR METEOROLOGY AND ENVIRONMENTAL PREDICTIONS

DEPARTMENT OF PHYSICS, FACULTY OF SCIENCES, UNIVERSITY OF NOVI SAD, SERBIA

SEE VCCC

CENTRO EURO-MEDITERRANEO PER I CAMBIAMENTI CLIMATICI

GLOBAL AND REGIONAL CLIMATE SIMULATIONS

DYNAMICAL DOWNSCALING AS A TOOL FOR FOCUSING GLOBAL RESULTS TO A REGION OR SUB-REGION

GLOBAL AND REGIONAL CLIMATE SIMULATIONS

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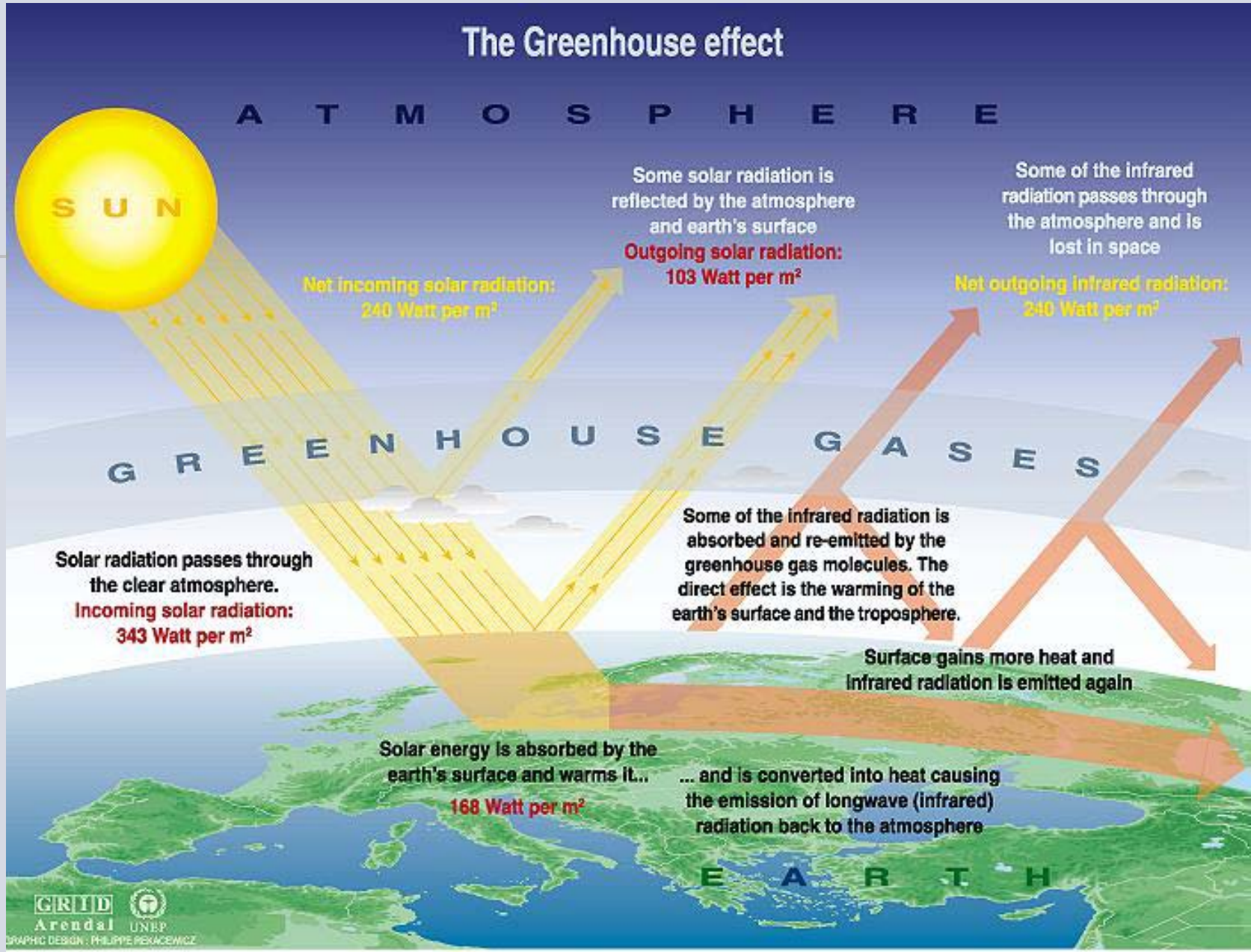
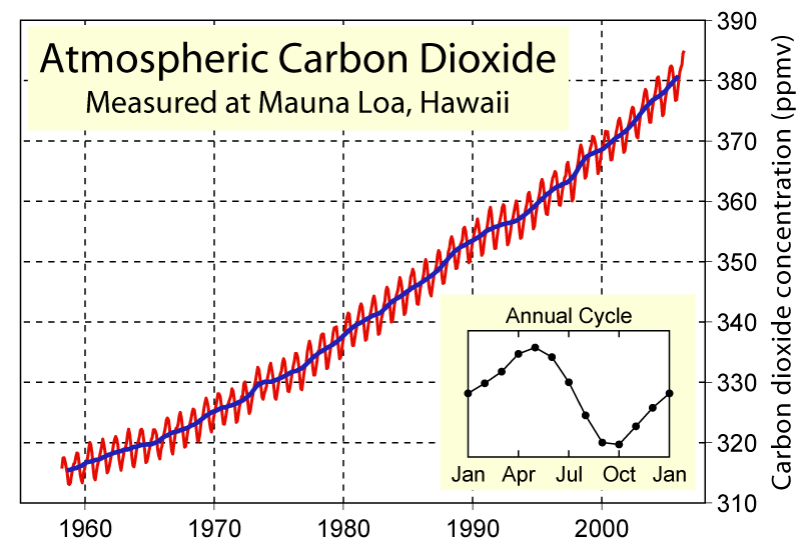
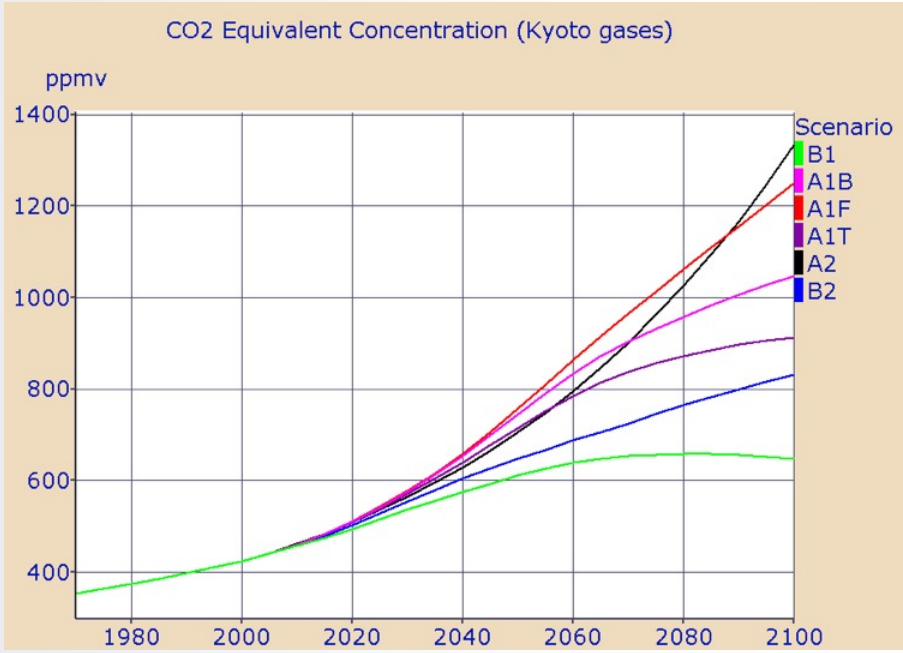
Center for Climate Change in the Mediterranean CCMC



Sources: Okanagan university college in Canada, Department of geography, University of Oxford, school of geography; United States Environmental Protection Agency (EPA), Washington; Climate change 1995, The science of climate change, contribution of working group 1 to the second assessment report of the intergovernmental panel on climate change, UNEP and WMO, Cambridge university press, 1996.

The observed CO2 and the IPCC scenarios

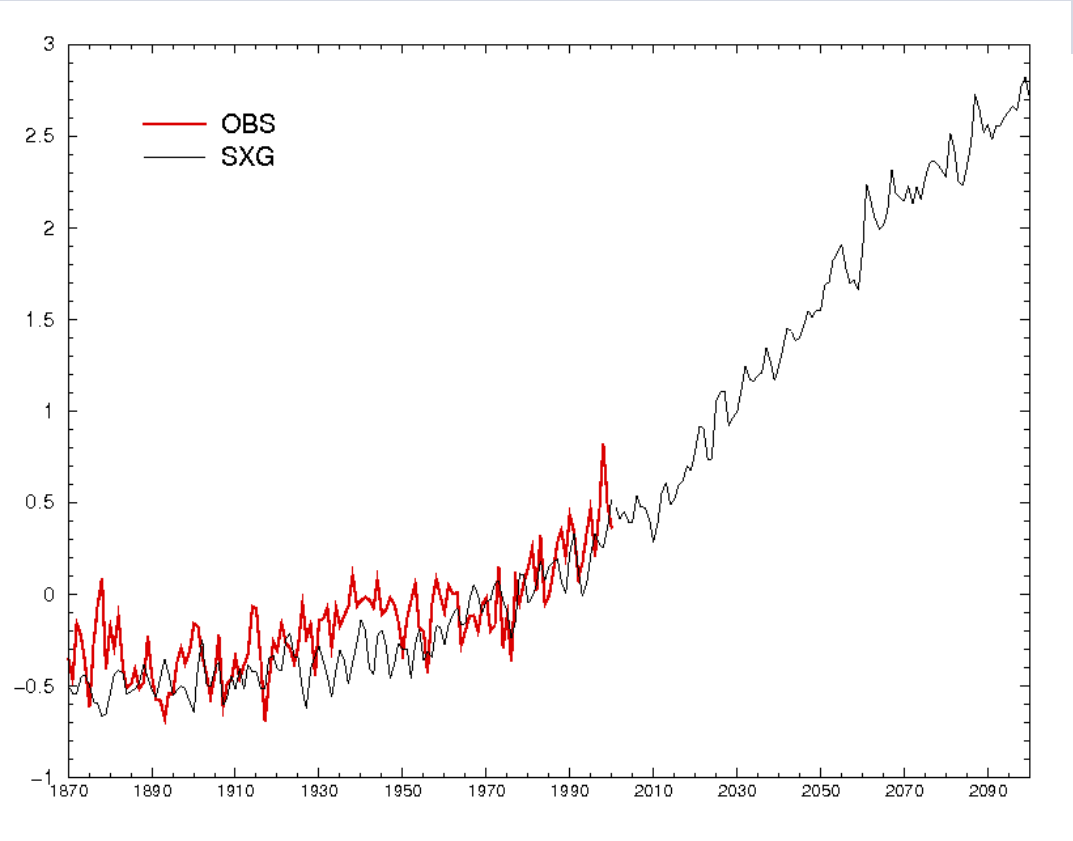




Results from the global (SINTEX-G) model

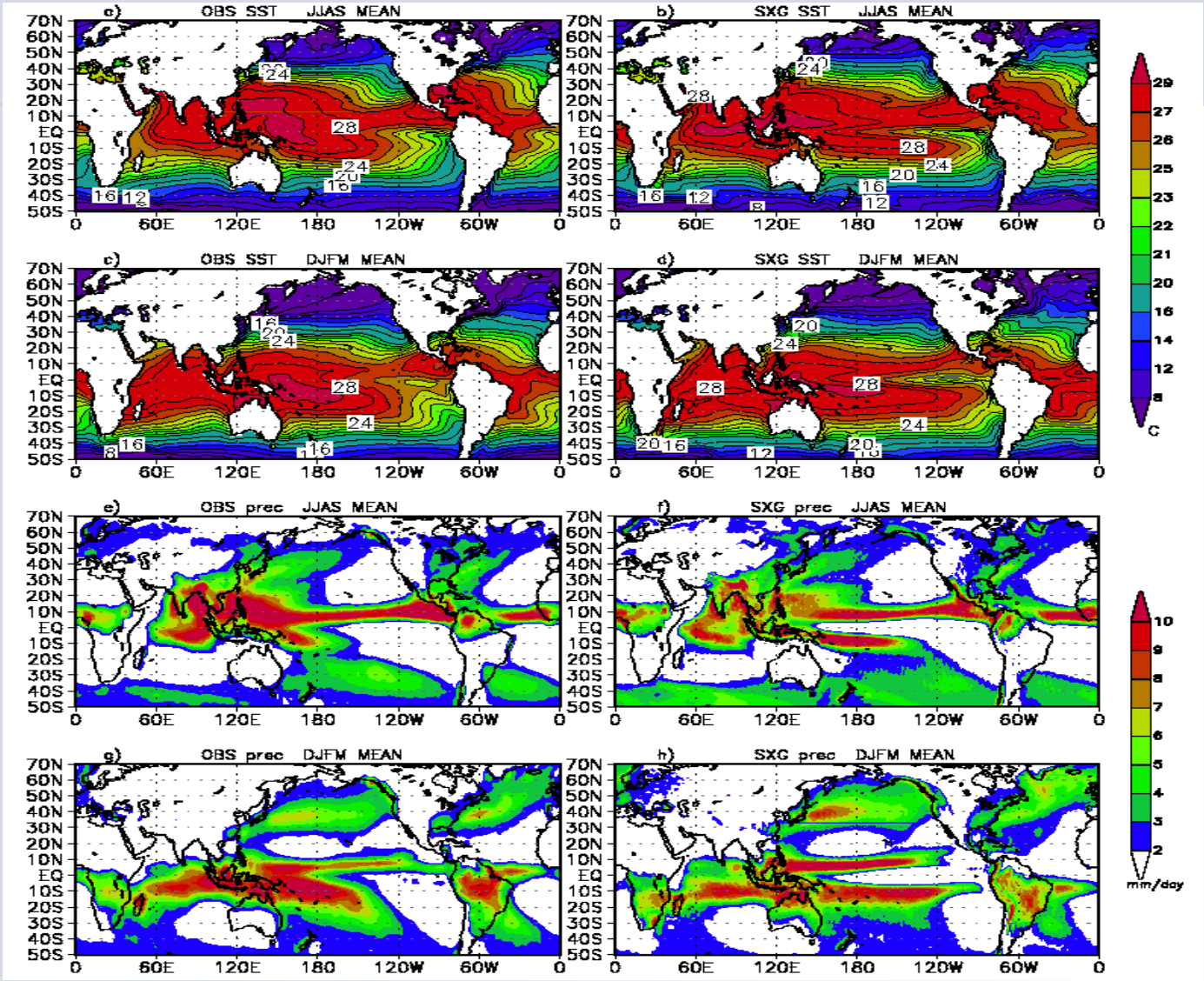
- Time series of the annual mean values of surface temperature averaged over the entire globe.

- The values plotted are the year-to-year deviation with respect to the 1870-1890 mean



- 1870-2000 - 20C simulation
- 2001-2100 - A1B scenario simulation

"Standard" Results from the global (SINTEX-G) model



Dynamical downscaling

- **Climate projections**

  Coupled Regional Climate Model **EBU-POM**
  (developed at UB and SEE-VCCC)

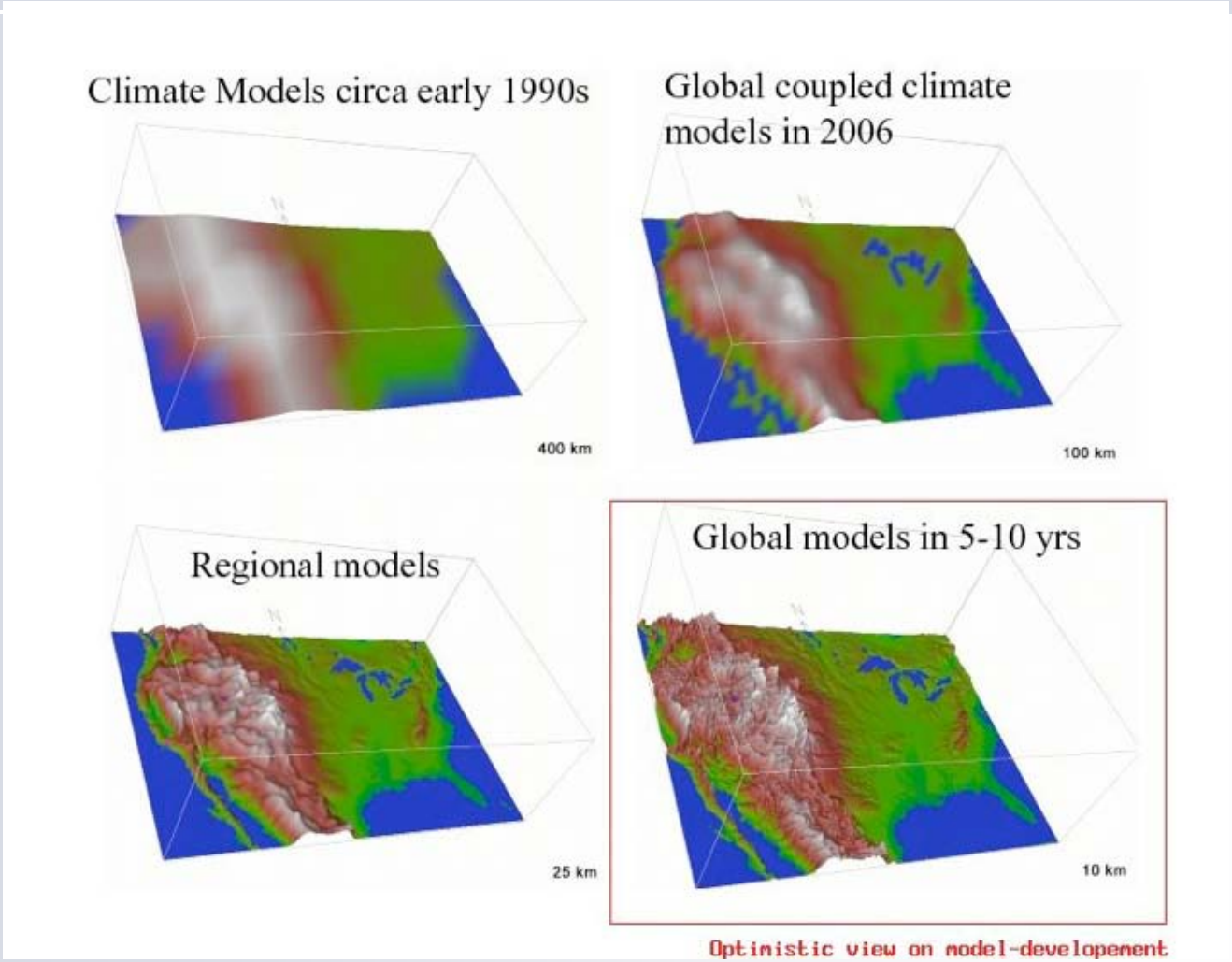
  → **model results:**
  air temperature and precipitation

  → calculation of **climate indices**

- **Application** of climate indices in agronomy (**viticulture**)

present climate (1961-1990) ⟷ climate at the end of 21st century (2071-2100)

Dynamical downscaling



Model description: EBU - POM

Atmospheric part: **Eta**/NCEP model (**EBU**=**E**ta **B**elgrade **U**niversity)

resolution: horizontal 0.25˚ (**~30km**) , 32 vertical levels
domain: Euro-Mediterranean region

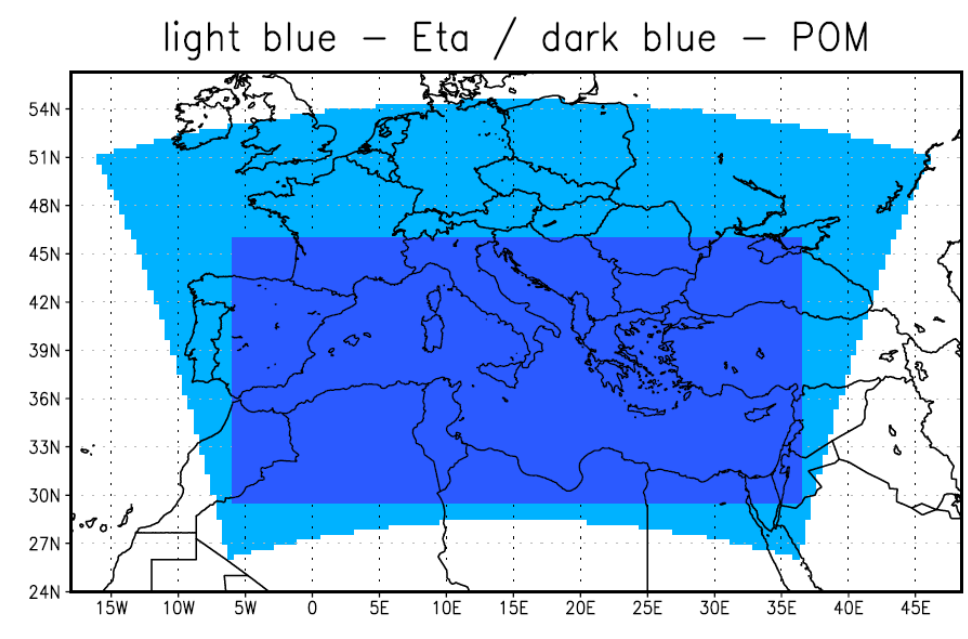
(center at 15E/41.5N, +/-19.9 W-E, +/-13.0 S-N)

Oceanic part:

POM (**P**rinceton **O**cean **M**odel)

resolution: horizontal 0.20˚
21 vertical levels

domain: Mediterranean Sea
without Black Sea



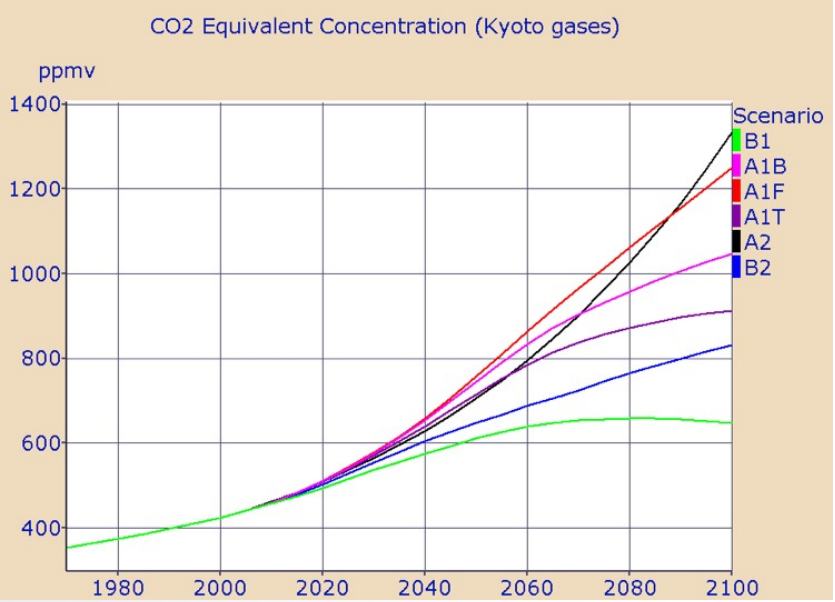
Simulations

Initial and boundary conditions:

from AOGCM SX-G (global model)

EBU-POM simulations:

Experiment	Time slice
20c3m (**present climate**)	**1961-1990**
A1B	2001-2030 2071-2100
A2	**2071-2100**



Model output variables available on every 6 hours !

model verification for 2m air temp.
(present climate)

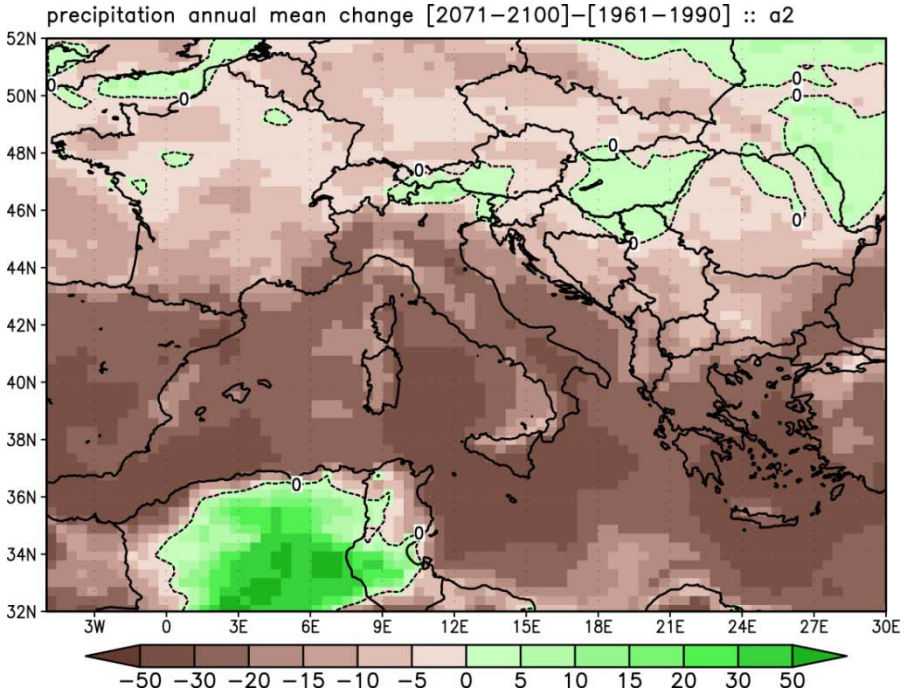
→

EP/CRU	BIAS	MAE	RMSE
annual	**0.64**	**1.63**	**1.87**

Results for Europe

precipitation

A2 (2071-2100) vs. (1961-1990)



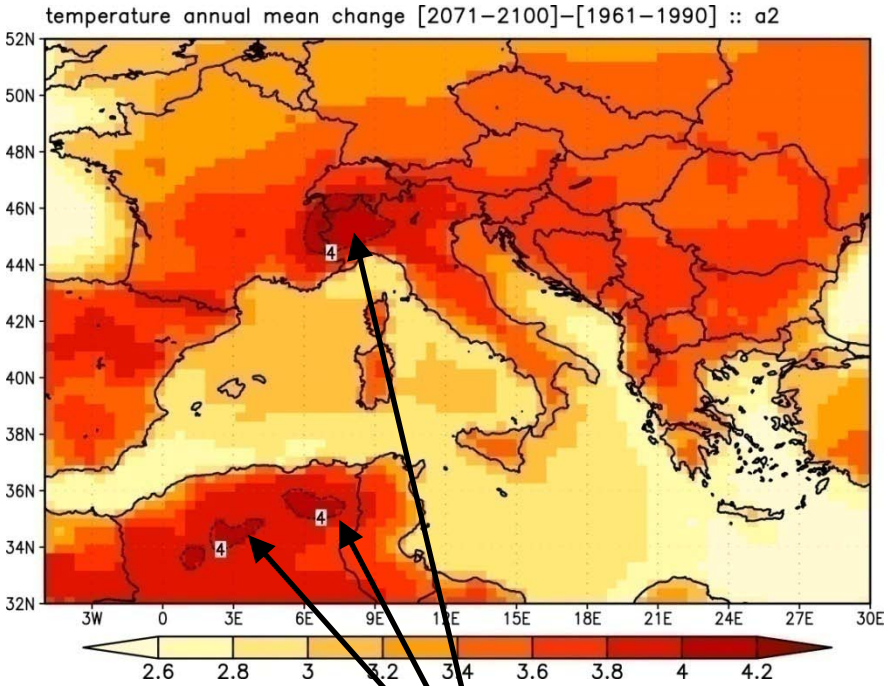
brown: decrease

green: increase

} in % comparing to present climate

2m air temperature

A2 (2071-2100) vs. (1961-1990)

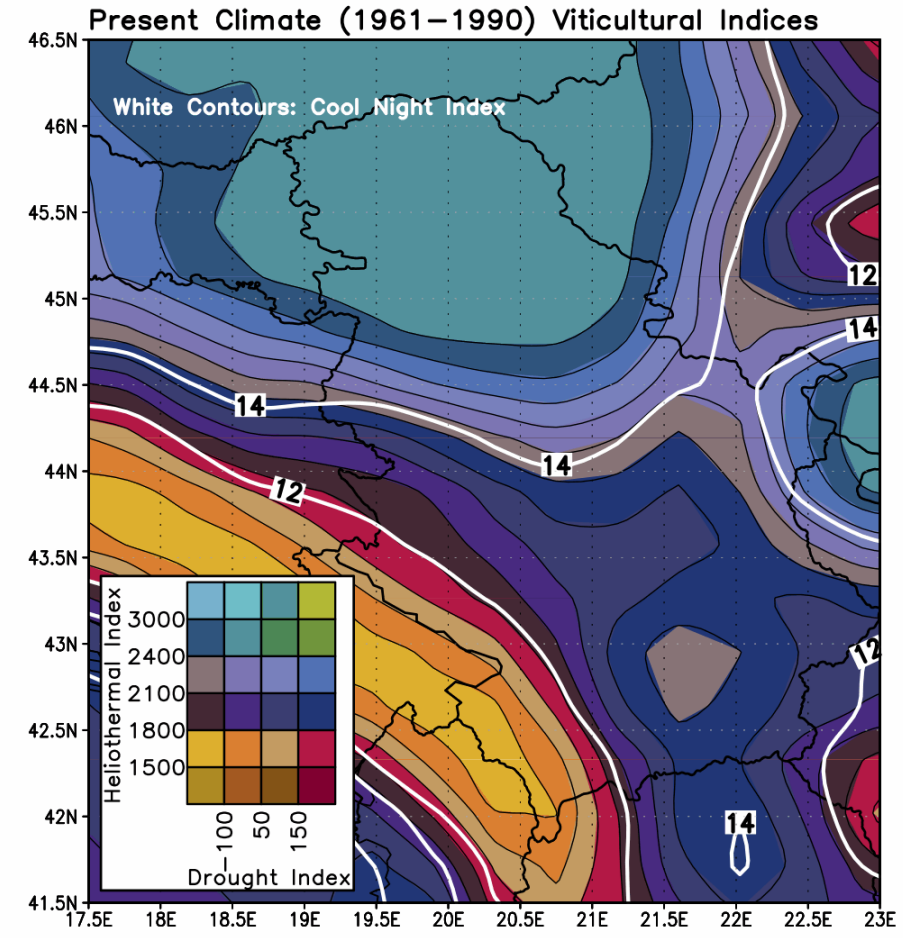


over 4 degrees

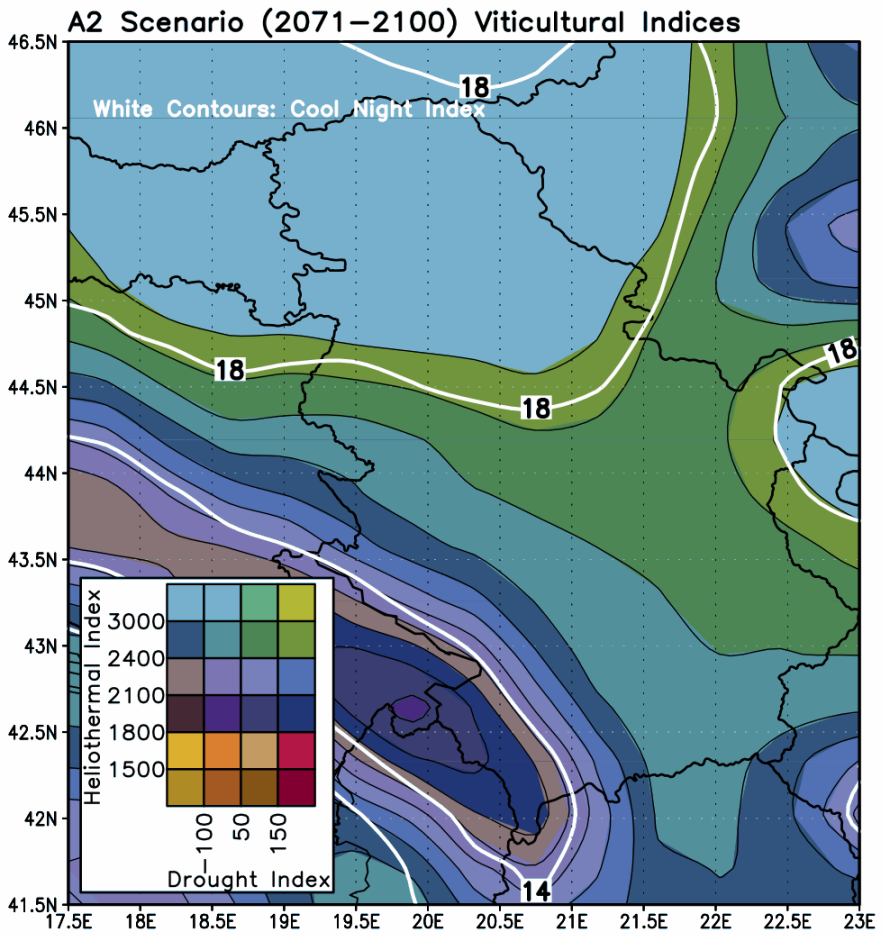
Application in viticulture

Heliothermal Index (HI) /Drought Index (DI) /Cold Night Index (CI)

→ define climate characteristics of vineyard regions (Tonnietto, 2004.)



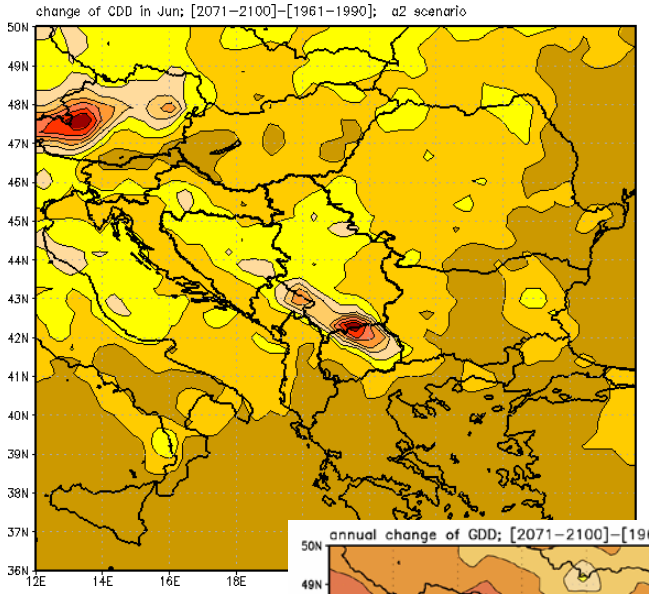
1961 – 1990.



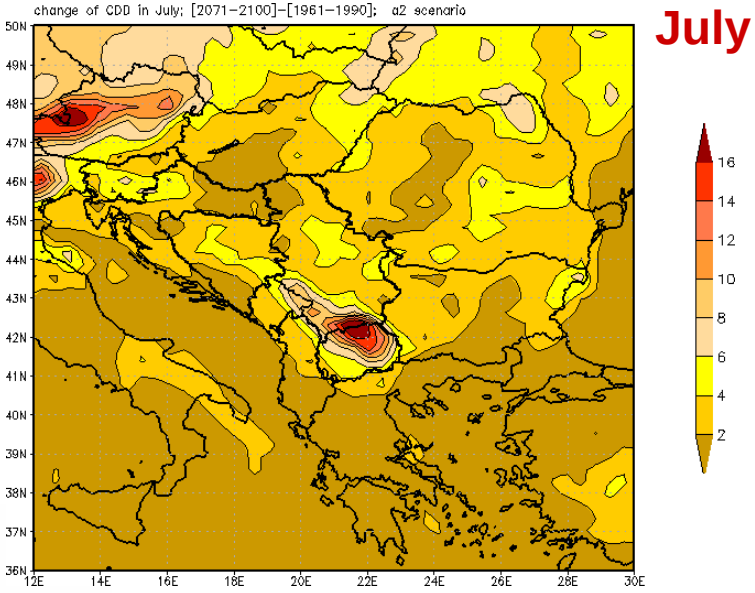
2071 – 2100.

Growing season (base temperature = 10°C)

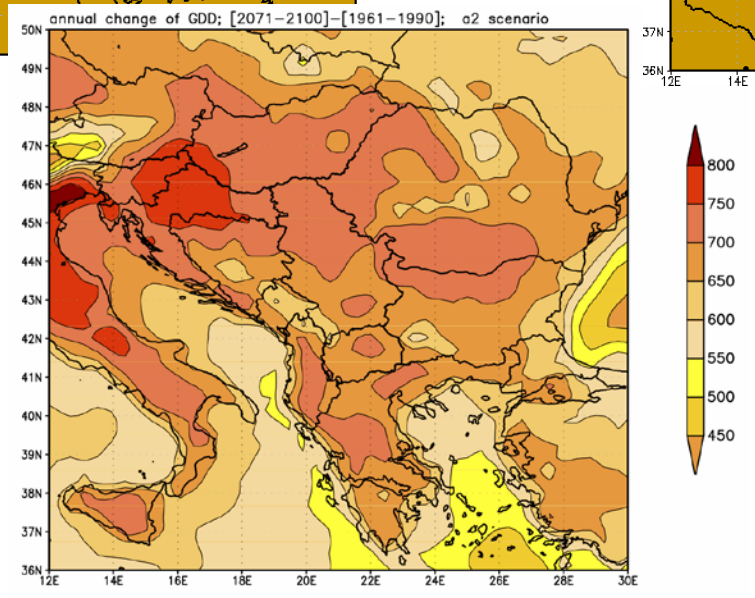
- maximum number of Consecutive Dry Days (CDD)
  - maximum number of consecutive days with daily prec.< 1mm



June



July

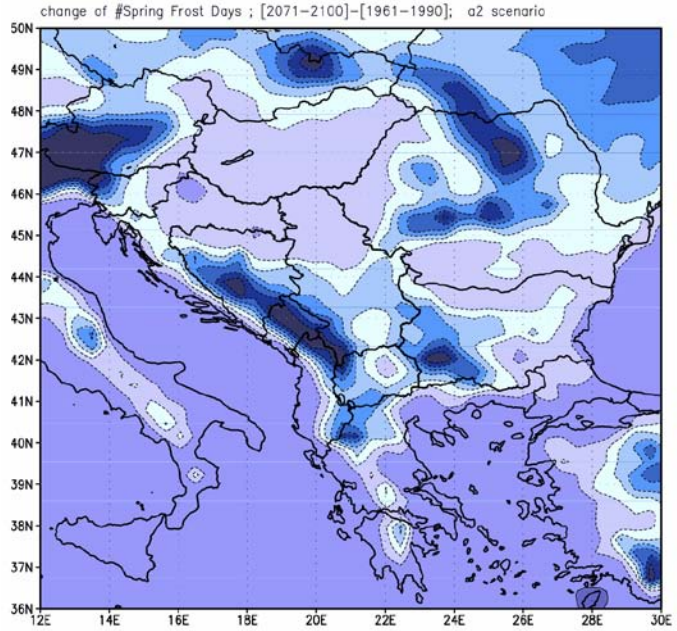


- growing degree days (GDD)
  - sum of daily averaged temperatures above 10°C

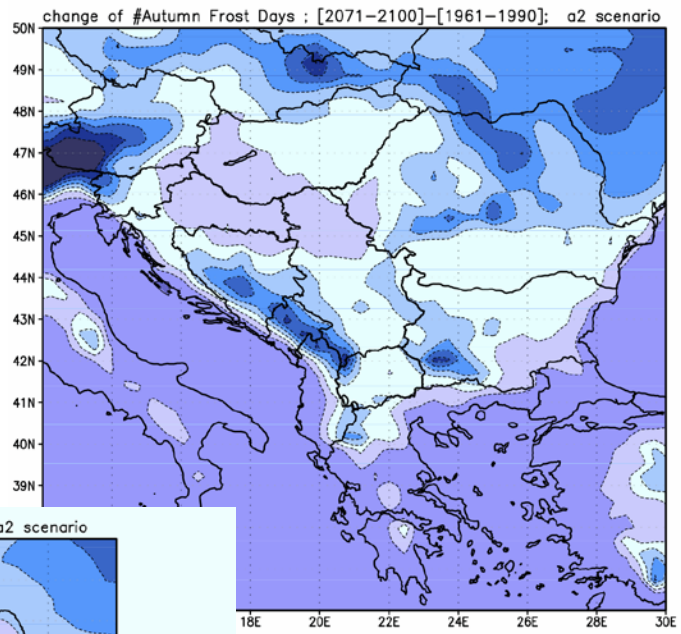
A2 (2071-2100) vs. (1961-1990)

Rest period

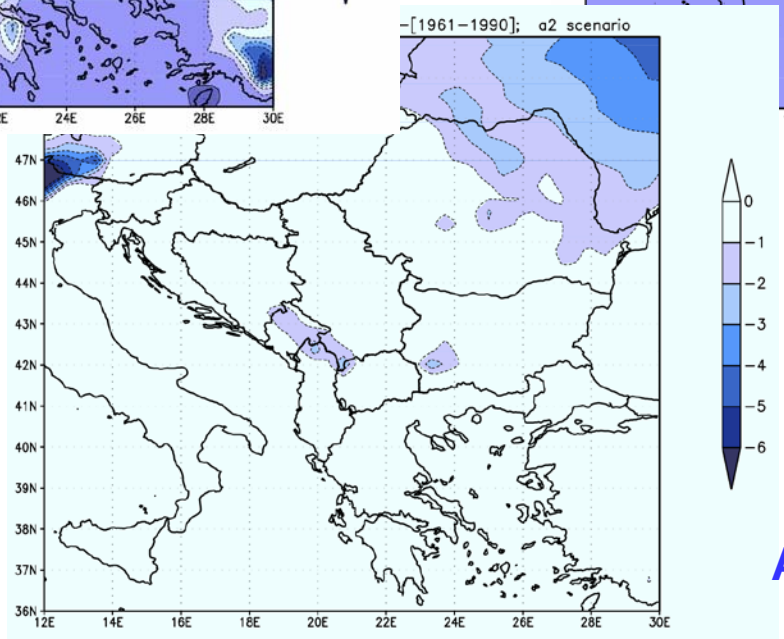
- total number of frost days



spring (MAM)



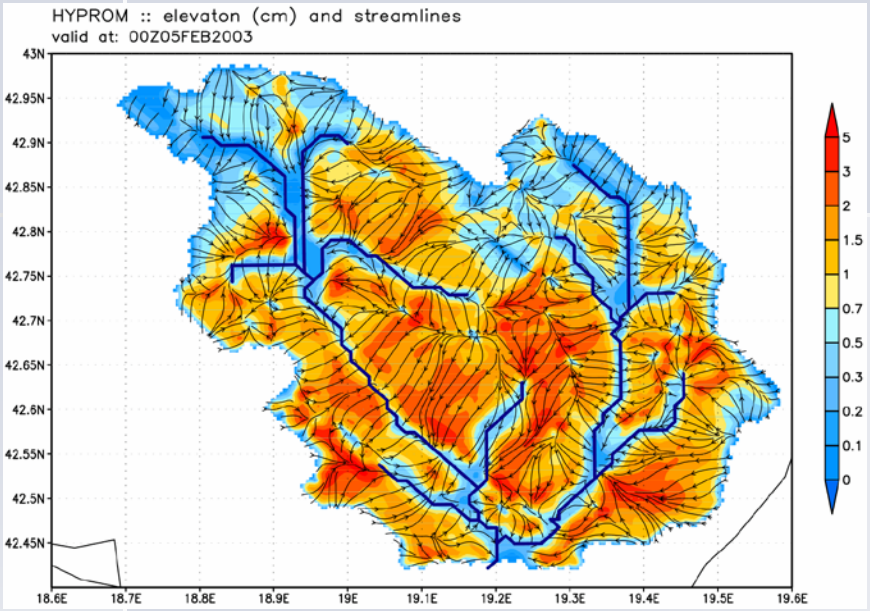
autumn (SON)

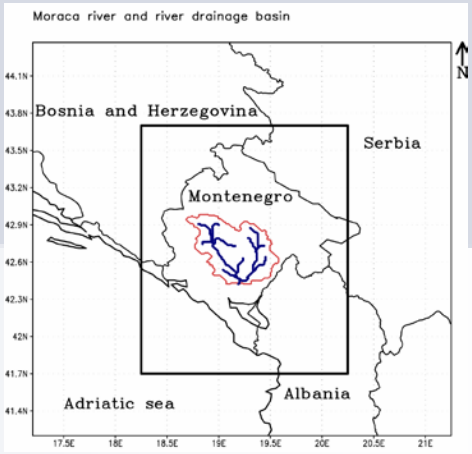


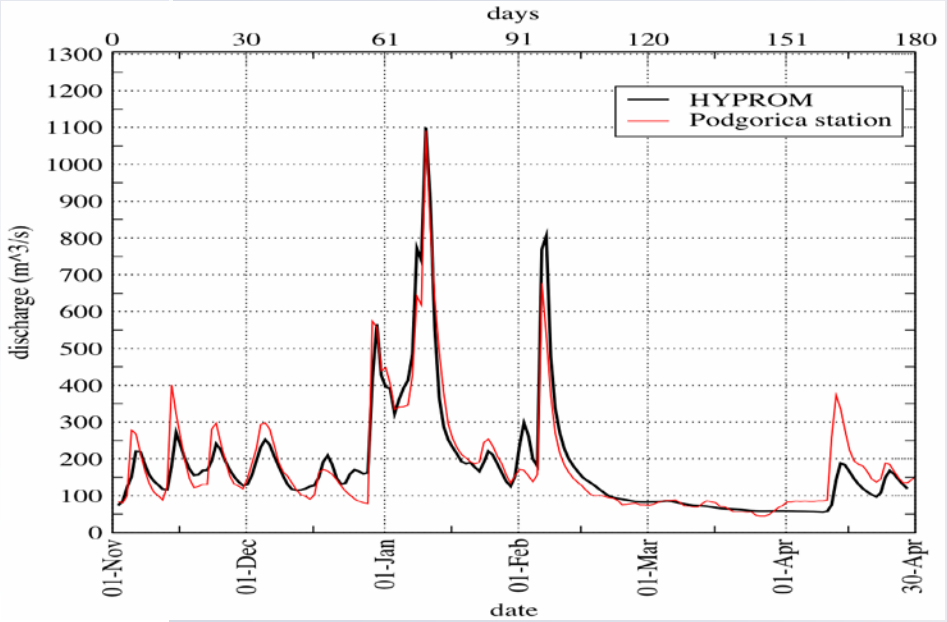
- number of days with tmin less than -15°C

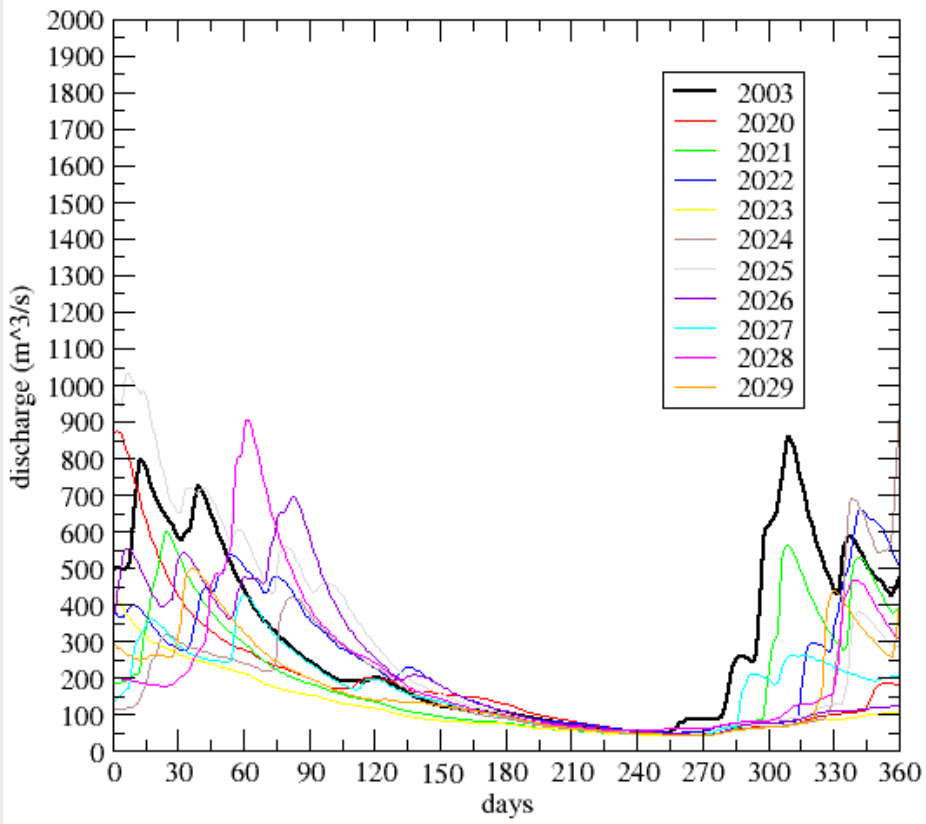
A2 (2071-2100) vs. (1961-1990)

A hydrological application









Conclusions

- Starting point is a global climate simulation
- It is possible to focus on a region or even very local sub-region using a regional climate model
- Analysis of climate observations and projections can be applied in agricultural as well as in other economy sectors