



REPUBLIC HYDROMETEOROLOGICAL SERVICE OF SERBIA



Southeast European Climate Change Framework Action Plan for Adaptation: Role of the Academic Communities

or

Research needs in the field of Impacts, Vulnerability and Adaptation to Climate change

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SEE Virtual Climate Change Center - SEEVCCC*

Danube Rectors' Conference, 4-6 February 2010, Novi Sad, Serbia

Content

- Impacts of Climate Change – global scale
- Impacts of Climate Change – Europe scale
- Nairobi Work Programme – NWP
- Limitations and needs to deal with climate change in SEE
- Research needs to assess the impacts
- Belgrade Initiative
- Some examples ...

Impacts of Climate Change – global scale

Observational evidence - all continents, most oceans - many natural systems affected

- **High confidence:**

- natural systems related to snow, ice and frozen ground affected (e.g. enlargement and increased numbers of glacial lakes; increasing ground instability in permafrost regions and rock avalanches in mountain regions; changes in some Arctic and Antarctic ecosystems).
- hydrological systems affected (through increased runoff and earlier spring peak discharge in many glacier- and snow-fed rivers and through effects on thermal structure and water quality of warming rivers and lakes)
- terrestrial ecosystems (earlier timing of spring events, such as leaf-unfolding, bird migration and egg-laying; and pole ward and upward shifts in plant and animal ranges)
- marine and freshwater systems (shifts in ranges and changes in algal, plankton and fish abundance - associated with rising water temperatures, and changes in ice cover, salinity, oxygen levels and circulation).

- **Medium confidence:**

- different managed and human systems: agricultural and forestry (earlier spring planting of crops, alterations in disturbances of forests due to fires and pests); some aspects of human health, such as excess heat-related mortality in Europe, changes in infectious disease vectors in parts of Europe, and earlier onset of and increases in seasonal production of allergenic pollen in Northern Hemisphere high and mid-latitudes; some human activities in the Arctic (e.g. hunting and shorter travel seasons over snow and ice) and in lower-elevation alpine areas (such as limitations in mountain sports).

- Of the more than 29,000 observational data series, from 75 studies, that show significant change in many physical and biological systems, more than 89% are consistent with the direction of change expected as a response to warming.

- **However, there is a notable lack of geographic balance in data and literature on observed changes, with marked scarcity in developing countries.**

Impacts of Climate Change – Europe scale

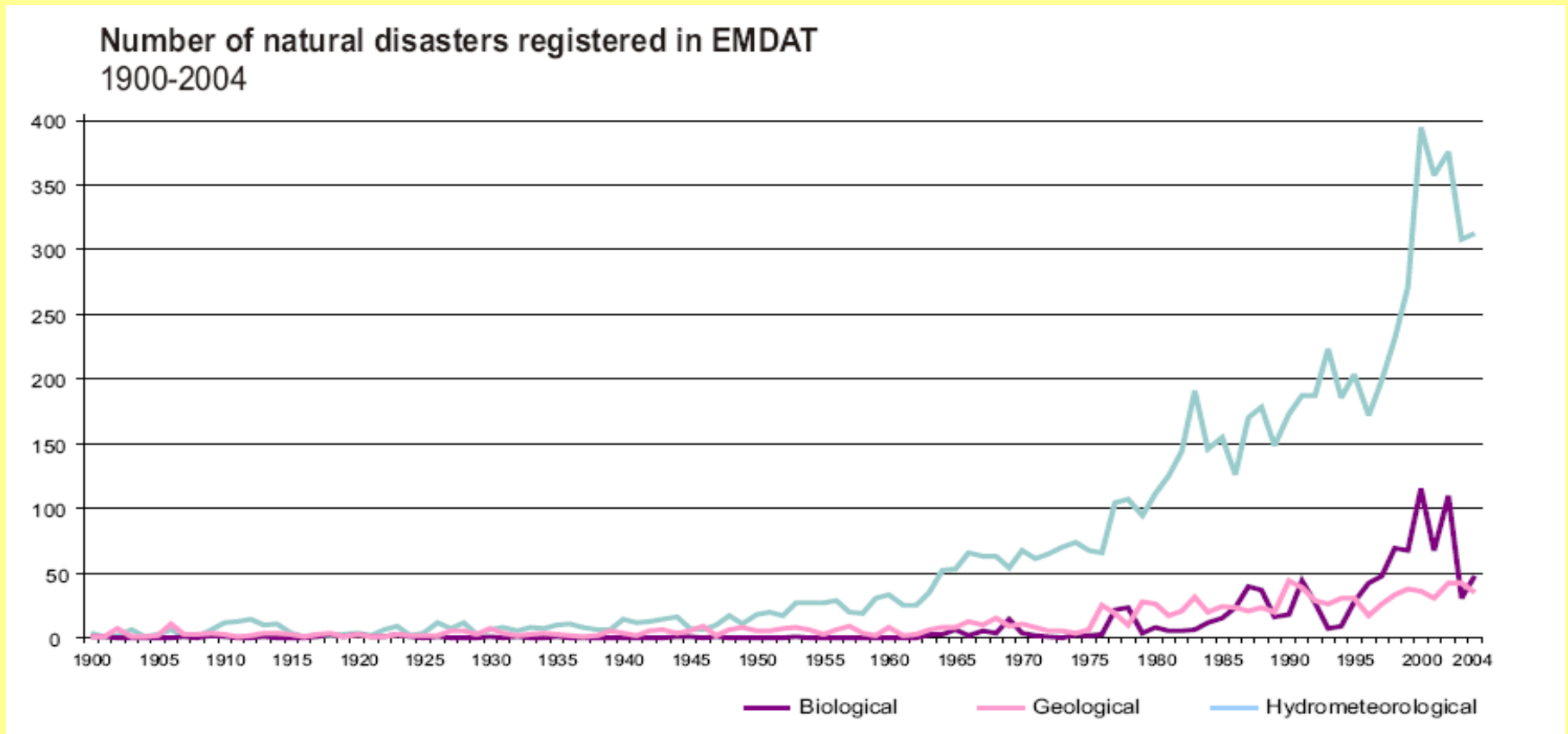
- expected to magnify regional differences
- increased risk of inland flash floods and more frequent coastal flooding and increased erosion
- glacier retreat, reduced snow cover and winter tourism, and extensive species losses
- increase the health risks due to heat waves and the frequency of wildfires
- In southern Europe, climate change is projected to worsen conditions (high temperatures and drought) in a region already vulnerable to climate variability, and to reduce water availability, hydropower potential, summer tourism and, in general, crop productivity.

The most vulnerable areas in Europe:

- **Southern Europe** and the entire **Mediterranean Basin** due to the combined effect of high temperature increases and reduced precipitation in areas already coping with water scarcity.
- **Mountain areas**, in particular the Alps, where temperatures increase rapidly leading to widespread melting of snow and ice changing river flows.
- **Coastal zones** due to sea level rise combined with increased risks for storms.
- Densely populated floodplains due to increased risks for storms, intense rainfall and flash floods leading to widespread damages to built-up areas and infrastructure.
- Scandinavia where much more precipitation is expected and a larger part in the form of rain instead of snow.
- The Arctic region where temperature changes will be higher than in any other place on Earth.

Weather and climate disasters

In many regions of the world changes in the intensity and frequency of the occurrence of climate extremes were registered.



Climate variability and extremes are already a major obstacle to development in many regions including SEE

Extreme Weather Conditions 2007



Exceptional Drought in July and August 2007 in Serbia accompanied by the longest registered wave of extremely high air temperature ($\sim 45^{\circ}\text{C}$):
Losses in agriculture cc. 0.5bn EUR



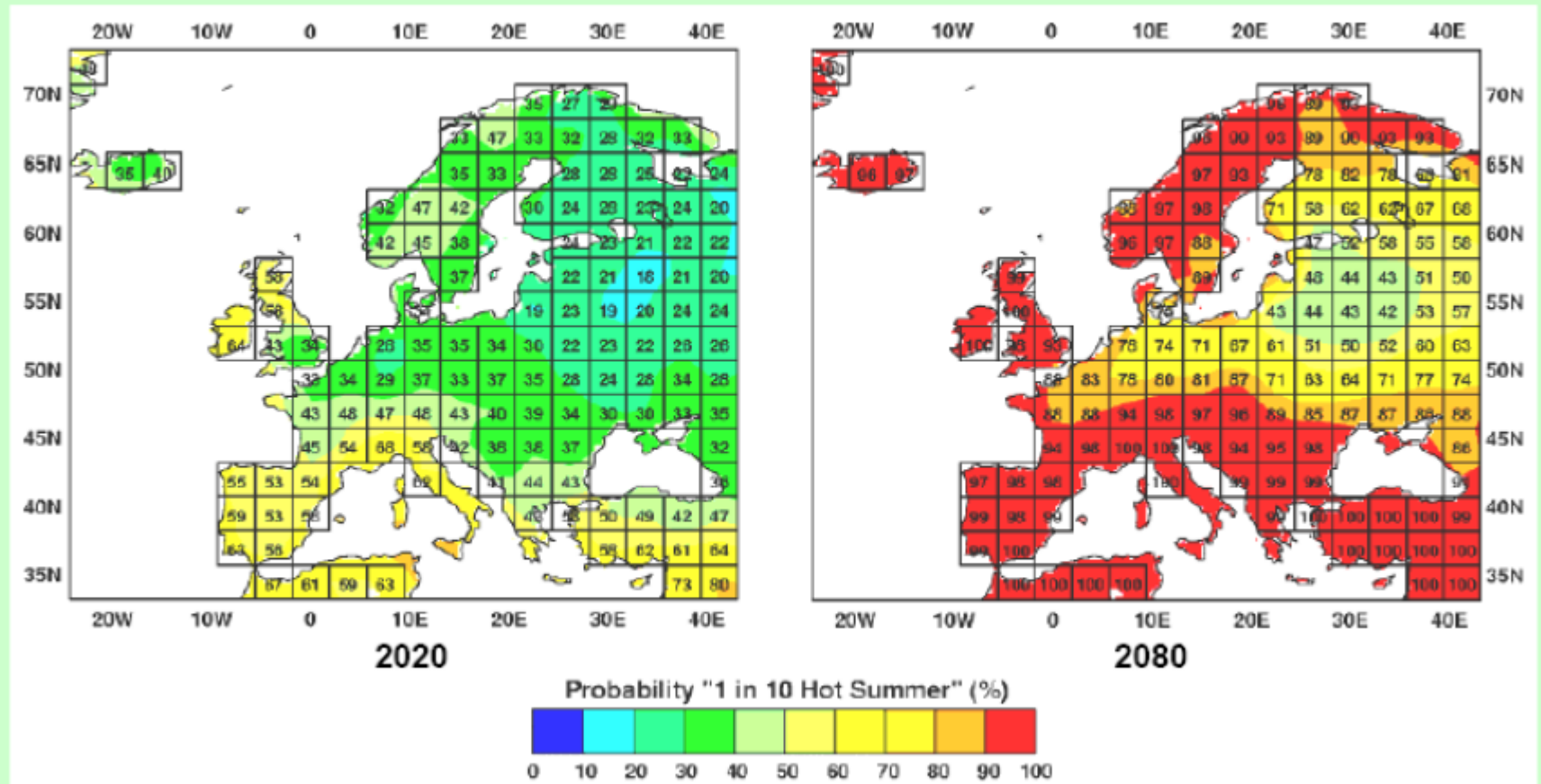
Case and effect of floods, hail and strong wind Serbia 2005, 2006



Projected impact (e.g.)

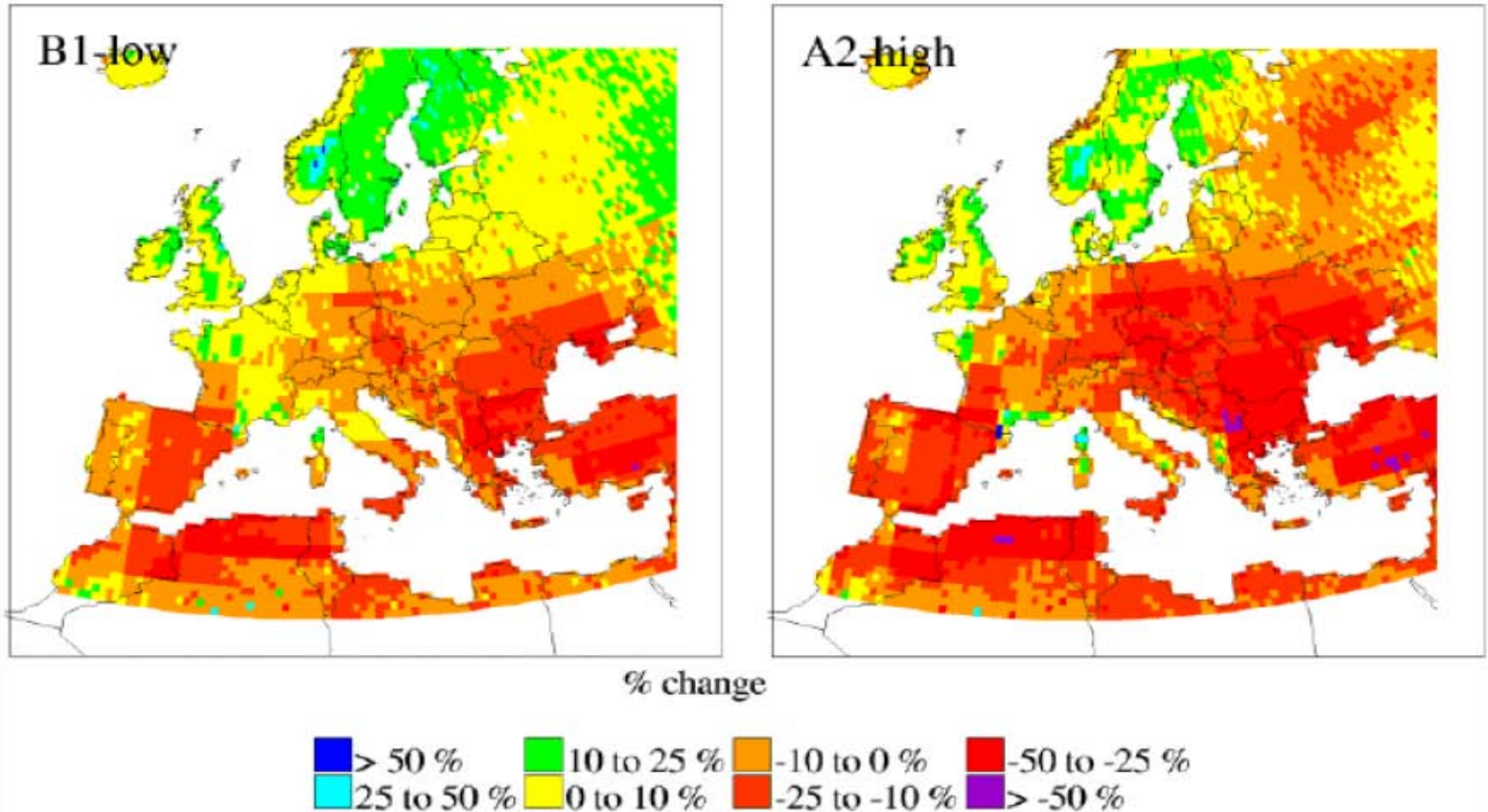
: Changing Frequency of Hot Summers (2020 to 2080). Source: Parry (2005).

A2



Projected impact (e.g.) cntd.

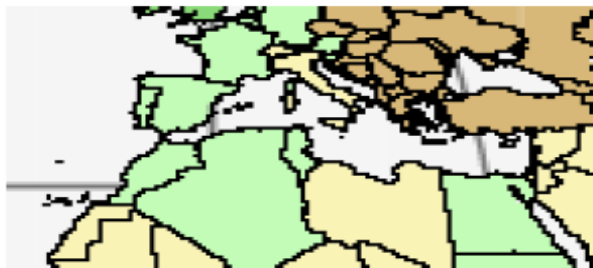
Water Availability in the 2050s (Change in annual runoff). Source: Parry (2005).



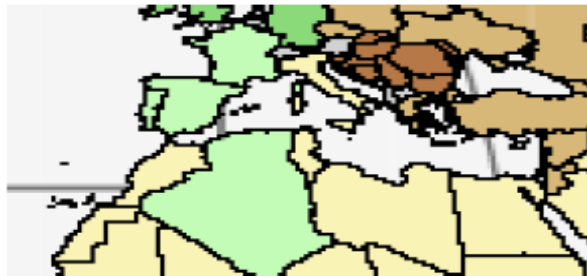
Projected impact (e.g.) cntd.

Climate Change in the Mediterranean. Changes of agricultural yield until 2020, 2050 und 2080. Source: Brauch (2006), based on WBGU (2006).

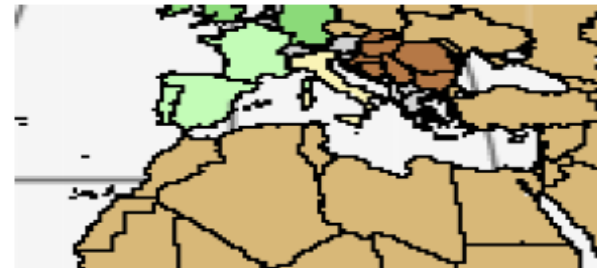
11A: Food security by 2020 (2010-2039) (HADCM3 GGa1)



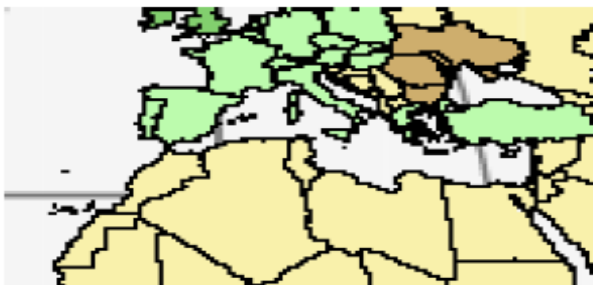
11B: Food security by 2050 (2040-2069) (HADCM3 GGa1)



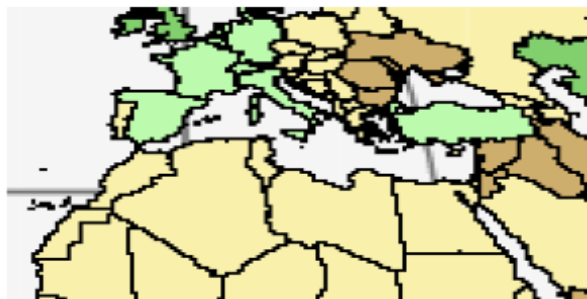
11C: Food security by 2080 (2070-2099) (HADCM3 GGa1)



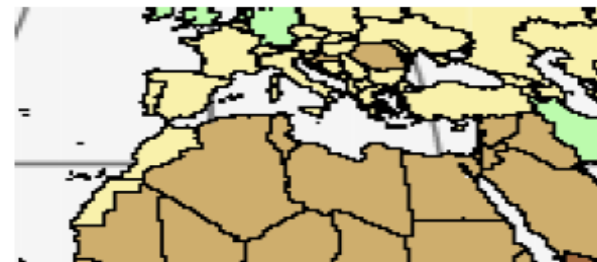
11D: Food security by 2080 (2070-2099) (HADCM2), CO2 Stabilisation at 550ppmv



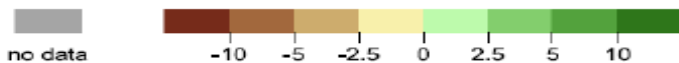
11E: Food security by 2080: 2070-2099 (HADCM2), CO2 Stabilisation at 750ppmv



11F: Food security by 2080: 2070-2099 (HADCM2 IS92a), CO2 unmitigated



potential yield change [%]



International Framework

Climate Change affect all countries, but **burden falls disproportionately on developing countries. Climate change is a result of the externality associated with greenhouse-gas emissions – it entails costs that are not paid for by those who create the emissions. Additional assistance to developing-country governments and civil society will be necessary to support adaptation.**

Key roles are with following institutions:

- 1. UNFCCC with its Capacity building framework and Nairobi Programme on Impacts, Vulnerability and Adaptation - NWP**
- 2. IPCC – Intergovernmental Panel on Climate Change**
- 3. WMO,GCOS, and National Hydrometeorological Services**
- 4. EU Climate Change Programme (Green paper on Adaptation)**
- 5. UN/ISDR**
- 6. Regional and Sub-regional climate change and related initiatives**

Nairobi Work Programme on Impacts, Vulnerability and Adaptation - NWP

Following Decision 2/COP11 of the UNFCCC Conference of the Parties (COP), COP-12 agreed to invite relevant organizations and other stakeholders to implement the activities of the Nairobi Work Programme in 9 main areas:

- **Methods and tools**
- **Data and observations**
- **Climate modelling, scenarios and downscaling**
- **Climate related risks and extreme events**
- **Socio-economic information**
- **Adaptation planning and practices**
- **Research**
- **Technologies for adaptation**
- **Economic diversification**

Limitations and needs to deal with climate change in SEE

- All SEE countries face problems with responding to the obligations under the United Nations Framework Convention on Climate Change.
- Developing countries in terms of the UNFCCC, including Serbia have a twofold problem. They are faced with growing damage caused by meteorological, hydrological and climate extremes and catastrophes, and on the other hand, they have to cope with poverty and necessity for development.
- In addition, the SEE countries **have limited access to knowledge, technology and financing, and have a** great need of capacity building and development (systemic, institutional and individual), that has to be coupled with the requirements of the Stabilisation and Association process to the EU.
- **This is a key reason for launching the Belgrade Initiative on climate change that is expected to provide region-driven climate change framework action in SEE and establishment of an adequate research-to-policy interface.**

Belgrade Climate Change Initiative

- The Belgrade Initiative for enhancement of the Sub-regional SEE cooperation in the field of climate change launched by the host country Serbia in 2006, received full support of the UNECE Sixth Ministerial Conference “Environment for Europe”, which was held in Belgrade, Serbia, on October 10-12, 2007.
- Within the Initiative the project to develop a SEE Climate Change Framework Action Plan (SEE/CCFAP) commence recently which is in accordance with the principles and objectives of the United Nations Framework Convention on Climate Change (UNFCCC). In particular, this relates to Research and Systematic Observation, Education, Training, Public Awareness, Capacity Building and Nairobi Work Programme. The Belgrade Initiative also provides for the establishment of a Sub-regional Virtual Climate Change related Centre in Belgrade as a means of improving sub-regional cooperation, which would also facilitate and coordinate implementation of the SEE/CCFAP.

Belgrade Initiative – General objectives

The Belgrade Initiative general objective is to support a sustainable economy development and environment in the interested SEE countries through attempts to reduce vulnerability to climate change and adaptation, effective implementation of the UN Framework Convention on Climate Change (UNFCCC) and its Nairobi Work Programme, and the establishment of the SEE network for climate change research.

Sub-regional cooperation within this Initiative will contribute to the following:

- Enhanced capacity for vulnerability and adaptation assessment;
- Enhanced development, dissemination and employment of knowledge from practical adaptation activities and other climate change issues;
- Enhanced integration of actions to adapt to climate change with those of sustainable development;
- Improved information and advice to national negotiators participating in UNFCCC and Kyoto Protocol negotiating processes;
- Enhanced cooperation among SEE countries, relevant organization, civil society, and decision makers, and
- Strengthening of partnership with relevant international organizations, conventions and protocols.

This initiative is seen as a main driver for closer cooperation among interested SEE countries, international organizations and institutions in addressing sub-regional common priority problems in the field of climate change.

Belgrade Initiative - Common SEE research priorities in addressing climate change (1)

Under SEE/CCFAP Project of the Belgrade Initiative, the different areas were identified where research is needed. These can be grouped as follows:

- Climate observations, monitoring and forecasting
 - There is a need for high-quality observations, reference datasets and reanalysis of historical data, climate change detection studies, trend analyses, process research, data assimilation, model development and testing. Development a sub-regional SEE climate alert system with the objective to support introduction of climate information and predictions into early warning and disaster prevention systems. Early warning systems are one way of reducing vulnerability and enhancing adaptive capacity to weather events and climate change. Socio-economic data are also necessary. Sufficient funding for this activities is essential to provide the basis for scientific progress and policy-relevant results.

Meteo-Alarm Operational in Serbia as part of the Early Warning System

Meteoalarm - Alerting Europe for extreme Weather

http://www.meteoalarm.eu/

meteoalarm
alerting europe for extreme weather

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Europe:

Weather warnings: Europe:

awareness types: show all awareness types Display: today tomorrow

Awareness Reports
You can find detailed information about

Created: 04.02.2010 22:32 CET | Valid for: 04.02.2010

Country	Warning Level	Warning Type
AT	Yellow	Extreme high temperature
BE	White	None
CH	White	None
CY	White	None
CZ	White	None
DE	White	None
DK	White	None
ES	Yellow	Extreme low temperature
FI	White	None
FR	White	None
GR	White	None
HR	White	None
HU	Yellow	Extreme high temperature
IE	White	None
IS	White	None
IT	White	None
LU	White	None
LV	White	None
MT	White	None
NL	White	None
NO	White	None
PL	White	None
PT	White	None
RO	White	None
RS	Yellow	Extreme high temperature
SE	White	None
SI	White	None
SK	White	None
UK	White	None

RХМЗ - Републички Хидрометеоролошки завод Србије Кнеза Вишеслава 66 Београд:..... - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Media Print Mail

Address http://www.hidmet.sr.gov.yu/ciril/proгноза/meteo_alarm.php?ma_datum=2008-02-19 Go Links Google Settings

Републички Хидрометеоролошки Завод Србије (основан 1888. год. WMO члан од 1947. год.)

Прогноза времена за Србију
011 2542 184
proгноза@hidmet.sr.gov.yu

Република Србија

Изабери датум: 19.02.2008. ...

Region	Warning Level	Warning Type
Бачка	Yellow	Extreme high temperature
Банат	Yellow	Extreme high temperature
Срем	Green	None
Београд	Yellow	Extreme high temperature
Западна Србија	Green	None
Шумадија	Yellow	Extreme high temperature
Поморавље	Yellow	Extreme high temperature
Источна Србија	Yellow	Extreme high temperature
Југоисточна Србија	Yellow	Extreme high temperature
Југозападна Србија	Green	None
Косово и Метохија	Green	None

Актуелни подаци
Прогноза
прогноза времена
прогноза времена 5 дана
прогноза времена 30 дана
прогноза времена сезонска
прогноза водостаја
биометеоролошка прогноза
прогноза UV индекса
метео аларм
Нумеричка прогноза
Метеограми
Емаграми
Прогностичке карте
Турбуленција
Залеђивање
Фронтотенетички параметар
Трајекторије
Прогноза за Европу 5 дана
Упозорења и најаве

EN English (United States)

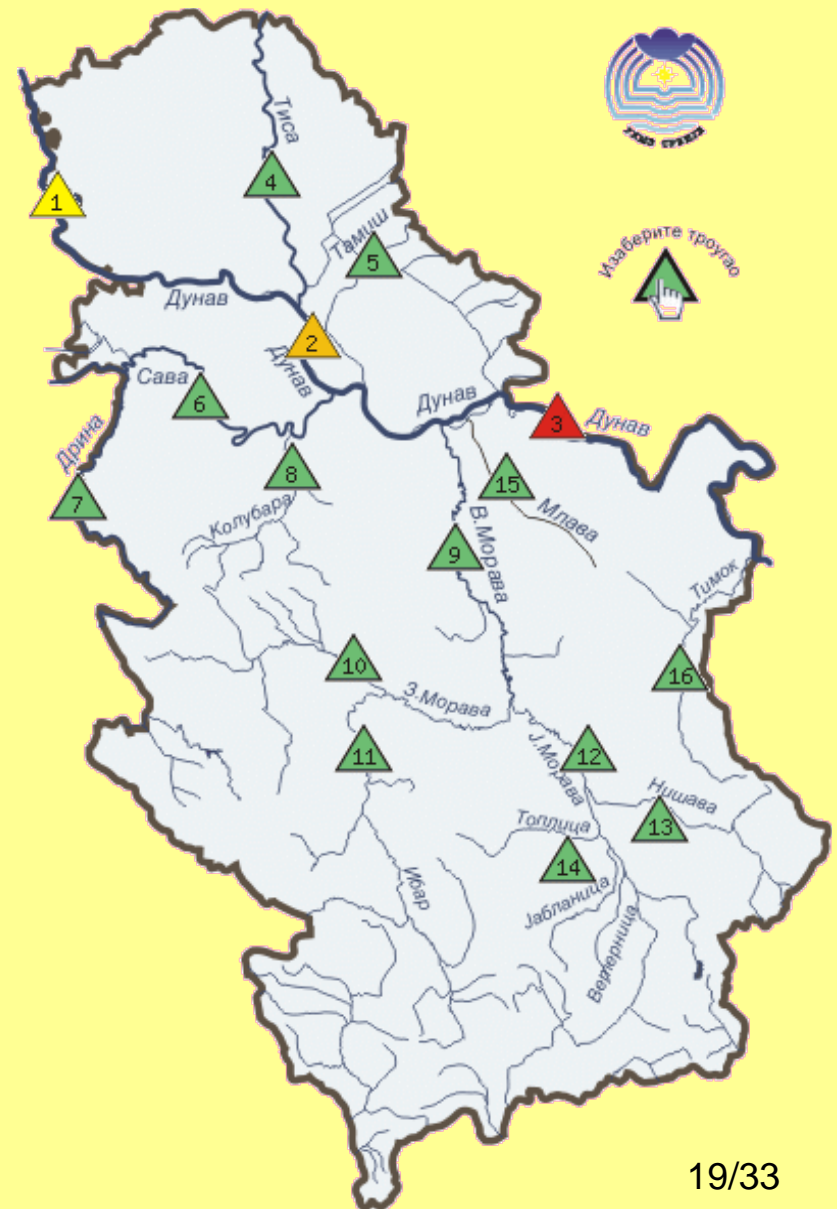
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Change Language: CZ | DA | DE | EE | EN | ES | FI | FR | GR | HR | HU | IT | IS | LT | LV | MT | NL | NO | PL | PT | RO | RS | SI | SK | SV

Powered by: www.backbone.co.at developed by: www.ng-software.at

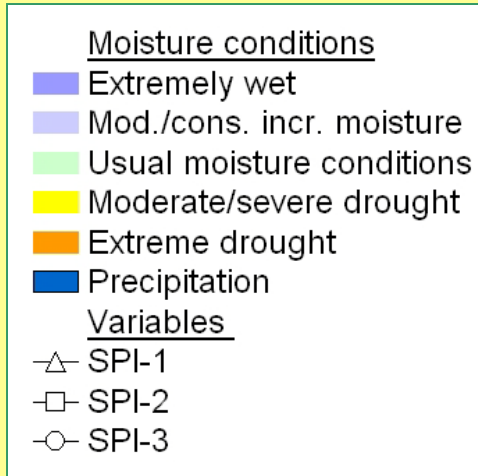
Hydro-Alarm Operational in Serbia as part of the Early Warning System

Internet warning against hazardous hydrological phenomena (high-level and flood waters, low-level waters and ice accretion) as support to efficient flood defense, navigation and other activities related to river waters.

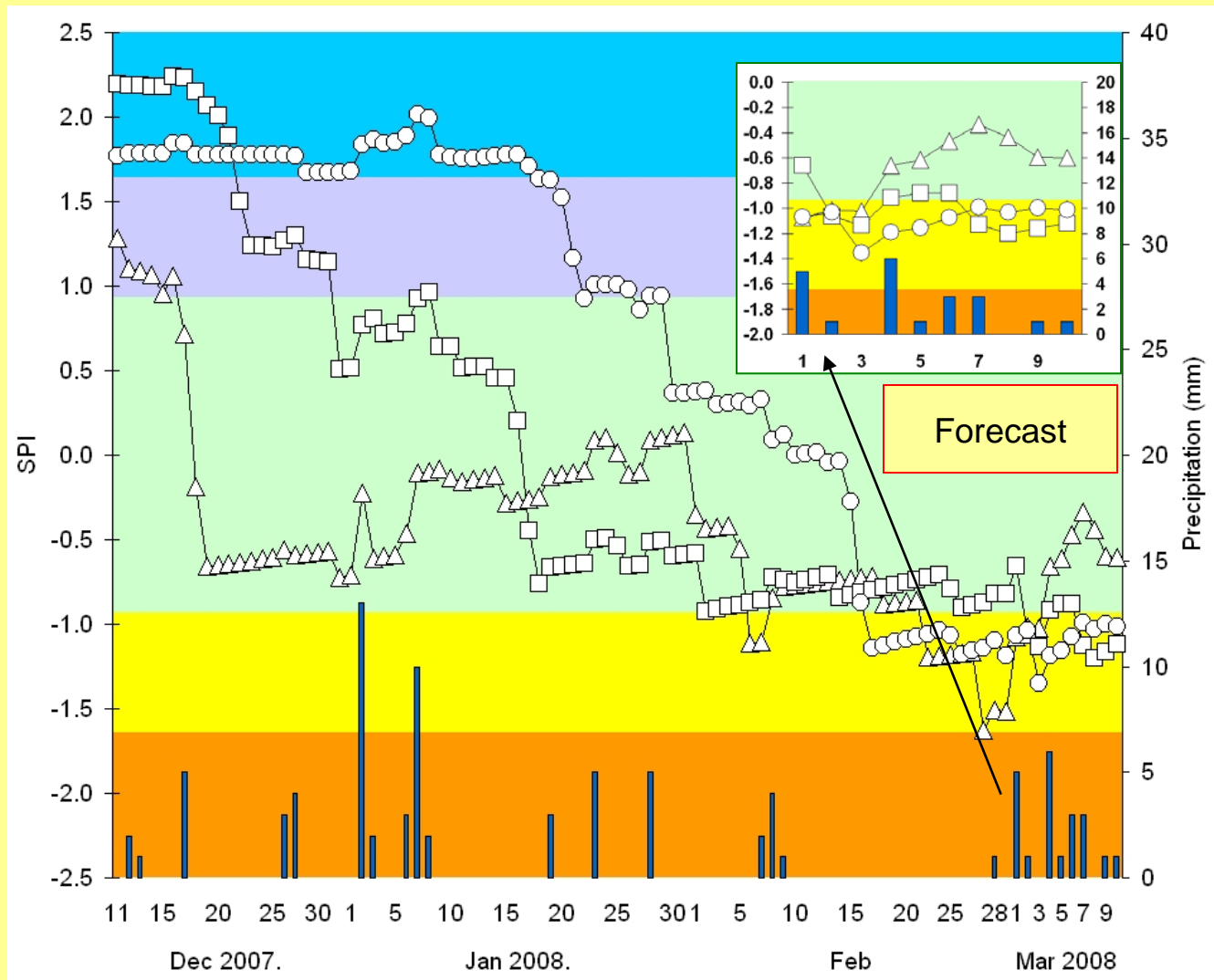


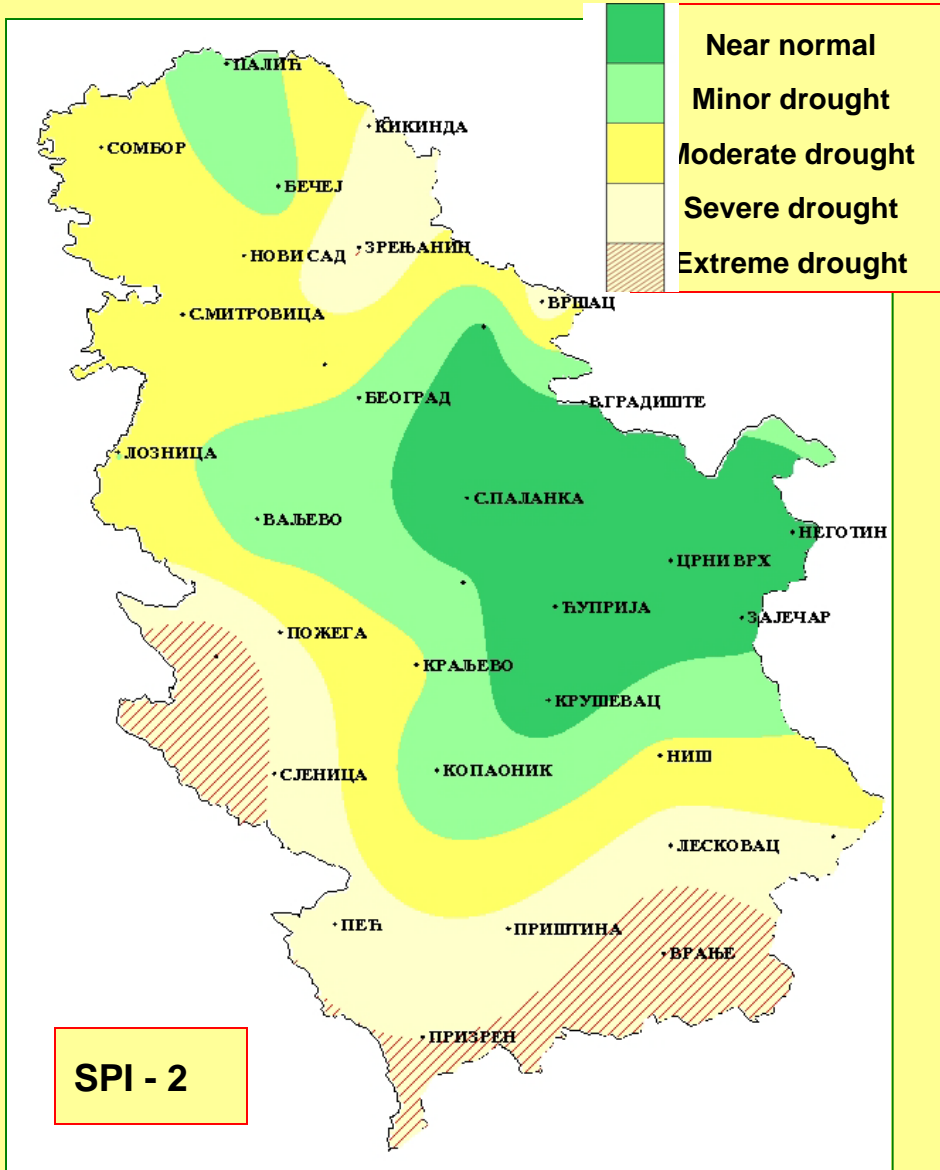
FORECAST OF THE STANDARDIZED PRECIPITATION INDEX

Preparations have started in RHMS for the introduction of operative SPI forecasting on the basis of forecasted precipitation (ECMWF medium range forecast and monthly precipitation anomaly forecast - seasonal forecast)



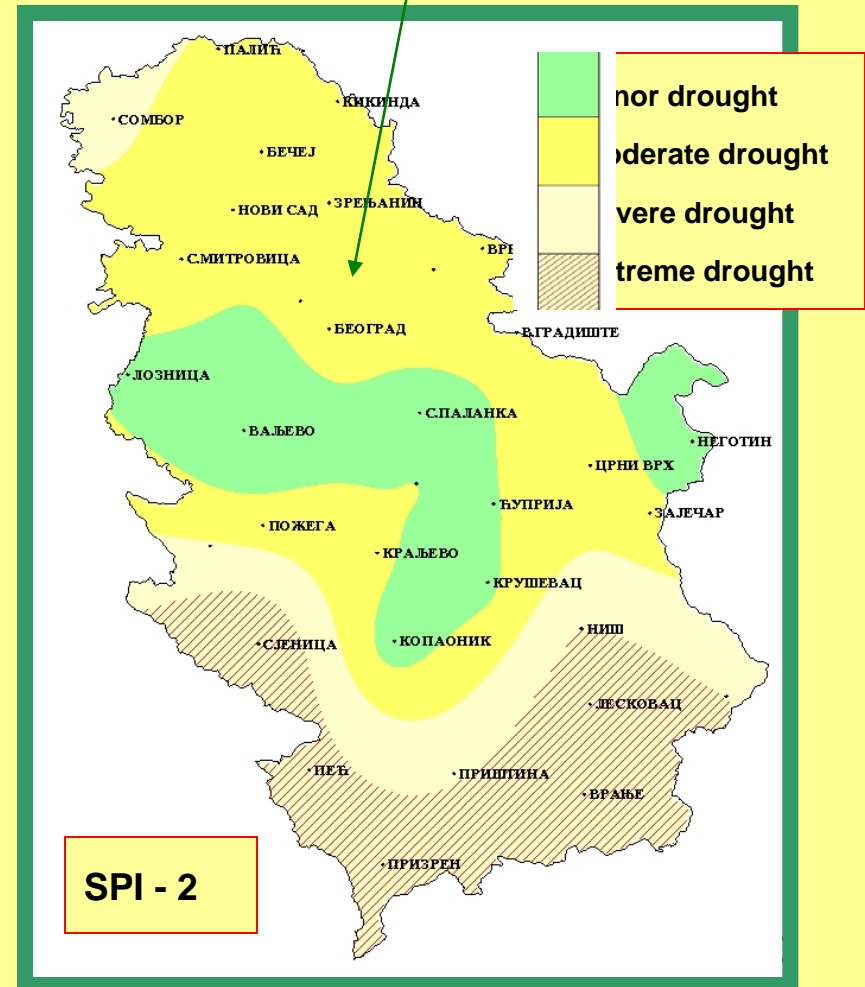
Belgrade,
February 29th
2008: monitoring
and forecast of SPI
on the various
time scales





Moisture conditions on February 29th 2008 on the basis of SPI - 2 values

Due to the forecasted monthly precipitation anomalies, deterioration of moisture conditions in Serbia can be expected till March 31th,...



Belgrade Initiative - Common SEE research priorities in addressing climate change (2)

- Climate modeling and scenarios

There is a need for development climate change scenarios using climate models especially those that provide subregional and regional specificity, such as regional climate models climNMM-B, PRECIS, etc.

Increased spatial resolution of climate models is also planned. Regional and local impact studies require the spatial scale of climate models to be reduced to 10km.

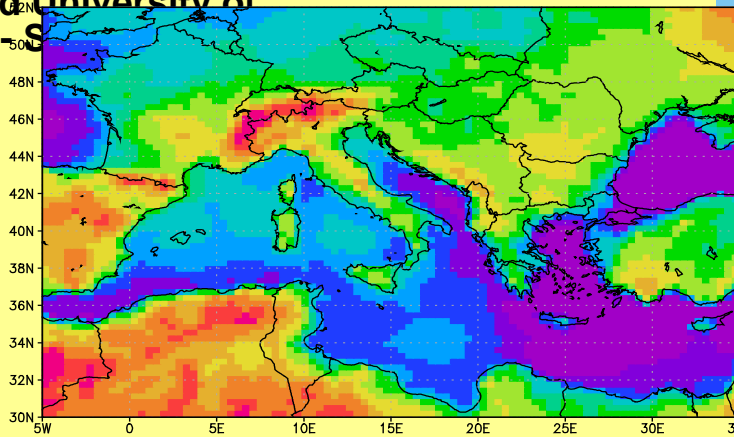
Sub-regional virtual climate change centre in Belgrade (SEEVCCC) which will facilitate and coordinate implementation of the SEE/CCFAP.

The Republic Hydrometeorological Service of Serbia, as a government authority hosting the centre, contributes in-kind to the virtual centre with its available human resources, expertise in regional climate modeling (ClimEta,PRECIS) communication, computational and technical infrastructure resources, including offices with the necessary office equipment.

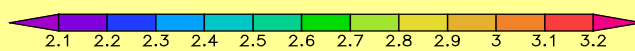


Existing collaboration:

Italian Ministry of Environment, Land and Sea – Republic Hydrometeorological Service of Serbia and University of Belgrade – S



Japan-Serbian Center for simulation Sciences – Earth Simulator – NEC super computers



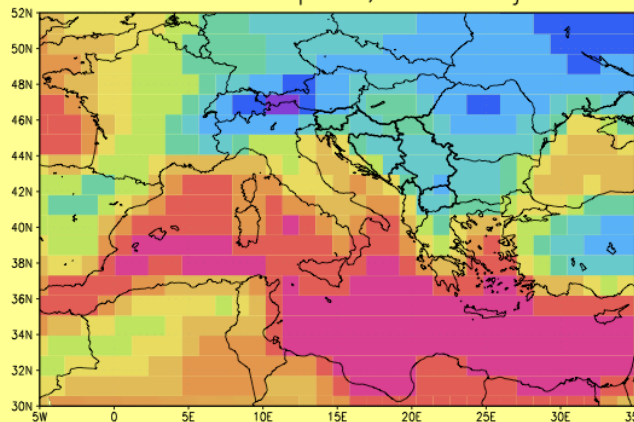
REGIONAL DYNAMICAL DOWNSCALING

- **Regional dynamical downscaling** provide us **information with more details** about present climate and future climate changes
- Detail information is **very important for different impact studies**, specially on regional level
 - energy
 - hydrology
 - agriculture
 - environmental protection
 - industry ...

1961-1990: MEAN SURFACE TEMPERATURE FOR WINTER SEASON

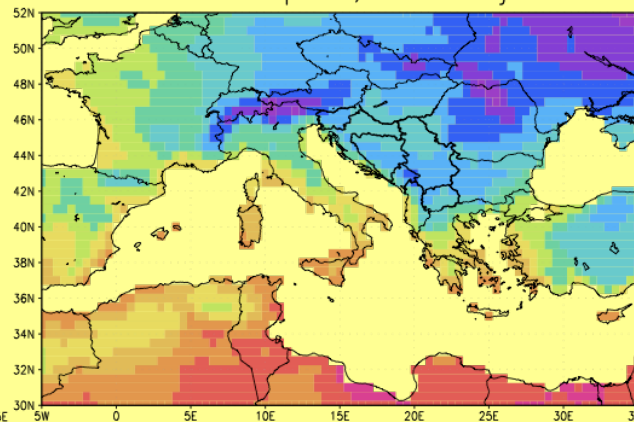
GLOBAL MODEL

SINTEX: temp 2m; season: djf



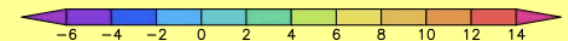
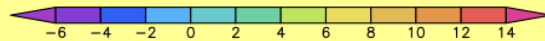
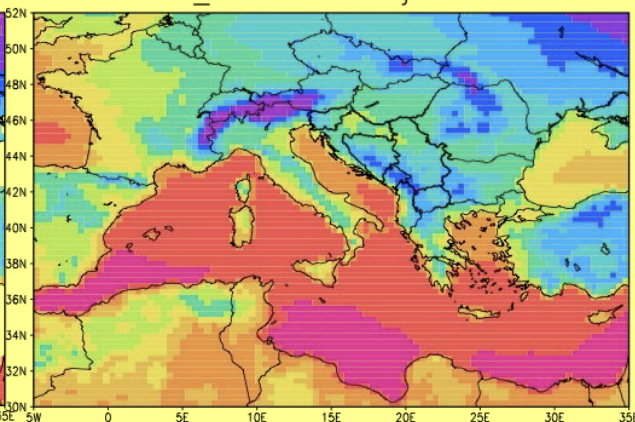
OBSERVATIONS

CRU: temp 2m; season: djf



REGIONAL MODEL

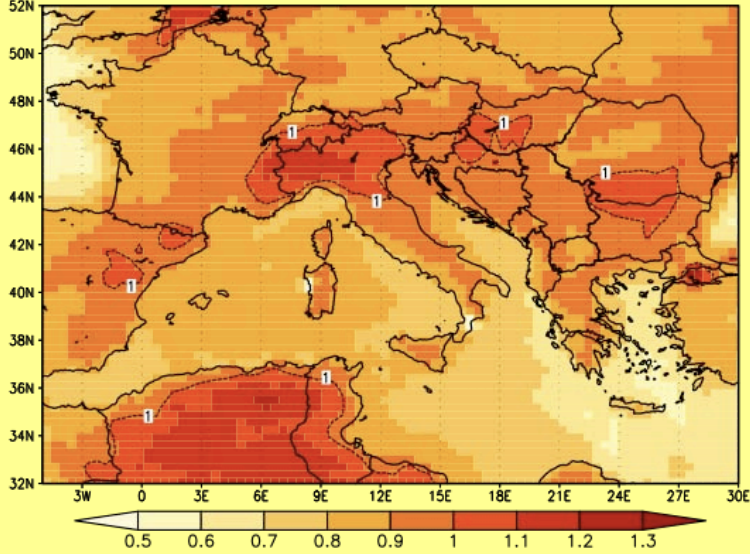
t2m EBU_POM season: djf 1961-1990



A1B SCENARIO (MODERATE)

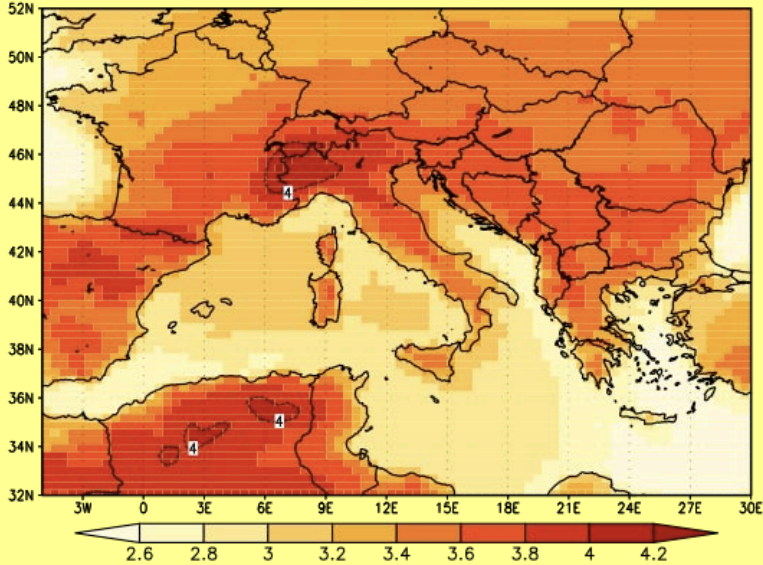
Annual temperature change [2001-2030] - [1961-1990]

temperature annual mean change [2030-2001]-[1961-1990] :: a1b



Annual temperature change [2071-2100] - [1961-1990]

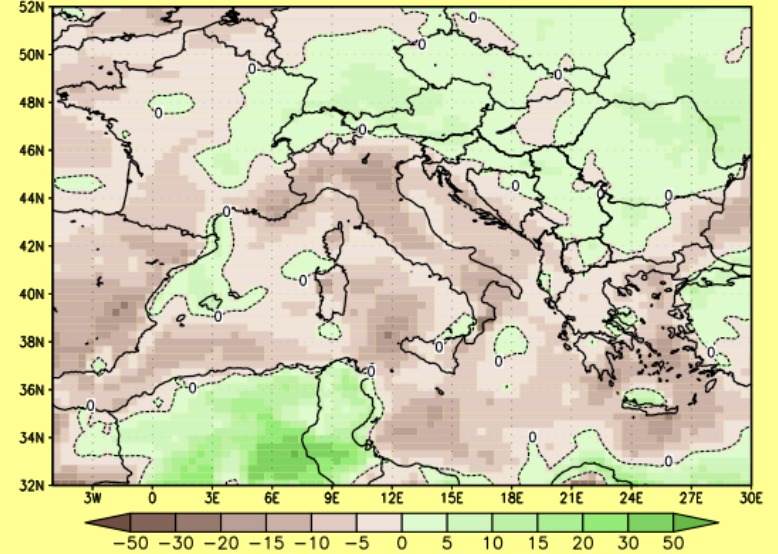
temperature annual mean change [2071-2100]-[1961-1990] :: a2



A2 SCENARIO (STRONG)

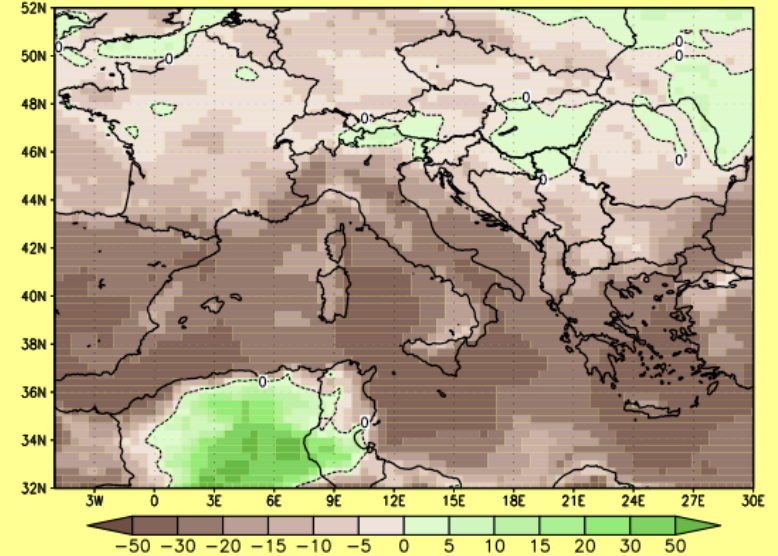
Annual precipitation change [2001-2030] - [1961-1990]

precipitation annual mean change [2030-2001]-[1961-1990] :: a1b



Annual precipitation change [2071-2100] - [1961-1990]

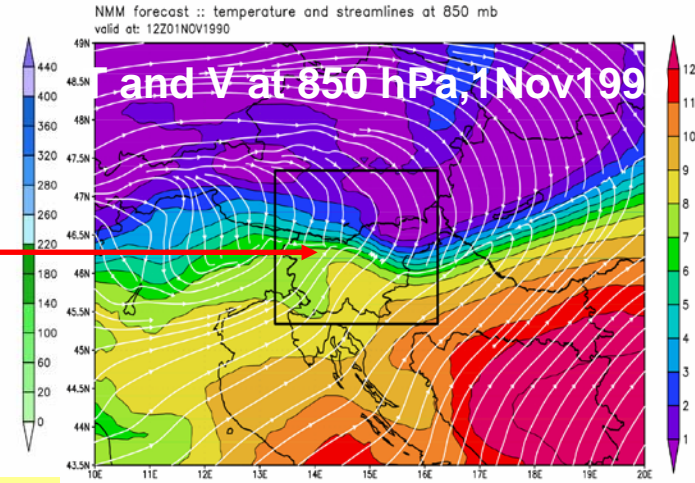
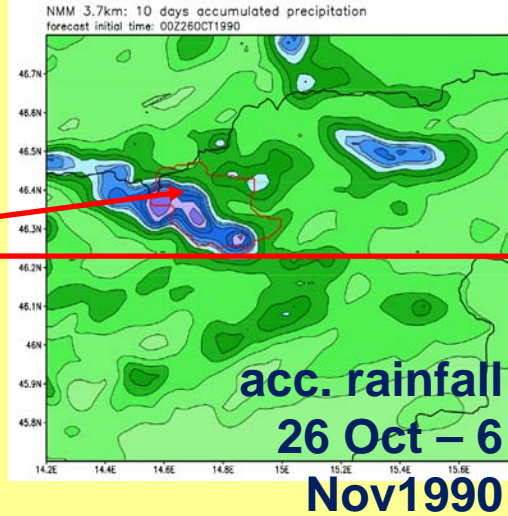
precipitation annual mean change [2071-2100]-[1961-1990] :: a2



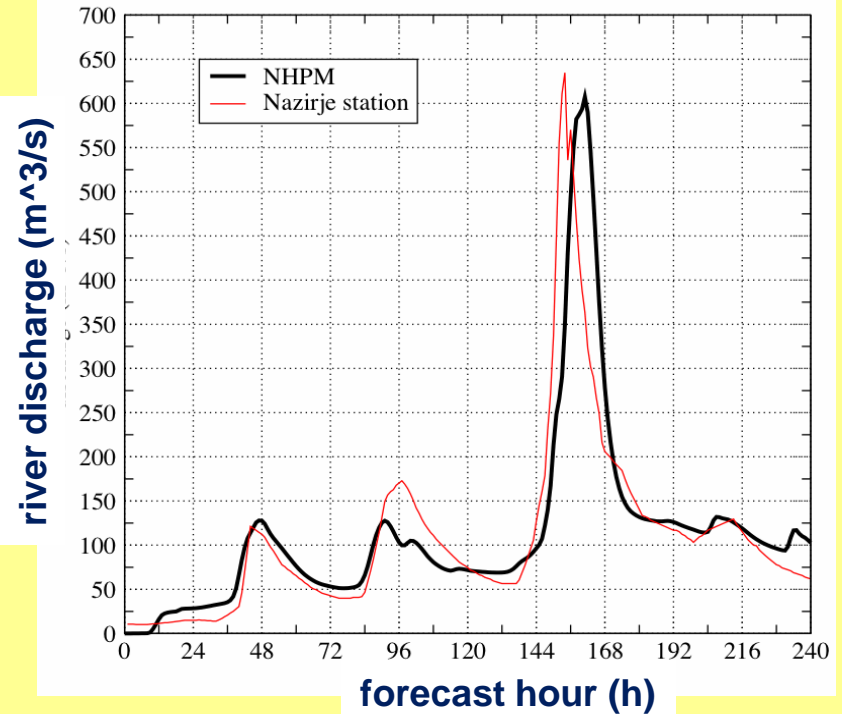
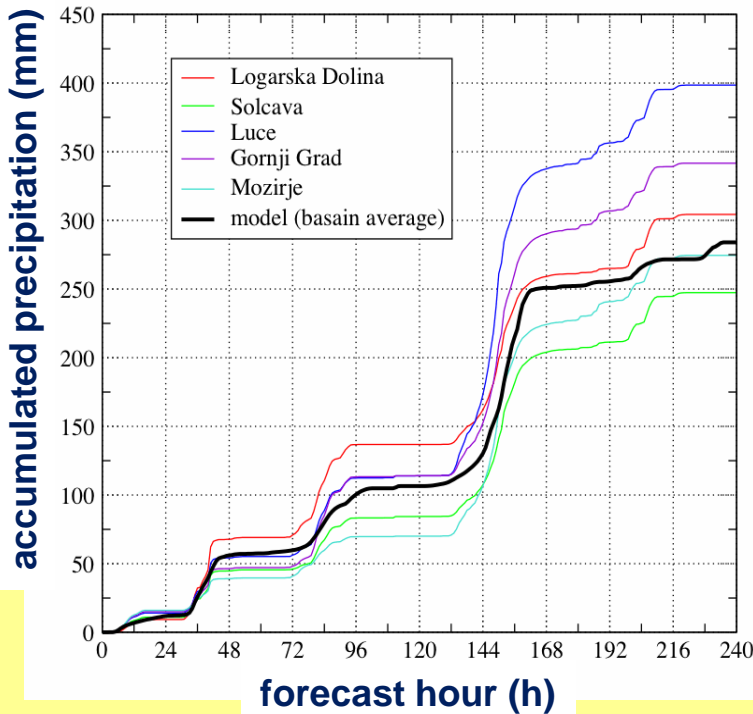
Savinja (Slovenia)

26/10 – 6/11 1990

NMM model

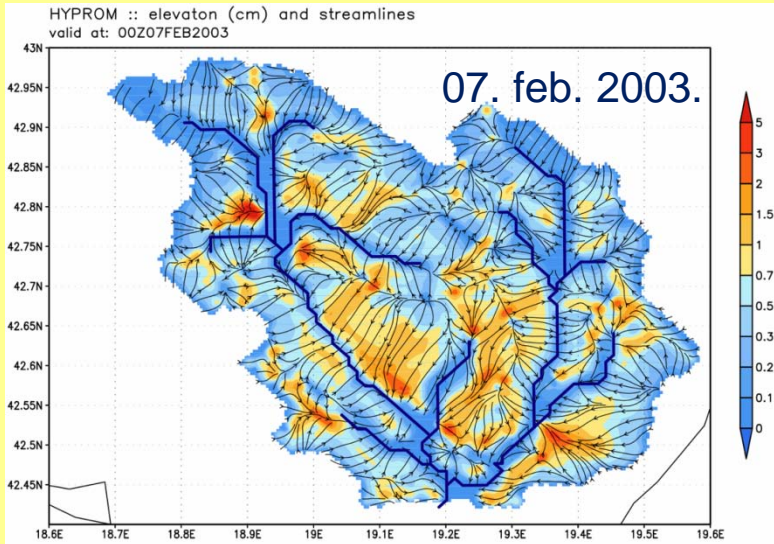
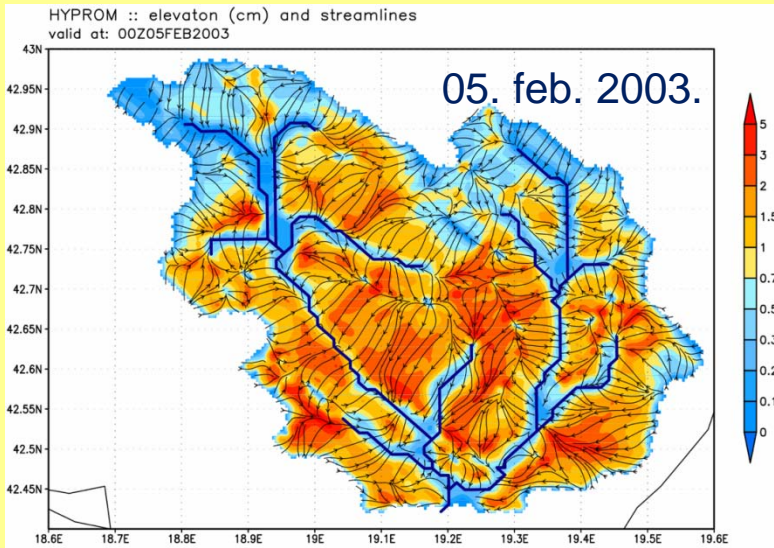


model vs. observations

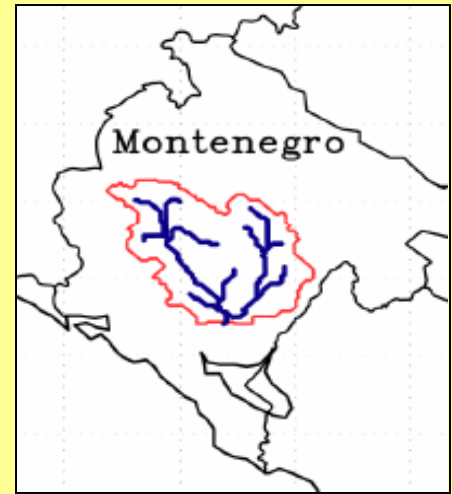


Morača (Montenegro)

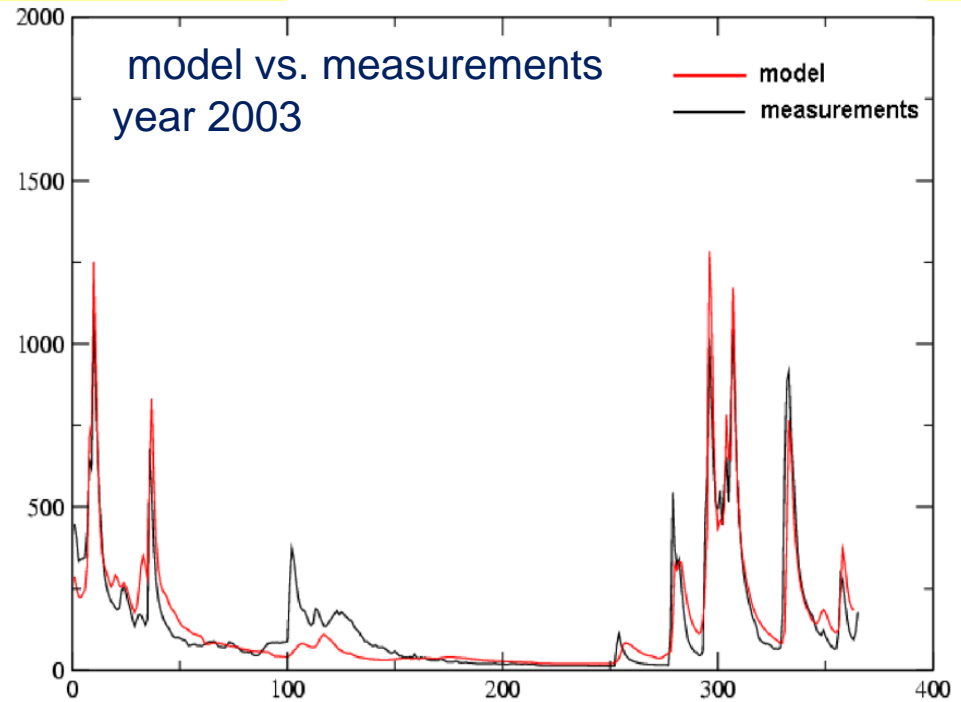
elevation (cm) and stream lines



HYPROM - example of dynamical treatment of surface runoff after heavy rains

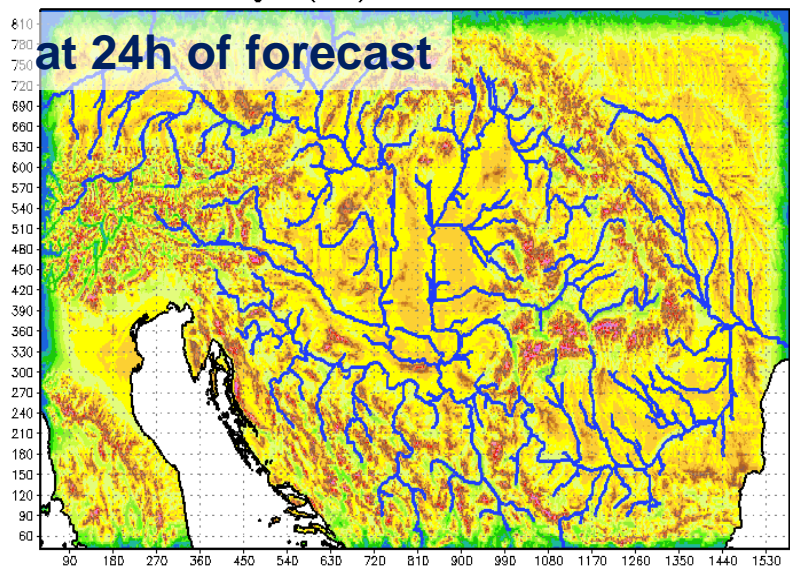


discharge (m^3/s) at Podgorica measuring point



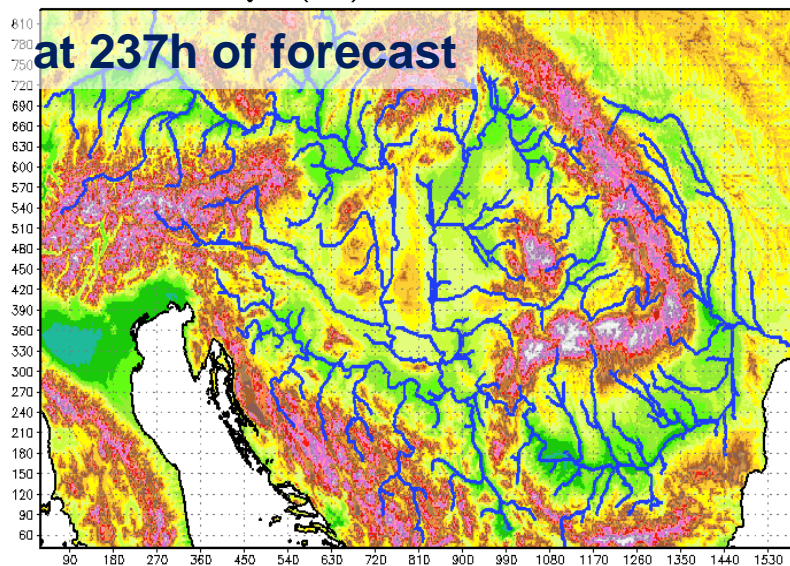
Extension of HYPROP to large basins and climate assessments

hight (cm) at: 24h forecast

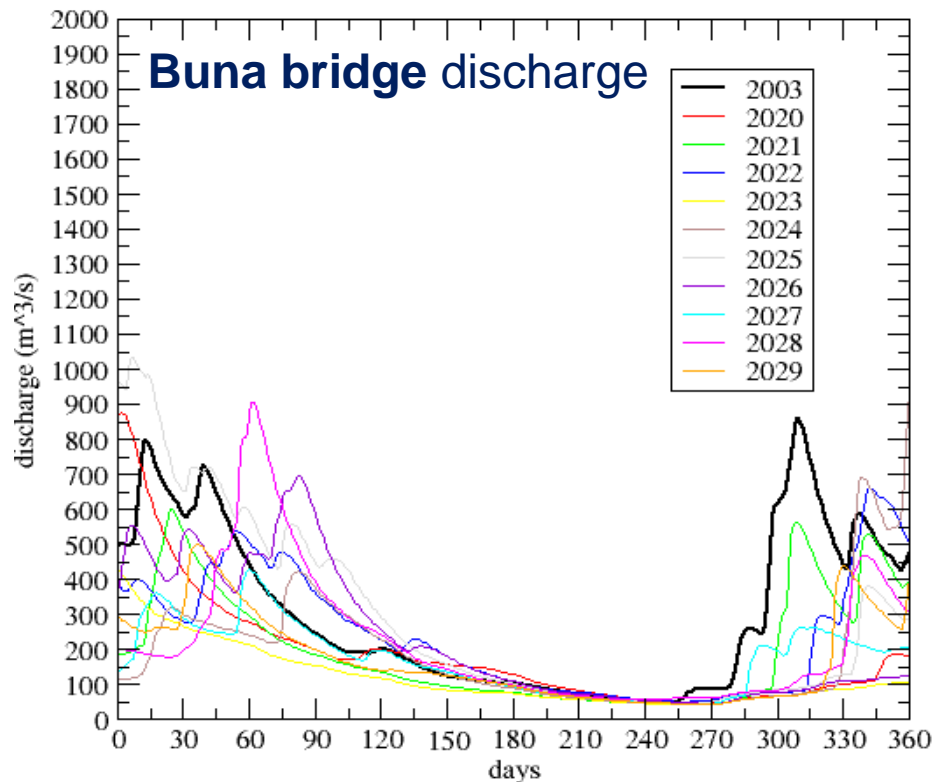


Danube basin experiment:
first 24h 1inch precipitation
over the whole domain

hight (cm) at: 237h forecast

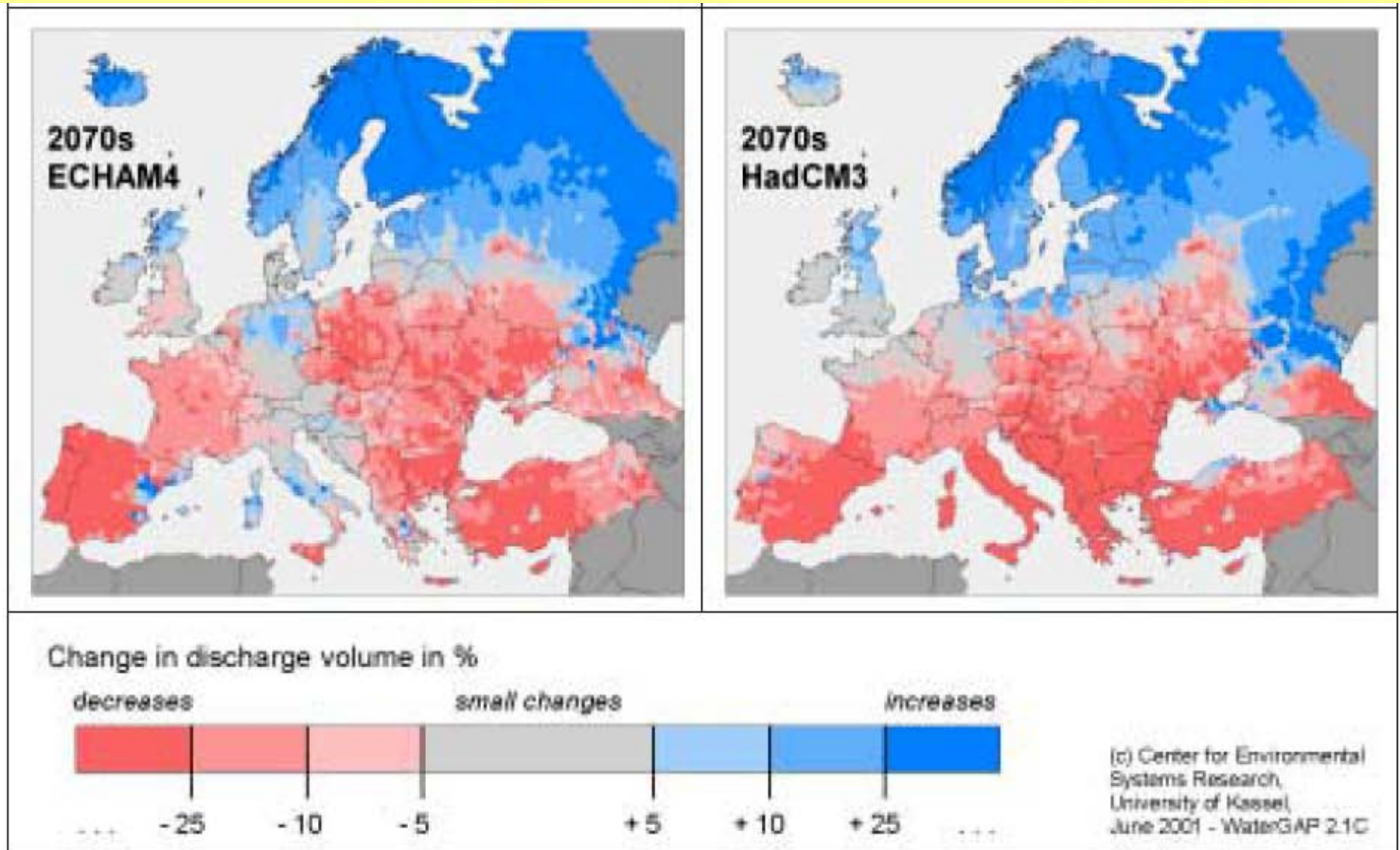


Climate simulations for Morača river 2020-2029



Climate Change Impact on Hydro energy potential (e.g.)

What is the impact of CC to hydro power potential?



SEE CCFAP - Common SEE research priorities in addressing adaptation to climate change

- **4. SEE/CCFAP: CONTINUOUS UPDATE ON [INSERT COUNTRY NAME] CLIMATE CHANGE PERSPECTIVE- URGENT ACTIONS**
 - 4.1 Background, need for urgent actions
 - 4.2 Climate Observations, Monitoring and Forecasting in [INSERT COUNTRY NAME]
 - 4.3 Climate Modelling and Scenarios in [INSERT COUNTRY NAME]
 - 4.4 Reduction of Climate Related Risks in [INSERT COUNTRY NAME]
 - 4.5 Socio Economic Information on Climate Impacts in [INSERT COUNTRY NAME]
- **5. SEE/CCFAP: DEVELOPMENT AND IMPLEMENTATION OF PROGRAMMES FOR ADAPTATION – Countries are invited to express their view on possible SHORT TO MEDIUM TERM PRIORITIES in relevant sub-regional programmes**
 - 5.1 SUBREGIONAL PROGRAMME 1/ STRATEGIC FOCUS: Climate Change and Public Health, Safety and Emergency Preparedness
 - 5.2 SUBREGIONAL PROGRAMME 2/ STRATEGIC FOCUS: Climate Change and Water Resources Management, Freshwater Quantity and Quality, and Water Supply
 - 5.3 SUBREGIONAL PROGRAMME 3/ STRATEGIC FOCUS: Climate Change and Agriculture and Forestry
 - 5.4 SUBREGIONAL PROGRAMME 4/ STRATEGIC FOCUS: Climate Change and Land Use, Buildings and Transportation
 - 5.5 SUBREGIONAL PROGRAMME 5/ STRATEGIC FOCUS: Climate Change and Tourism
 - 5.6 SUBREGIONAL PROGRAMME 6/ STRATEGIC FOCUS: Climate Change and Coastal Zones
 - 5.7 SUBREGIONAL PROGRAMME 7/ STRATEGIC FOCUS: Climate Change and Biodiversity and Ecosystems
 - 5.8 SUBREGIONAL PROGRAMME 8/ STRATEGIC FOCUS: Climate Change and Energy

SEE CCFAP - Common SEE research priorities in addressing adaptation to climate change, cntd.

- **6. SEE/CCFAP: CROSS CUTTING ISSUES**
 - 6.1 SEE COOPERATION IN ADAPTATION
 - 6.2 CAPACITY BUILDING in [INSERT COUNTRY NAME]
 - 6.3 Education, Training and Public Awareness in [INSERT COUNTRY NAME]
 - 6.4 Roster of Experts in [INSERT COUNTRY NAME]
 - 6.5 Climate Change Partnerships in [INSERT COUNTRY NAME]

- **7. SEE/CCFAP: Implementation Modalities: Views from [INSERT COUNTRY NAME]**
 - 7.1 Possible sources of funding
 - 7.2 Coordination of implementation

A KEY ISSUE IN ADAPTATION

– Need for coordinated Sub-regional approach –

- There is a need to support both facilitation and implementation of adaptation activities in terms of integrating across scales, from local to national and sub-regional.**
- This will require improvements in knowledge and expertise, institutional strength, good governance, transparency and stakeholders involvement, supportive government of interested countries, and financial resources for effective and efficient adaptation activities.**
- To facilitate these activities in the frame of the Belgrade Initiative priority is given to the development of the sub-regional climate change action plan CCFAP and respective cooperative programmes and projects.**

Thank you for your attention.

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