

A topographic map of the Mediterranean region, showing the Mediterranean Sea, the Iberian Peninsula, the Balkans, and parts of North Africa and the Middle East. The map uses a color gradient from green (low elevation) to yellow and brown (high elevation).

**Identifying synergies for Mediterranean
Climate Research:
the HyMeX and MedCLIVAR contributions.**

2nd HYMEX workshop, Paris 2 - 4 June 2008

Piero Lionello, University of Salento, Italy



2nd HYMEX workshop, Paris 2 - 4 June 2008

...Mediterranean Climate research: a crowded space

ENSEMBLES



MEDEX



CIRCE

SESAME



HYMEX



MEDCLIVAR



MEDEX

Cyclones that produce high impact weather in the Mediterranean

Status: WMO (WWRP), 2000-2005 and 2006-2010, financing by participating organizations

Objectives: Going to better understanding and improved forecast of Mediterranean severe storms, through better understanding and improved forecast of cyclones that produce severe storms. Objectives, with reference to the cyclones that produce high impact weather:

- The elaboration of a dynamic climatology of cyclones
- The better understanding of their genesis and evolution together with the analysis of the behavior of numerical prediction models in the simulation of these processes.
- The identification of the most sensitive areas in which an improvement of the observation leads more clearly to a better forecasting.
- The evaluation of the societal impact of the hazardous weather and the establishment of ways to translate the scientific achievements to the operational meteorological community.

Key-activities: modeling (weather prediction), case studies analysis (database), Field campaigns, modeling impacts of extreme weather events

CIRCE

Climate Change and Impact Research: the Mediterranean Environment

Status: EU-fp6 Integrated project, 2007-2011 (48months), budget 16.5 Meuros

Objectives: to understand and to explain how climate will change in the Mediterranean area (an assessment of the climate change impacts in the Mediterranean area).

- to predict and to quantify physical impacts of climate change in the Mediterranean area;
- to evaluate the consequences of climate change for the society and the economy of the populations located in the Mediterranean area;
- to develop an integrated approach to understand combined effects of climate change;
- to identify adaptation and mitigation strategies in collaboration with regional stakeholders.

Key-activities:

(Climate dynamics RL1-6, climate change impacts RL7-RL14)
Data analysis, Climate model simulations (GCM and RCM), impact studies, climate change assessment, integrated meta-database.

SESAME

Southern European Seas Assessing and Modelling Ecosystems changes

Status: EU-fp6 Integrated project, 1/11/2006-2010 14.8Meuro

Objectives: to assess and predict changes in the Mediterranean and Black Sea ecosystems as well as changes in the ability of these ecosystems to provide goods and services. The assessment of ecosystem changes will be based on the identification of the major regime shifts in ecosystems that occurred during the last 50 years. Mathematical models, validated and upgraded using existing and new observations, will be used to predict ecosystem responses to changes in climate and anthropogenic forcings during the next five decades. The new data will be gathered during multidisciplinary, multiship oceanographic cruises in the Mediterranean and Black Sea.

Key activities Ecosystems Modeling, Climate Change projections and impacts, Oceanographic Cruises,

- Assessment WP1-3 (historical, existing, new multidisciplinary field data);
- Prediction WP4-6) (simulate past, predict changes for next 5 decades, develop models);
- Application (WP7) Connect ecosystem functions to human uses and value the impacts of changes on goods and services for human welfare

ENSEMBLES

ENSEMBLE- based Predictions of Climate Changes and their Impacts

STATUS: EU-fp6 Integrated project, duration 5 years 1/9/2004-2009, budget 23.1Meuros

Objectives:

Integrate climate change impacts studies into an ensemble prediction system, quantify the uncertainty in long-term predictions of climate change, provide a reliable quantitative risk assessment of long term climate change and its impacts. Particular emphasis is given to probable future climate changes in extremes. To focus on the needs of policymakers, ENSEMBLES considers impacts on timeframes ranging from seasonal to decadal to centennial, and at local, regional and global spatial scales.

Key-activities:

Organized in RT 0 to 8

- RT2B – Production of Regional Climate Scenarios for Impact Assessments
- RT3 – Formulation of very high resolution Regional Climate Model Ensembles for Europe
- RT5 – Independent comprehensive evaluation of the ENSEMBLES simulation-prediction system against observations/analyses with both GCM and RCM models (interpolation to a CRU like 0.25 grid), delivery of climate datasets, assessment of observed variability, RT6 and 7: impacts (agriculture yields , water availability, diseases) and policies



MedCLIVAR

(Mediterranean CLimate VARIability)

Status: (WCRP) endorsed by CLIVAR, ESF Networking (2006-2012, years, budget 0.8Meuros)

Objectives:

MedCLIVAR aims to coordinate and promote the study of the Mediterranean climate. Its scientific priorities

- description of climate past evolution
- assessment of climate variability at different space and time scales
- understanding the mechanisms responsible for the observed climate variability
- identifying trends and providing climate prediction in relation to future emission scenarios.
- Study of the occurrence of extreme events and climate change impacts

Key activities:

networking, synthesis, data identification

A topographic map of the Mediterranean region, showing the Mediterranean Sea, the Iberian Peninsula, the Balkans, and the Middle East. The map uses a color scale from green (low elevation) to brown and yellow (high elevation).

HYMEX: Hydrological cycle in the Mediterranean Experiment

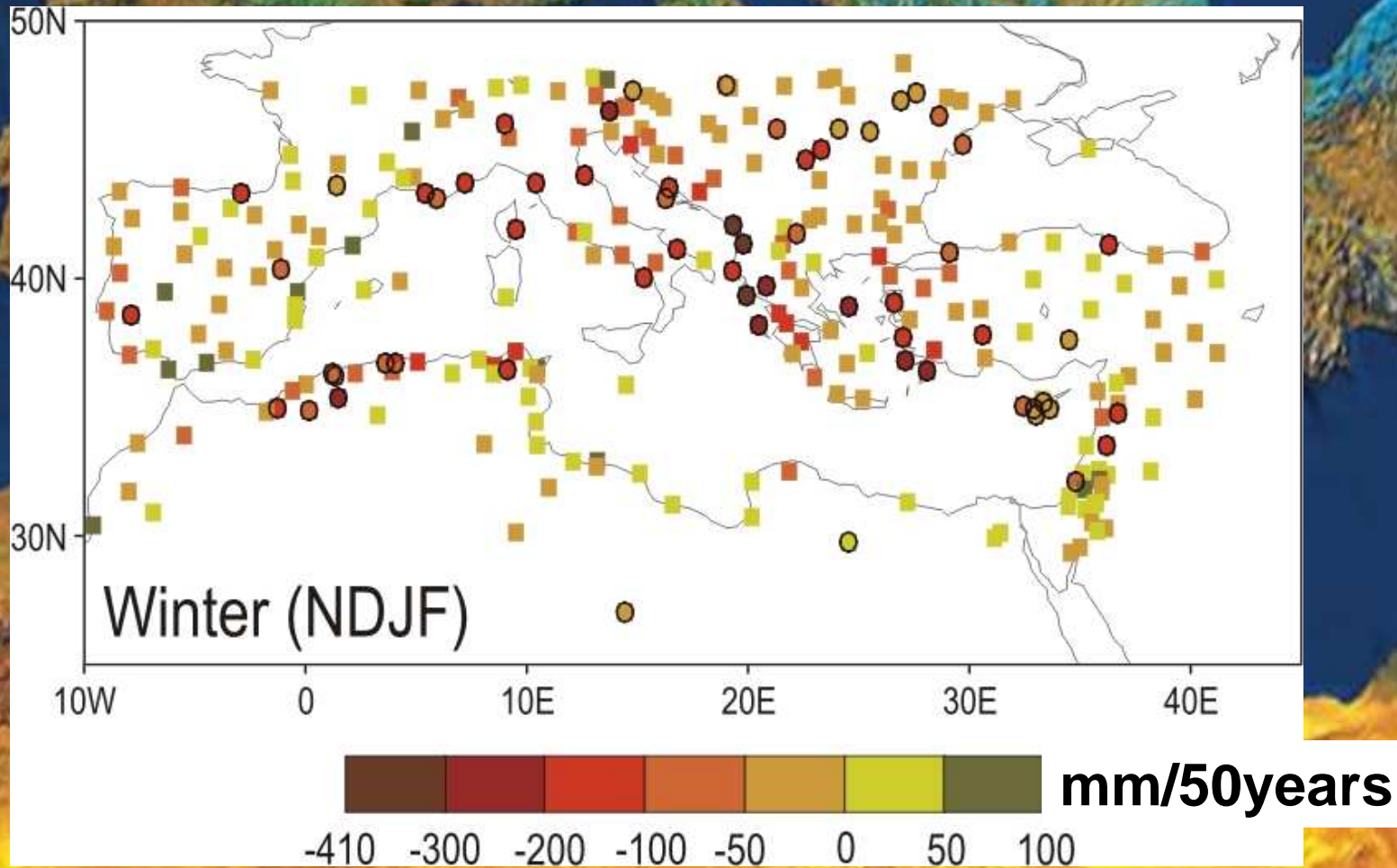
Status: project proposal, duration 2008-2020, level of funding not yet determined

Objectives: HYMEX is a major experimental program aiming at a better quantification and understanding of the hydrological cycle and related processes in the Mediterranean, with emphases put on high-impact weather events and their modeling, regional impacts of the global change including those on ecosystems and the human activities.

Key activities: Observations Periods (long, enhanced, special). Modeling weather and Climate, weather prediction, climate simulations. Long term and short term impacts of hydrological cycle.

Wet season precipitation trend (1950-1999)

Acknowledgement: Xoplaki, 2002; Xoplaki et al., 2004



Precipitation change (% , 2071-2100 minus 1961-1990), MGME ensemble average, B1 scenario

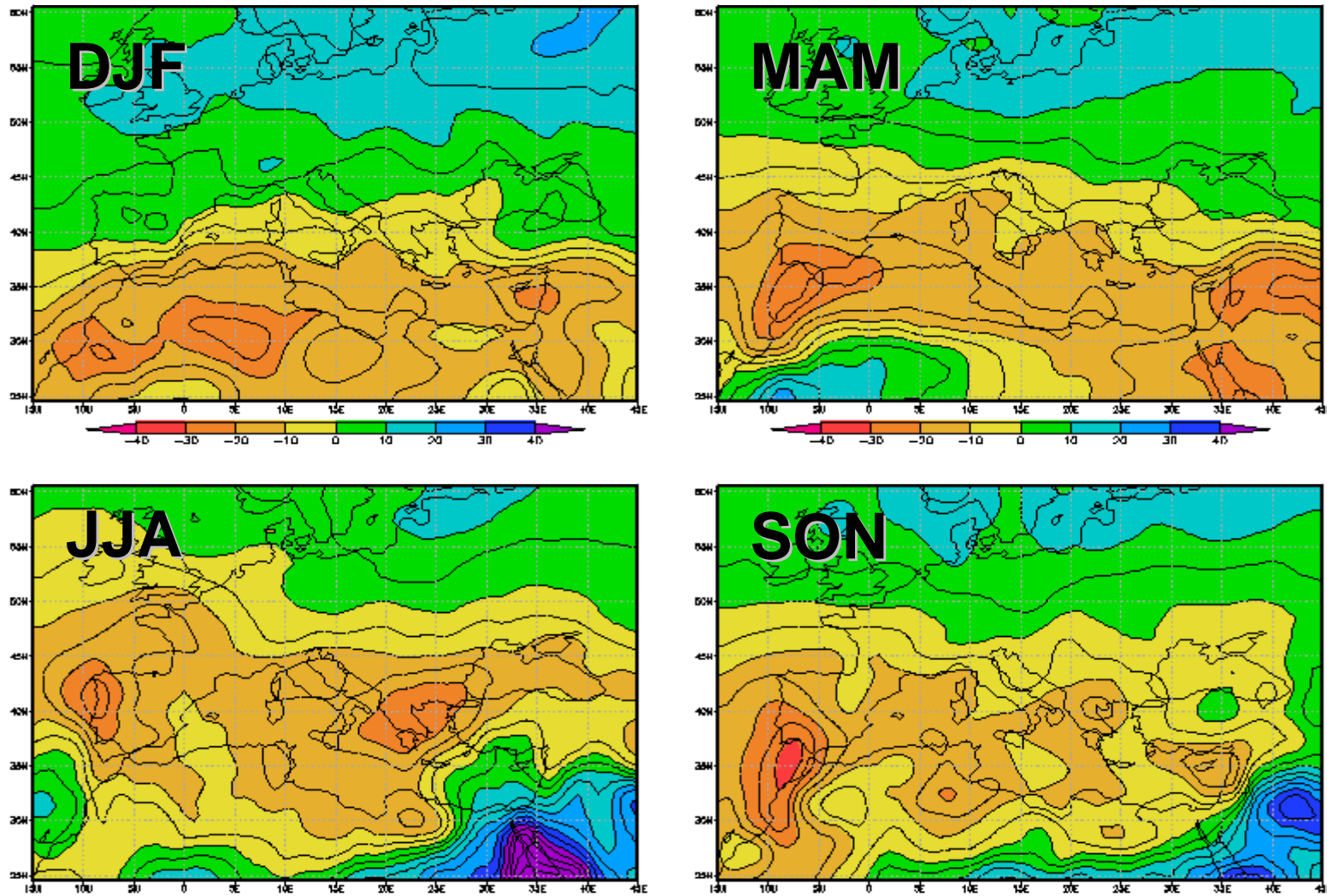


Figure 6

from Giorgi and Lionello, 2007

Precipitation change (% , 2071-2100 minus 1961-1990), MGME ensemble average, A1B scenario

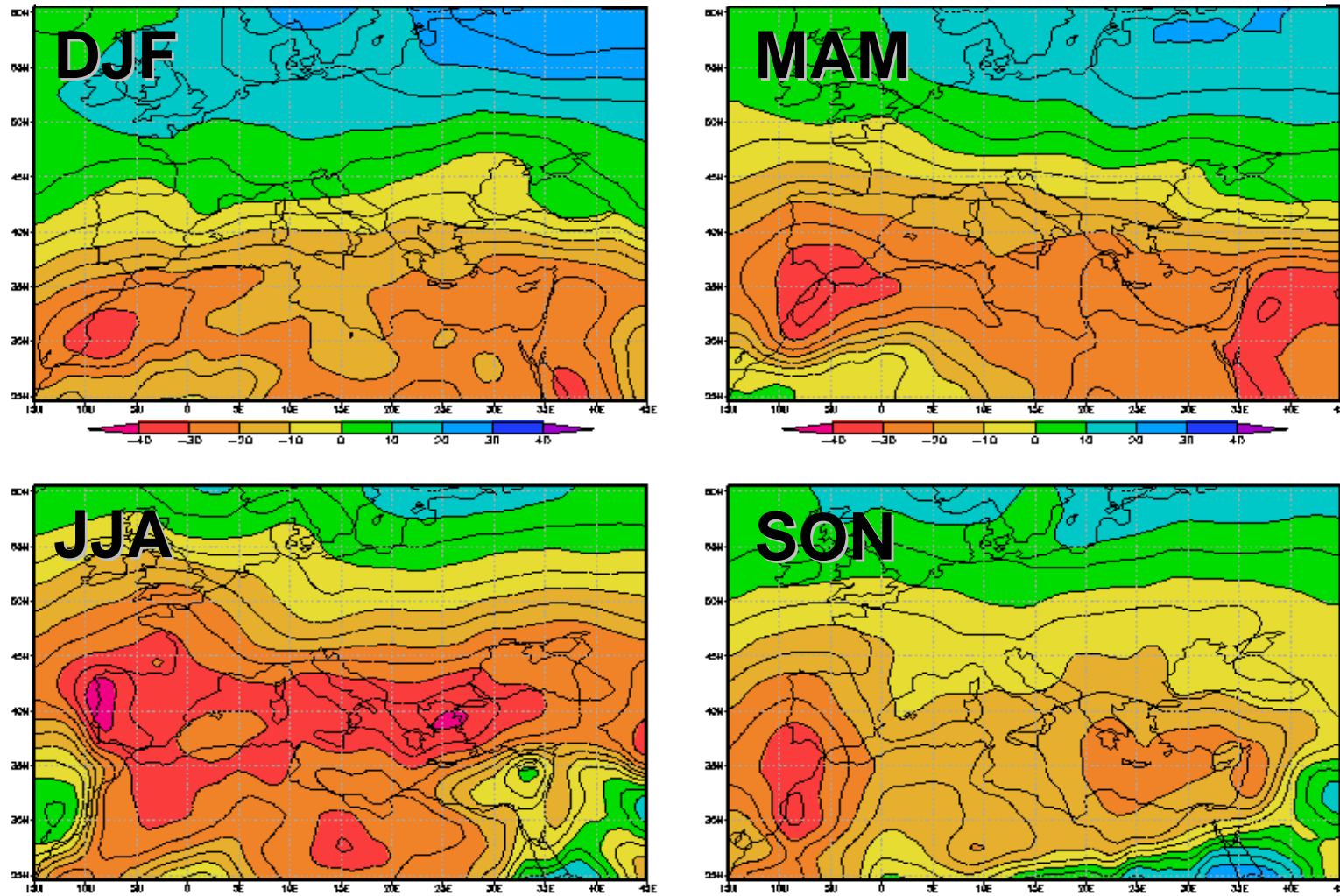


Figure 4

from Giorgi and Lionello, 2007

Precipitation change (% , 2071-2100 minus 1961-1990), MGME ensemble average, A2 scenario

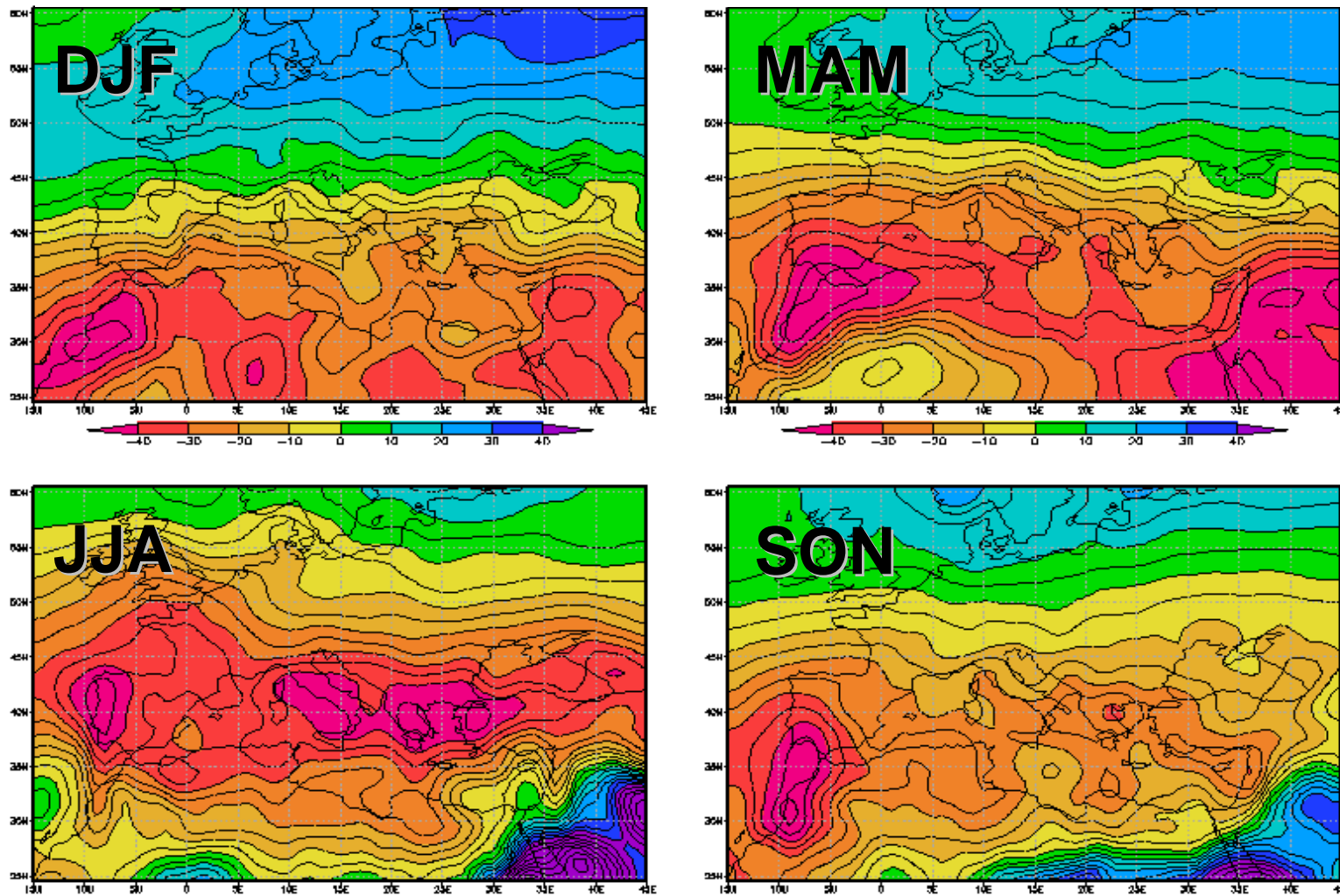
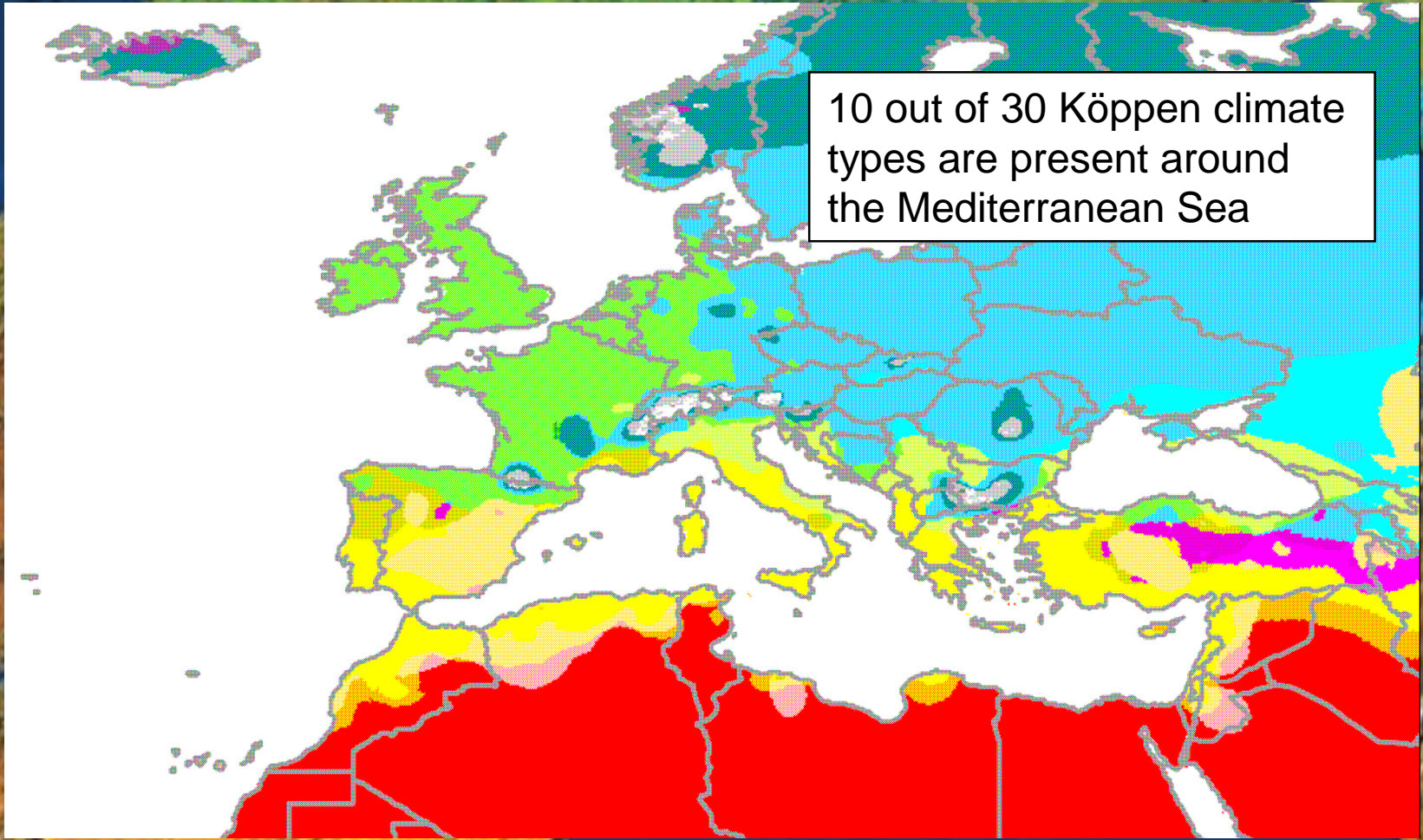


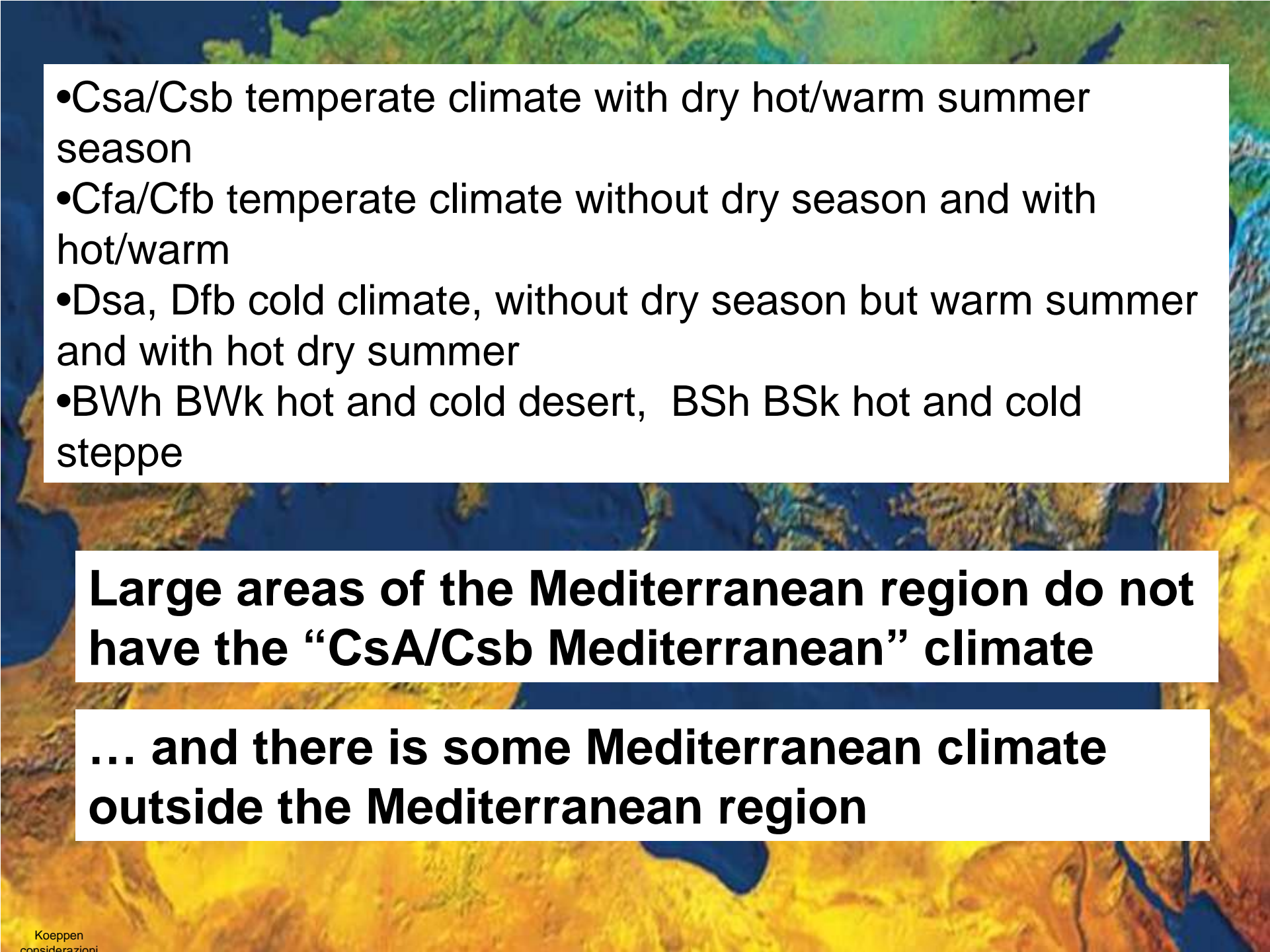
Figure 7

from Giorgi and Lionello, 2007

10 out of 30 Köppen climate types are present around the Mediterranean Sea



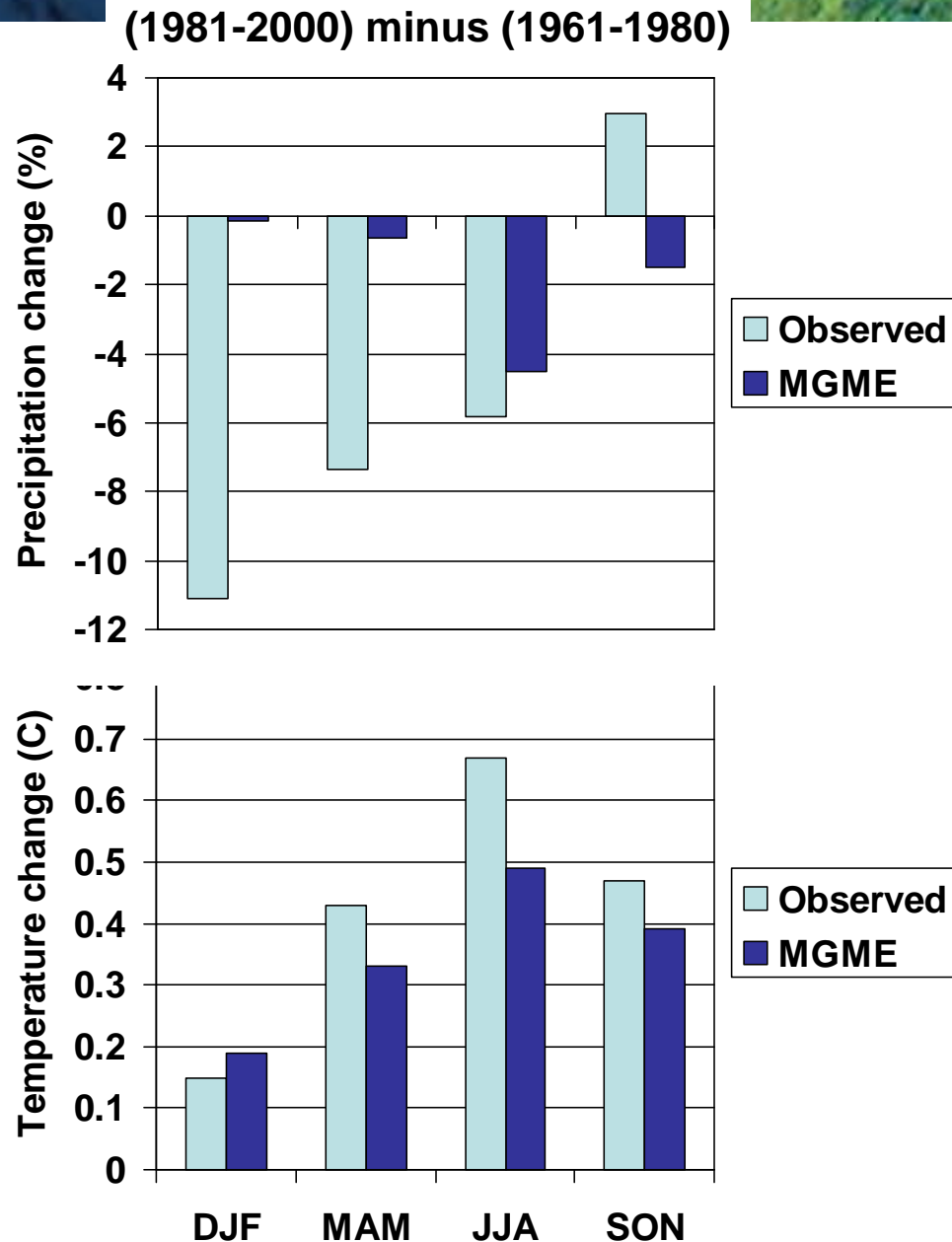
Af	BWh	Csa	Cwa	Cfa	Dsa	Dwa	Dfa	ET
Am	BWk	Csb	Cwb	Cfb	Dsb	Dwb	Dfb	EF
Aw	BSh		Cwc	Cfc	Dsc	Dwc	Dfc	
	BSk				Dsd	Dwd	Dfd	

- 
- Csa/Csb temperate climate with dry hot/warm summer season
 - Cfa/Cfb temperate climate without dry season and with hot/warm
 - Dsa, Dfb cold climate, without dry season but warm summer and with hot dry summer
 - BWh BWk hot and cold desert, BSh BSk hot and cold steppe

Large areas of the Mediterranean region do not have the “CsA/Csb Mediterranean” climate

... and there is some Mediterranean climate outside the Mediterranean region

Models are not conclusive! Are they telling us the truth about the future precipitation?

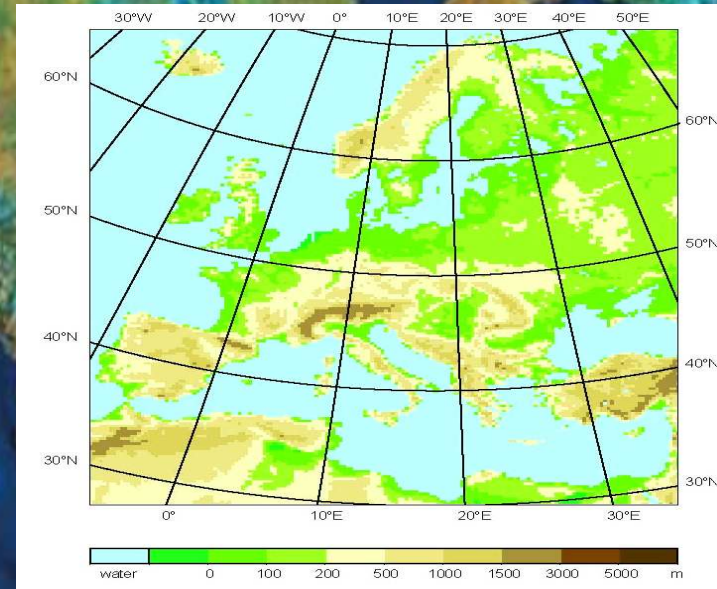


Observed (CRU data) and MGME ensemble average change in precipitation (upper panel) and surface air temperature (lower panel) for the four seasons over the full Mediterranean region (land only) 1981-2000 minus 1961-1980. Units are % of 1961-1980 value for precipitation and degrees C for temperature.

MODELS... RCM

ENSEMBLES: RT3: Formulation of very high resolution Regional Climate Model Ensembles for Europe

RT3 has the responsibility for providing improved climate model tools developed in the context of regional models, but contributing to high-resolution modelling in general, first at spatial scales of 50 km at a European-wide scale within ENSEMBLES and later also at a resolution of 25km for specified sub-regions.



0.22° (25km) grid mesh (courtesy of Burkhardt Rockel)

CIRCE:RL2 - The Mediterranean Region and the Global Climate System

- (i) Assemble existing scenarios that are relevant to the Mediterranean region.
- (ii) Perform a limited set of global scenarios with improved horizontal resolution in the atmosphere and active coupling to a Mediterranean ocean circulation model.
- (iii) Perform a limited set of scenarios with regional coupled models (Mediterranean simulators), using boundary conditions from existing and new global scenarios.

Future sea level ????

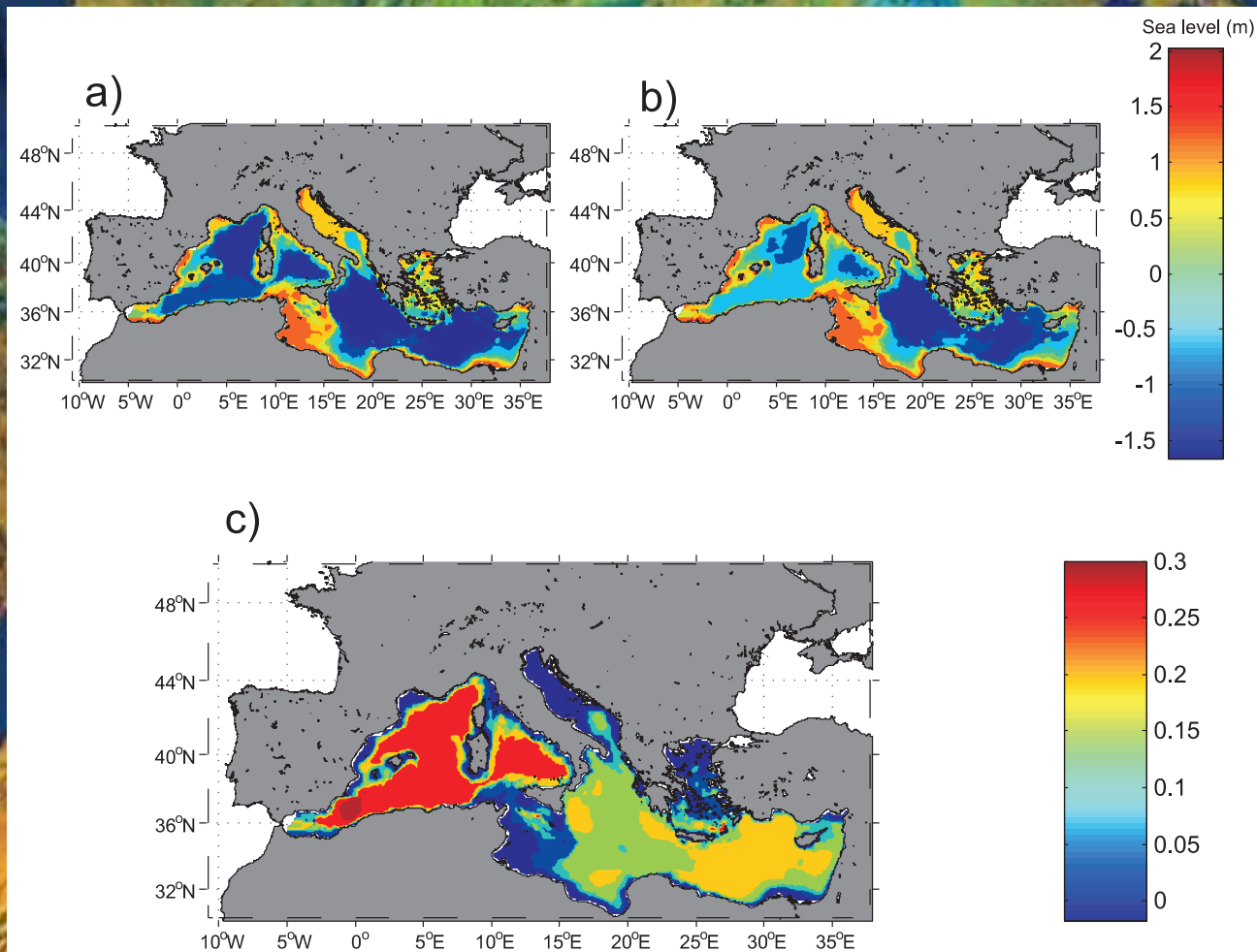



Fig.1 Steric sea level for the periods 1961-1990 (a) and A2 scenario 2070-2099 (b) and their differences (c) (From Tsimplis et al, 2007)

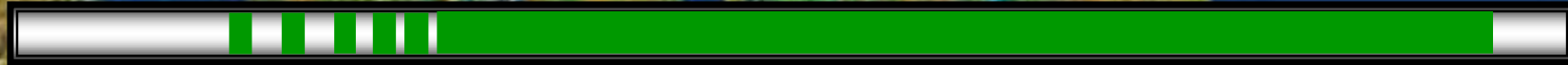


**Recovery of past data and past climate info:
long time series opportunity,
documentary proxies,
the North African lack of data**

SATELLITE DATA ???

CLIMATIC DATA OBTAINABLE FOR IBERIAN PENINSULA

Proxy-data: descriptions of meteorological extreme events



AD 1000

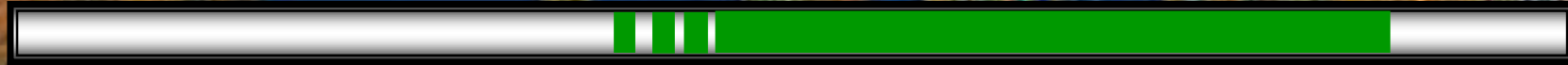
1250

1500

1750

2000

Proxy-data: rogations by environmental factors



AD 1000

1250

1500

1750

2000

Old instrumental data (private observers)



AD 1000

1250

1500

1750

2000

Modern instrumental data (Official Institution)



AD 1000

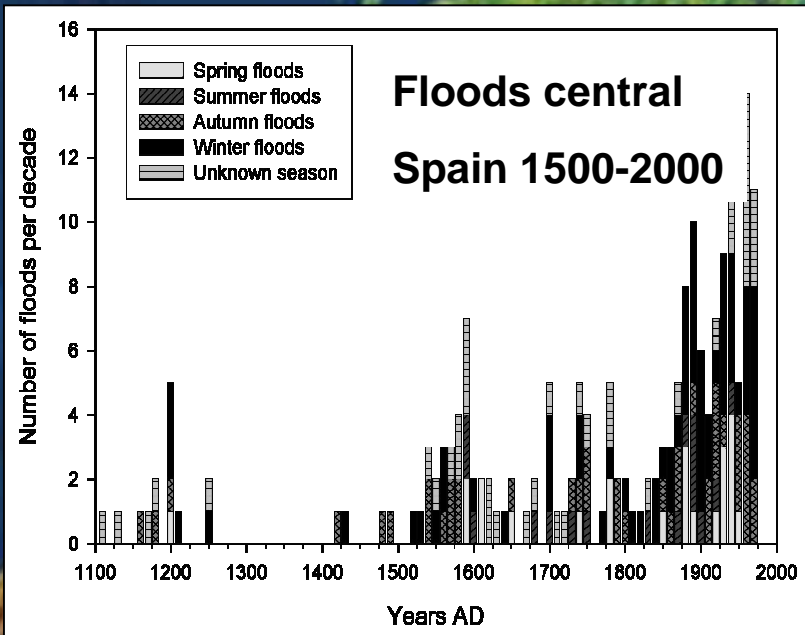
1250

1500

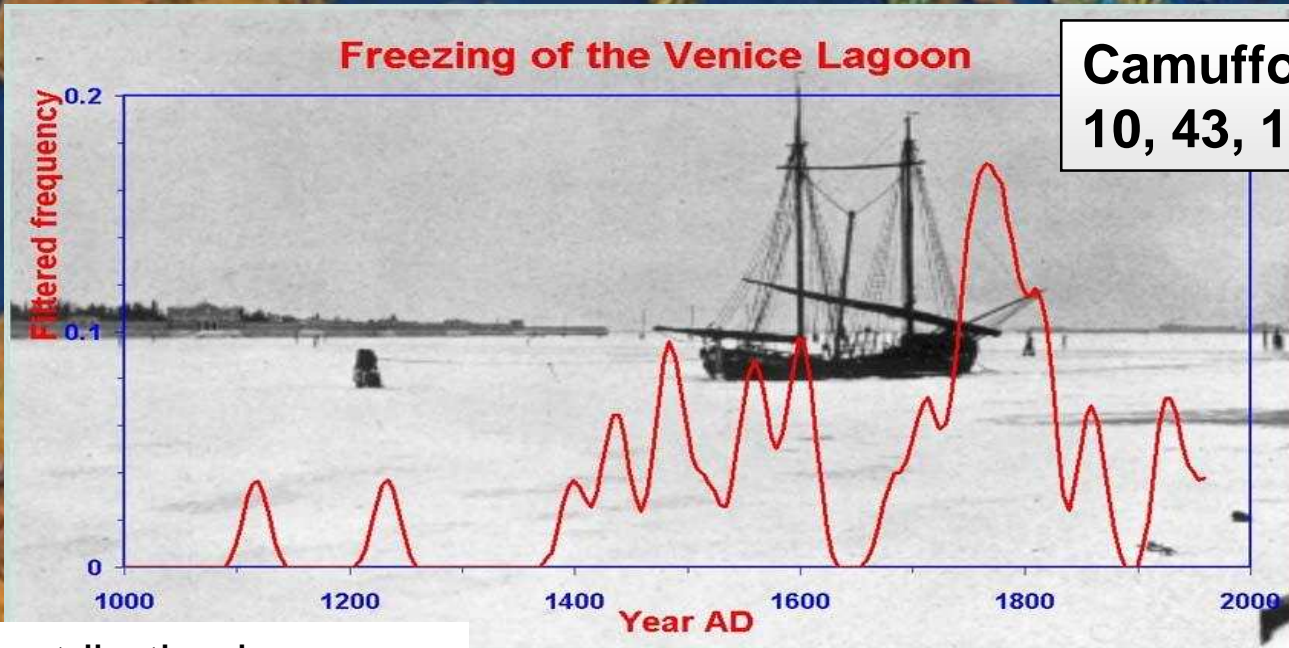
1750

2000



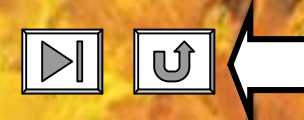


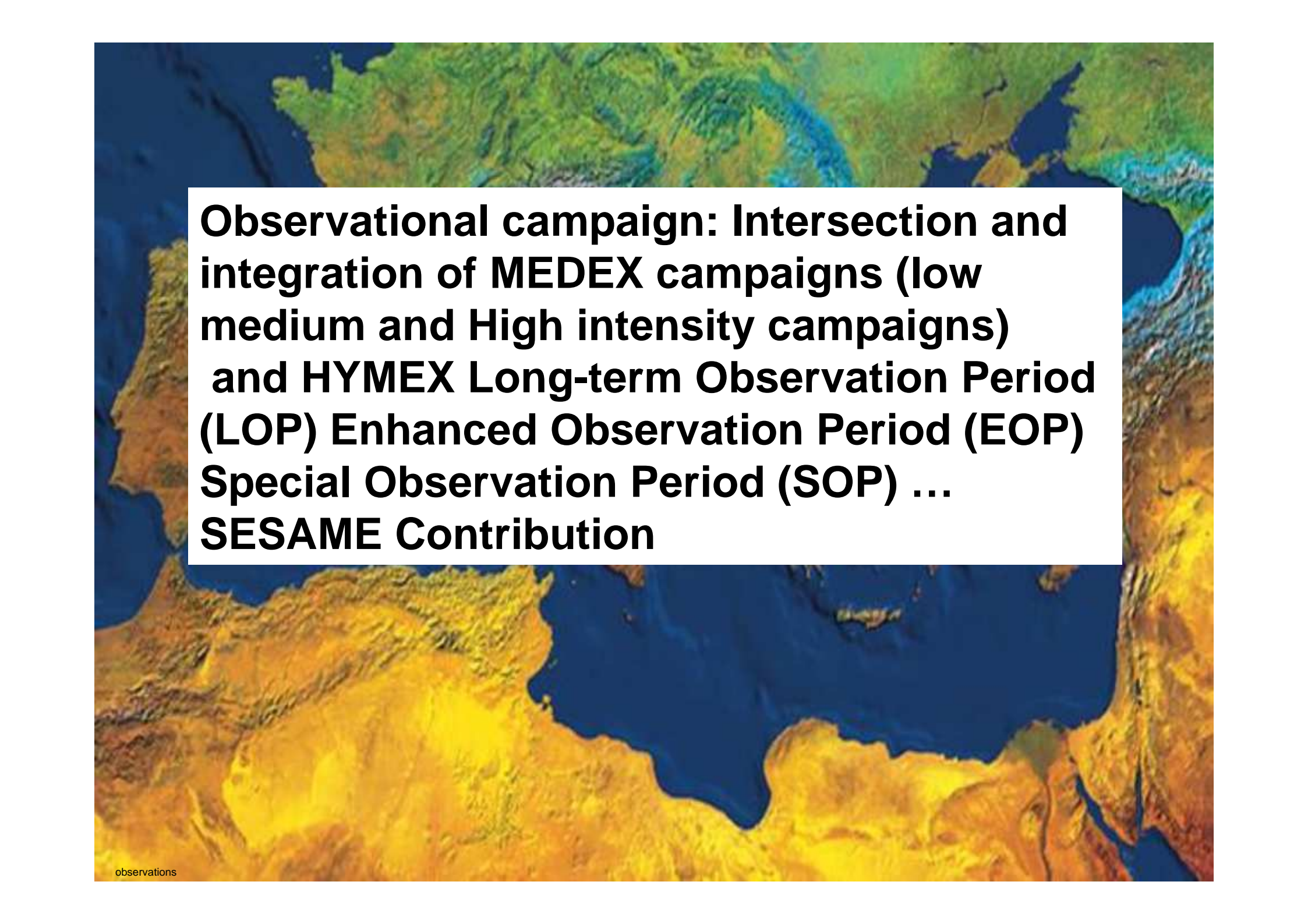
**Benito et al.,
Clim. Change,
28, 171, 2003**



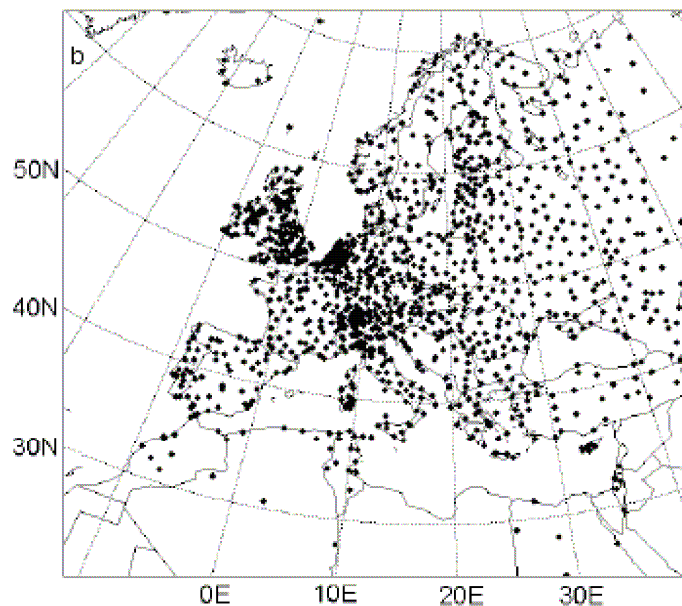
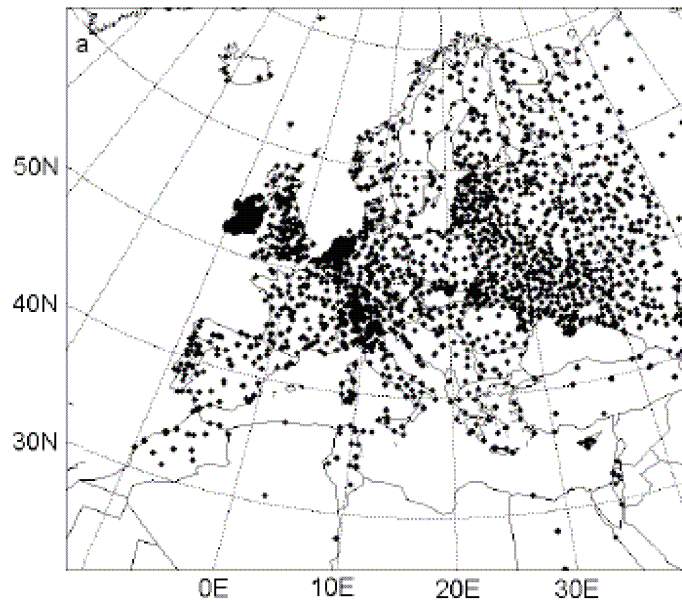
**Camuffo, Clim. Chang.,
10, 43, 1987**

contribution by
F.Gonzalez



A topographic map of the Mediterranean region, showing the Mediterranean Sea, the Iberian Peninsula, the Balkans, and the Middle East. The map uses a color scale from green (low elevation) to yellow and orange (high elevation).

Observational campaign: Intersection and integration of MEDEX campaigns (low medium and High intensity campaigns) and HYMEX Long-term Observation Period (LOP) Enhanced Observation Period (EOP) Special Observation Period (SOP) ... SESAME Contribution



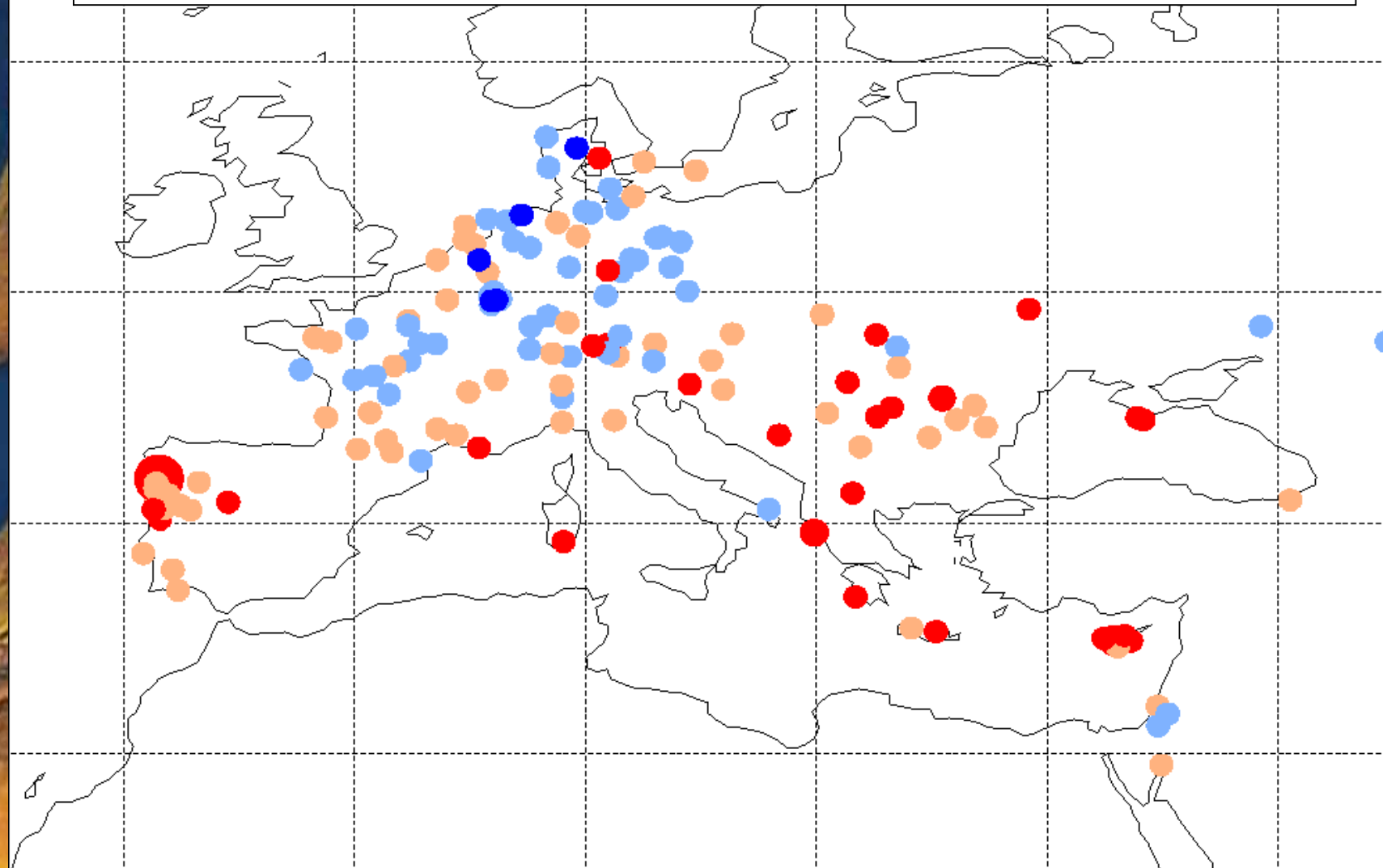
A European daily high-resolution gridded dataset of surface temperature and precipitation for 1950-2006.

M. R. Haylocka, N. Hofstrab, A. M. G. Klein Tankc, E. J. Klok d, P.D. Jonesa, M. Newb

The complete gridding region (land only), showing the station network for a) precipitation; and b) mean temperature.

winter precipitation trend (1958-2001)

ECA-KNMI stations with at least 25 year long
uninterrupted record of daily observations





CIRCE RL5: Water Cycle

Objectives: This Research Line aims at producing an assessment of the expected variations of the water cycle in the Mediterranean Environment due to global climate changes. This Research Line is focused on main components of atmospheric, inland and oceanic water cycle that are expected to be highly impacted by climate evolution. This RL is made by four WPs: atmospheric water budget, precipitation, terrestrial, Mediterranean sea water budget

2nd HYMEX workshop, Paris 2 - 4 June 2008

MEDEX objectives

1. Improvement of the climatological knowledge on the cyclones that produce high impact weather in the Mediterranean, including aspects related to the inter-annual variability and tendencies.
2. Improvement of the understanding of the dynamical and physical processes that are involved in the genesis and evolution of the cyclones that produce high impact weather in the Mediterranean.
3. Development and testing of observational targeting and adaptive strategies and of assimilation of new observations, oriented to the improvement of the forecasting of the cyclones that produce high impact weather in the Mediterranean.
4. Development and testing of forecasting techniques, like different kinds of ensemble forecasting and statistical post-processing of the numerical prediction model outputs, **to improve the forecasting of the cyclones** that produce high impact weather in the Mediterranean and of the high impact weather itself.
5. Evaluation of the social and economical benefit of improved forecasts of cyclones that produce high impact weather in the Mediterranean and of the high impact weather itself.

2nd HYMEX workshop, Paris 2 - 4 June 2008

**• Knowledge of climate dynamics is not conclusive yet.
There is need for filling gaps**

**• Hydrological cycle is a critical component of the
Mediterranean environment.**

(Intersection and integration of HYMEX, CIRCE, MEDEX)

**• Observational campaign: Intersection and integration of
MEDEX campaigns (low medium and High intensity
campaigns) and HYMEX Long-term Observation Period
(LOP) Enhanced Observation Period (EOP) Special
Observation Period (SOP) ... SESAME Contribution**

• Unexplored fields: sea level rise

**• integrating new contribution with climate (ENSEMBLES,
CIRCE) and weather (MEDEX) modeling strategies**

• synthesis of impacts studies and their uncertainties

2nd HYMEX workshop, Paris 2 - 4 June 2008

A topographic map of the Mediterranean region, showing the sea and surrounding landmasses with color-coded elevation. The map is the background of the slide.

Networking among projects and among scientific communities

Next:

Workshops...and

Roundtable and regular Mediterranean CL session

Vienna EGU 2009

MedCLIVAR conference in spring 2012 (co-sponsoring
will be welcome)

... beyond the lifespan of the single projects

Webpage: www.medclivar.eu

2nd HYMEX workshop, Paris 2 - 4 June 2008

...Mediterranean Climate research: a not yet sufficiently crowded space

ENSEMBLES



SESAME

CIRCE

MEDCLIVAR

MEDEX

HyMeX

HYdrological cycle in Mediterranean EXperiment



HYMEX



... with important research opportunity not to be missed

A topographic map of Europe and the Mediterranean region, showing elevation and terrain. The map uses a color scale from green (low elevation) to brown and yellow (high elevation). The Mediterranean Sea is visible in the center, surrounded by the Iberian Peninsula, France, Italy, Greece, and the Balkans. A white rectangular box is overlaid on the map, containing the text "THANK YOU for your attention".

THANK YOU
for your attention

2nd HYMEX workshop, Paris 2 - 4 June 2008





