

**WMO**  
**MEDARE**  
initiative



# The WMO/MEDARE Initiative: bringing and developing high-quality historical Mediterranean climate datasets into the 21<sup>st</sup> century

By

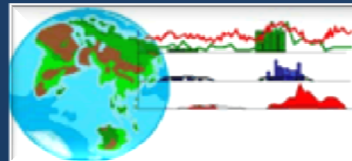
**Khalid Elfadli<sup>1</sup> & Manola Brunet<sup>2</sup>**

*(BUDAPEST, HUNGARY, 12 – 16 May 2014)*

- 1- Climate & Climate Change adviser at Libyan National Meteorological Center + Astronomical & Meteorological Dep. At Cairo university.*
- 2- MEDARE co-chair and WMO/CCI OPA2 co-chair + Centre for Climate Change (C3), Dep. of Geography, University Rovira i Virgili, Tarragona, Spain + Climatic Research Unit, School of Environmental Sciences, University of East Anglia, Norwich, UK*



**WMO**  
World  
Meteorological  
Organization



**WCDMP**  
World Climate Data  
and Monitoring  
Programme



**WCP**  
World  
Climate  
Programme



# WHAT MEDARE IS?

- **The Mediterranean (climate) DATA REscue (MEDARE) Initiative is:-**
  - **A joint-WMO effort (established on November, 2007) whose common goals being the enhancement of bringing historical climate datasets into the 21<sup>st</sup> century, which is paving the way to get achieved the MEDARE's end-goal of building up the Mediterranean climate databases of Greater Mediterranean Region (GMR)**
  - **Following the MEDARE recipe: bringing together climatologists and scientists from Mediterranean NMHS & Academia to exchange their experiences (both theoretical and operational) on DARE**
  - **promoting a new culture of data and knowledge sharing within GMR**
- **Non-regularly-funded WMO project and run on a volunteer basis**
- **Integrated by most of the Mediterranean NMHS (Albania & Portugal not included yet)**
- **Endorsed by WMO EC-60 (June, 2008) and quoted by GFCS (2013) as one of DARE initiatives to be supported**

# The RATIONALE & NEED FOR MEDARE...

- Mediterranean region has a long and rich history in monitoring the atmosphere, going back in time several centuries in some countries and at least to the mid-19<sup>th</sup> century across much of the GMR
- However, limited availability and accessibility of long and high-quality climate series represents the biggest challenge in the region:
- This is hampering progress on our capability to detect, predict & adapt the countries to the impacts of climate variability & change and it is limiting the timely delivery of climate products and services. Following factors could be considered the key challenges:
  - short period climate records (e.g. from 1970s onwards) availability and accessibility
  - poor spatial coverage (limited observing stations), especially over southern and south-eastern countries
  - lack of quality climatic time series



*Oldest data source in the Algerian NMHS archive (1856-1861). Courtesy of Mehdi Kerrouche*



# MEDARE COMPOSITION...

- MEDARE Community composed of 37 organizations, including 25 Mediterranean NMHS and 11 research centres with about 100 individual members
- 4 working groups (WG):
  - WG1. Inventorying/assessing/approaching old material sources and holders
  - WG2. DARE techniques and procedures (including digitization)
  - WG3. Approaches on best practices for quality controlling and homogenizing specific climate variables.
  - WG4. Promotional activities, bringing MEDARE to the wider scientific and other communities
- Steering Group: the 2<sup>nd</sup> SG is composed of:
  - *Manola Brunet & Serhat Sensoy (Co-chairs)*
  - *Victor Venema (University of Bonn)*
  - *Athanasios Sarantopoulos (Greece NMHS)*
  - *Fatima Elguelai (Morocco NMHS)*
  - *Khalid Elfadli (Libya NMHS)*
  - *Yolanda Luna (Spain NMHS)*
  - *Janja Milkovic (Croatia NMHS)*
  - *Djamel Boucherf (Algeria NMHS)*
  - *Mesut Demircan (Turkey NMHS)*
  - *Marius Theophilou (Cyprus NMHS)*



*(Istanbul, Turkey, 27-28/Sep/2012)*



# MEDARE OBJECTIVES...

- **Fostering DARE projects at national, sub-regional and regional scales**
- **Mobilising resources (human and financial) to undertake DARE projects over the GMR**
- **Innovating on DARE techniques (from efficient data transfer into digital format to time-series QC and homogenisation)**
- **Capacity building through training activities (regional workshops and tailored training programs)**
- **Increasing awareness on the need for DARE among stake-holders and decision-makers (several dissemination material elaborated and distributed)**
- **Linking MEDARE members to other DARE initiatives to better coordination and avoid duplication with special links to ECA&D and ICA&D and WMO DARE-I**



# MAIN PROGRESS & ACTIVITIES MADE SINCE THE LAST (3) YEARS...

- I. Updating and maintaining the MEDARE web-site for linking the MEDARE Community
- II. Defining, implementing and populating the MEDARE portal Metadata Base (<http://app.omm.urv.cat/urv>) with country and research projects metadata on long and key Mediterranean climate records: about 700 sites documented for mainly Tx/Tn and RR (SLP) variables at daily (sub-daily) scales
- III. Paving the way for MEDARE becoming a WMO/WIS Data Collection and Production Centre (DCPC)
- IV. Undertaking DARE activities over North Africa and Middle East countries under the opportunity that brought us by EU-EURO4M project (*EUropean Reanalysis and Observations for Monitoring project*) and in cooperation with NMHS in these areas

# I. MEDARE main online web-page for linking the MEDARE Community & joint users

WMO World Meteorological Organization

WCDMP World Climate Data and Monitoring Programme

WCP World Climate Programme

## WMO MEDARE initiative

The Mediterranean climate Data REScue (MEDARE) is an initiative, born under the auspice of the World Meteorological Organization, with the main objective of being to develop, consolidate and progress climate data and metadata rescue activities across the Greater Mediterranean Region (GMR)

[Download MEDARE BROCHURE](#)

### MEDARE Workshop Proceedings

[Download PDF \(5 MB\)](#)

- ▶ The MEDARE Initiative
- ▶ WORKSHOPS MEDARE
- ▶ MEDARE Data Portal



## II. MEDARE portal Metadata Base

- **Managed by C3/URV** (*Centre for Climate Change (C3), University Rovira i Virgili, Tarragona, Spain*)
- **Contributed mainly by Med. NMHS, but with a significant input from the DARE component of the EURO4M project: 35 metadata providers & 261 users.**
- **On-line accessibility (psw protected), but accessible through Toulouse GISC**
- **Remarkable improvement in coverage over southern and south-eastern areas**
- **Useful for identifying the “TARGET” records to be developed (digitised and homogenised)**
- **But this only contains METADATA, NO DATA**

Country name	No. of observing sites in MEDARE metadata base
Algeria	190
Andorra	7
Bulgaria	10
Croatia	13
Egypt	62
France	14
Greece	44
Israel	15
Italy	54
Jordan	12
Lebanon	3
Libya	28
Morocco	30
FYR of Macedonia	56
Slovenia	20
Spain	72
Tunisia	18
Turkey	8
<b>Total</b>	<b>656</b>





# The MEDARE Metadata Base: contributions & access

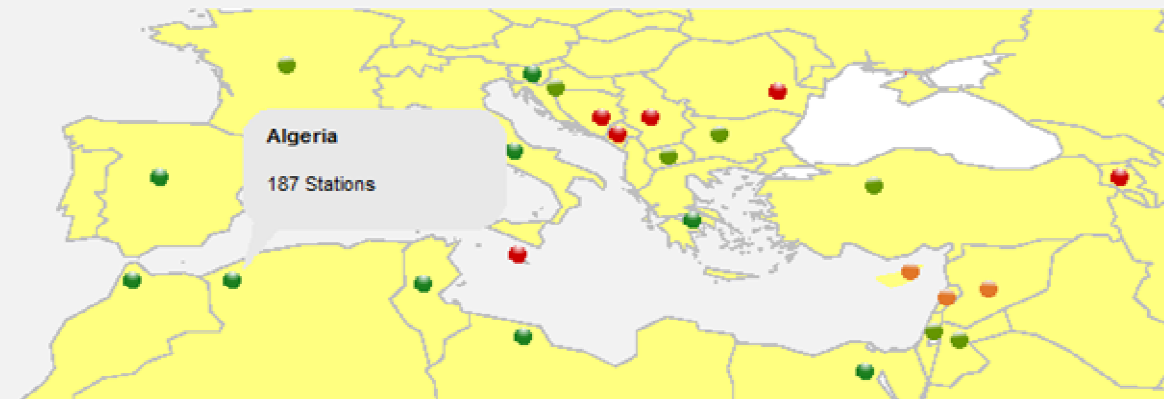


user:

password:

[Register Now!](#)

Works with IE 8  
or Mozilla Firefox



# The MEDARE portal and Metadata Base: easy access and using

**STATION:**

Current Station Details | Station Time Series | Station History

If already you have inserted the station code, you must search it in

Station Code:\*  WMO Code:

Station Name:\*

Latitude:\*  Longitude:\*

Altitude:\*  City/Town/Village:\*

Country:\*  Type of Station:

Opening Date:\*  End Date:

Responsible Organisation:\*  Contact E-mail\*

Data Holder Details (Clicking this box, the Responsible Organisation's details will be automatically introduced into the Data Holder's identifier box in station time-series page)

Address:

\* required field

Add Station

**REQUEST**

List of Stations and Station History

List of Time Series

All Countries...  
Algeria  
Andorra  
Armenia  
Bosnia & Herzegovina  
Bulgaria  
Croatia  
Cyprus

Hourly Temp  
Precipitation  
Humidity  
Air Pressure  
Wind Speed  
Wind Direction  
Sunshine Duration  
Cloud Cover

Press the control key to select multiple countries/variables

Resolution Time:  
 Monthly  Daily  Subdaily

Period:  
FROM Month Num:  Year:  TO Month Num:  Year:

Records:  
 Digitised  Not Digitised  Both

Select de output:  
PREVIEW EXCEL

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Country: Libya  
Climate Variables: All Climate Variables  
Resolution Time: Monthly  
Period: All  
Digitised Record: BOTH

Country	City/Town/Village	Station Code	WMO Code	Station Name	Climate Variable	Start Date	End Date	Data Source	Latitude	Longitude	Altitude (m)	Digitised Record
Libya	Agedabia	96910009	62055	Agedabia	Air Pressure	1961.01.01	2009.12.31	Meteorological Department	30.7167	20.1667	07	Yes
Libya	Agedabia	96910009	62055	Agedabia	Cloud Cover	1946.05.01	2009.12.31	Meteorological Department	30.7167	20.1667	07	Yes
Libya	Agedabia	96910009	62055	Agedabia	Hourly Temp	1951.01.01	2010.12.31	Meteorological Department	30.7167	20.1667	07	Yes
Libya	Agedabia	96910009	62055	Agedabia	Humidity	1946.04.01	2009.12.31	Meteorological Department	30.7167	20.1667	07	Yes
Libya	Agedabia	96910009	62055	Agedabia	Maximum Temp	1946.04.01	2010.12.31	Meteorological Department	30.7167	20.1667	07	Yes
Libya	Agedabia	96910009	62055	Agedabia	Mean Temp	1946.04.01	2010.12.31	Meteorological Department	30.7167	20.1667	07	Yes
Libya	Agedabia	96910009	62055	Agedabia	Minimum Temp	1946.04.01	2010.12.31	Meteorological Department	30.7167	20.1667	07	Yes
Libya	Agedabia	96910009	62055	Agedabia	Precipitation	1946.05.01	2010.12.31	Meteorological Department	30.7167	20.1667	07	Yes
Libya	Agedabia	96910009	62055	Agedabia	Sunshine Duration	1965.06.01	2009.12.31	Meteorological Department	30.7167	20.1667	07	Yes
Libya	Agedabia	96910009	62055	Agedabia	Wind Direction	1956.01.01	2009.12.31	Meteorological Department	30.7167	20.1667	07	Yes
Libya	Agedabia	96910009	62055	Agedabia	Wind Speed	1949.01.01	2009.12.31	Meteorological Department	30.7167	20.1667	07	Yes
Libya	Bengazi	96910008	62053	Benina	Air Pressure	1961.01.01	2009.12.31	Meteorological Department	32.0833	20.2667	132	Yes
Libya	Bengazi	96910008	62053	Benina	Cloud Cover	1945.01.01	2009.12.31	Meteorological Department	32.0833	20.2667	132	Yes
Libya	Bengazi	96910008	62053	Benina	Hourly Temp	1951.01.01	2010.12.31	Meteorological Department	32.0833	20.2667	132	Yes
Libya	Bengazi	96910008	62053	Benina	Humidity	1945.03.01	2009.12.31	Meteorological Department	32.0833	20.2667	132	Yes
Libya	Bengazi	96910008	62053	Benina	Maximum Temp	1945.03.01	2010.12.31	Meteorological Department	32.0833	20.2667	132	Yes
Libya	Bengazi	96910008	62053	Benina	Mean Temp	1945.03.01	2010.12.31	Meteorological Department	32.0833	20.2667	132	Yes
Libya	Bengazi	96910008	62053	Benina	Minimum Temp	1945.03.01	2010.12.31	Meteorological Department	32.0833	20.2667	132	Yes
Libya	Bengazi	96910008	62053	Benina	Precipitation	1945.03.01	2010.12.31	Meteorological Department	32.0833	20.2667	132	Yes
Libya	Bengazi	96910008	62053	Benina	Sunshine Duration	1963.09.01	2009.12.31	Meteorological Department	32.0833	20.2667	132	Yes
Libya	Bengazi	96910008	62053	Benina	Wind Direction	1989.01.01	2009.12.31	Meteorological Department	32.0833	20.2667	132	Yes
Libya	Bengazi	96910008	62053	Benina	Wind Speed	1949.01.01	2009.12.31	Meteorological Department	32.0833	20.2667	132	Yes



## III.MEDARE as WIS/Data Collection and Production Centre (DCPC): steps taken & status

- Endorsed by the *Spanish PR* (16<sup>th</sup> March 2011) and starting the process
- Fulfilling in the CBS Expert Team on GISC-DCPC Demonstration Process (ET-GDDP) questionnaire
- A test account & the ET-GDDP audit of MEDARE metadata (in compliance with WMO/WIS standards) on July 2012
- On August 2012, MEDARE metadata publicly available on the Toulouse GISC site: (<http://wisp.meteo.fr:8080/openwis-user-portal/srv/en/main.home>)
- And on the MEDARE portal: (<http://app.omm.urv.cat/urv/>)

English

List of variables for each station from Medare

View - Simple

West bound -5.61000

East bound 41.75860

South bound 30.27360

Distribution Information

Transfer options

Online resource <http://app.omm.urv.cat/urv/>

Reference System Information

Code WGS 1984

Data quality info

Hierarchy level Dataset: Information applies to the dataset

Metadata

File Identifier urn:uuid:medare::C3

Metadata language English

Character set UTF8: 8-bit variable size UCS Transfer Format, based on ISO/IEC 10646

What's New

■ Draft Stop-Gap metadata generated for

constants boroncert

18080/openwis-user-portal/srv/en/main.home#\_L0ZM

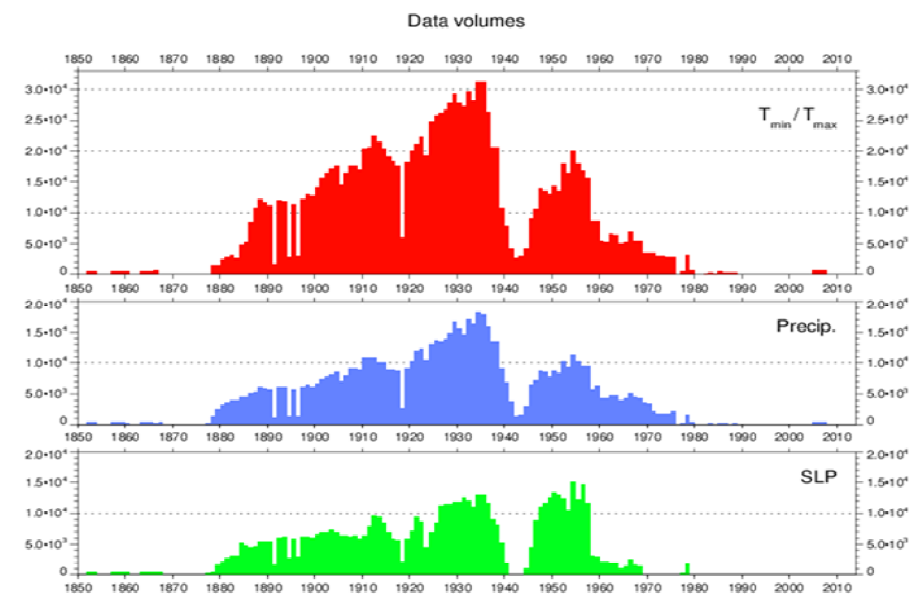
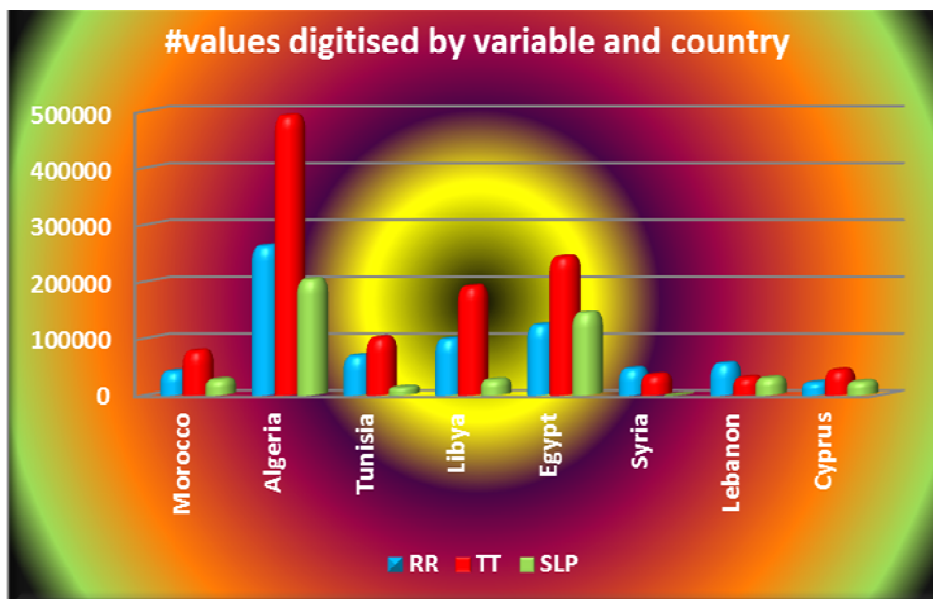
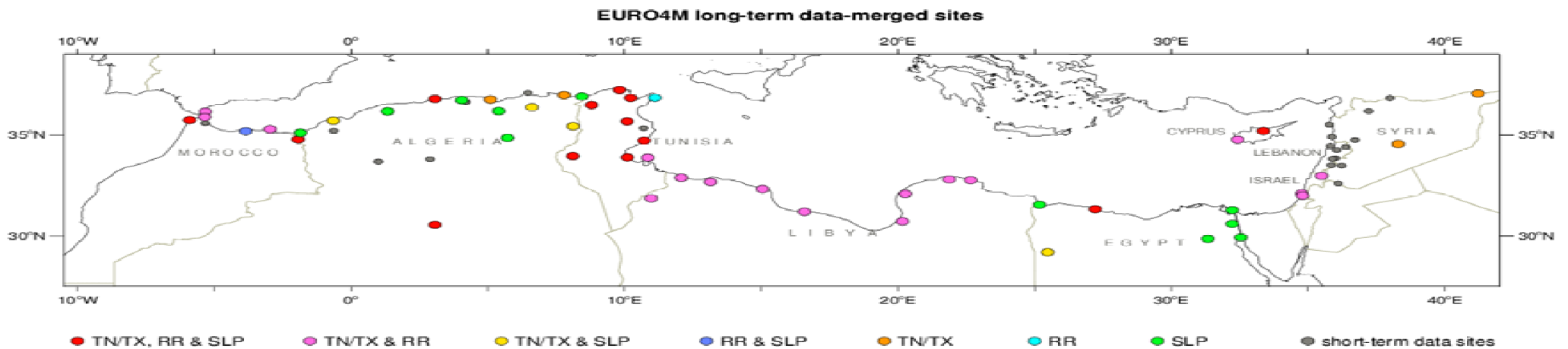


## **IV. The MEDARE datasets under development**

- **Based on MEDARE formula (bringing together NMHS & Academia) and under the EU-FP7 EURO4M project, the first ancient series are being recovered and populated at the MEDARE database**
- **The focus put on southern (North Africa) and eastern Mediterranean countries , involving the recovery & development of ancient climate daily (Tx/Tn, RR (about 65 series)) and hourly SLP (38 series) from various sources (from digitisation to QC & homogenisation)**
- **Combining the ancient parts with recently observed fractions by data exchange agreements with several NMHS (e.g. Algeria, Cyprus, Libya, Jordan...) for developing long and high-quality climate time-series**

# MEDARE DARE activities over southern and south-eastern Mediterranean countries under EURO4M

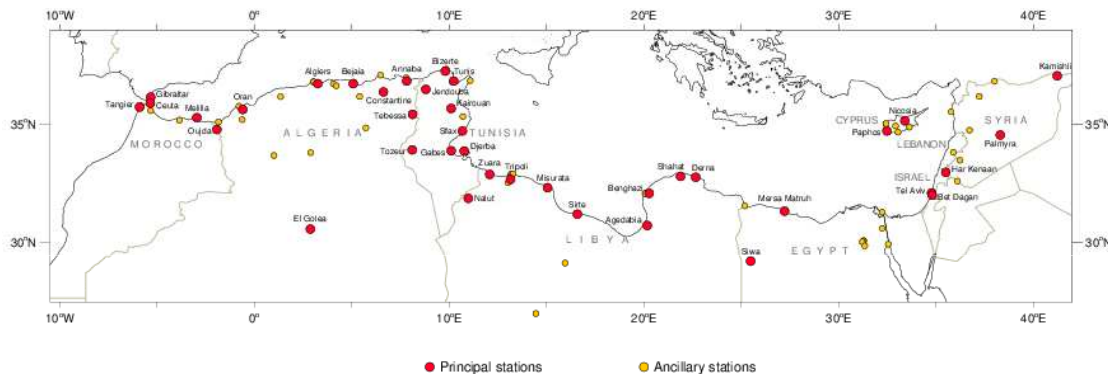
(recovering, digitising and quality controlling processes)



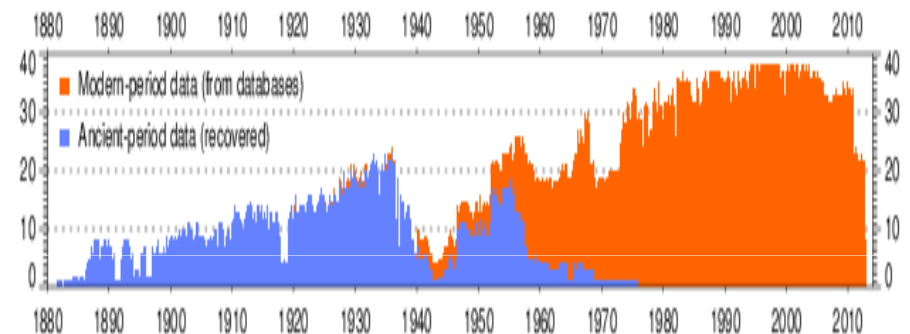


# Homogenising daily temperature series over southern and eastern Mediterranean locations, and merging old records with recent series

*Location of sites with Tx/Tn data series that have been merged and homogenised*



*Data availability for the sites selected*



A total of 38 daily Tx and Tn time-series for various locations in the southern and eastern parts of the Mediterranean Basin have been selected ; their recent part extends into the first decade of the 21<sup>th</sup> century, while for some of them data are available since the late part of the 19<sup>th</sup> century



# Homogenisation methods & results

*(Cited by: D. Efthymiadis et al. 2013)*

The daily time series selected have been converted into monthly means and then subjected to homogenisation following two approaches:

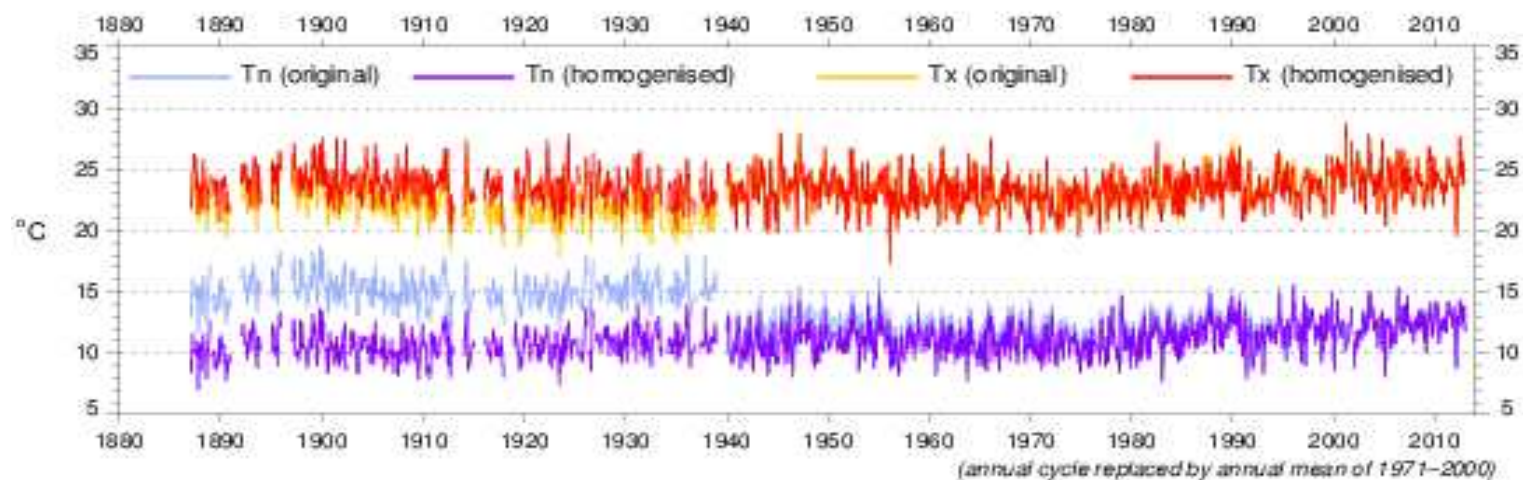
(1) the ACMANT method:

*(<http://www.c3.urv.cat/data.html>)*

(2) The HomeR method:

*([http://www.homogenisation.org/v\\_02\\_15/index.php?option=com\\_content&view=article&id=93:homer&catid=1:general&Itemid=1](http://www.homogenisation.org/v_02_15/index.php?option=com_content&view=article&id=93:homer&catid=1:general&Itemid=1))*

The homogenisation methods have identified a series of breaks and estimated adjustment factors which are necessary for making the original time series homogeneous over their overall span

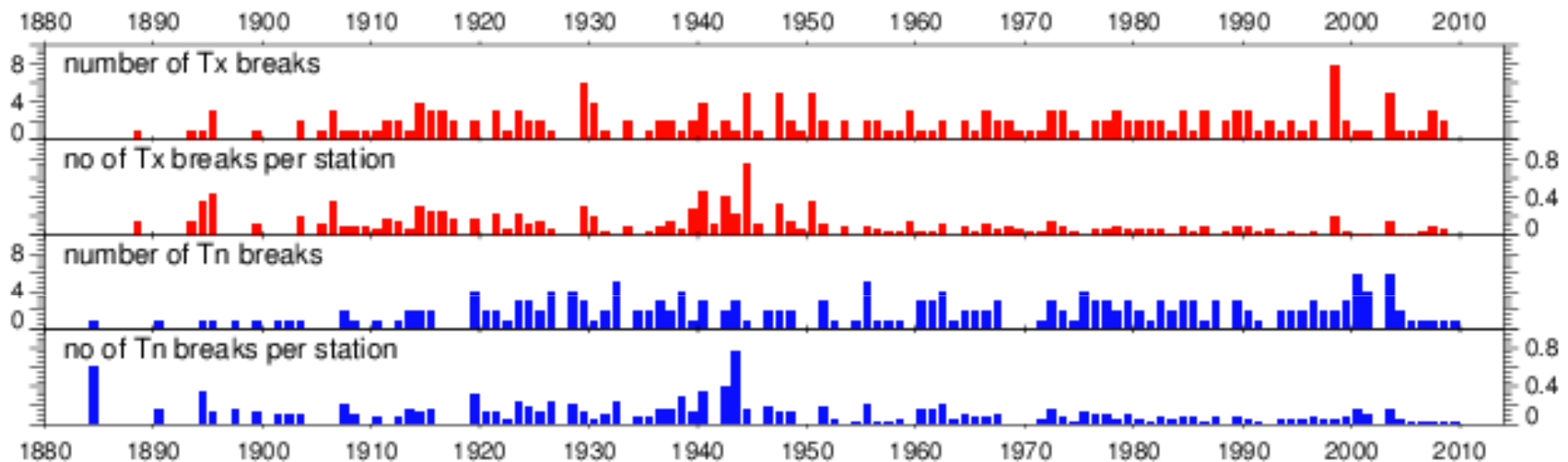


*Original and ACMANT-homogenised times series for Algiers (Algeria)*



## Homogenisation methods & results (*cont.*)

The density of breaks detected, i.e. the number of breaks per year, is similar in both the modern and ancient periods of data . However, since the station network declines back in time the number of breaks per station available is higher in the early data periods and especially before the mid-20<sup>th</sup> century .



*Number of ACMANT-detected breaks per year and per station for Tx and Tn.*

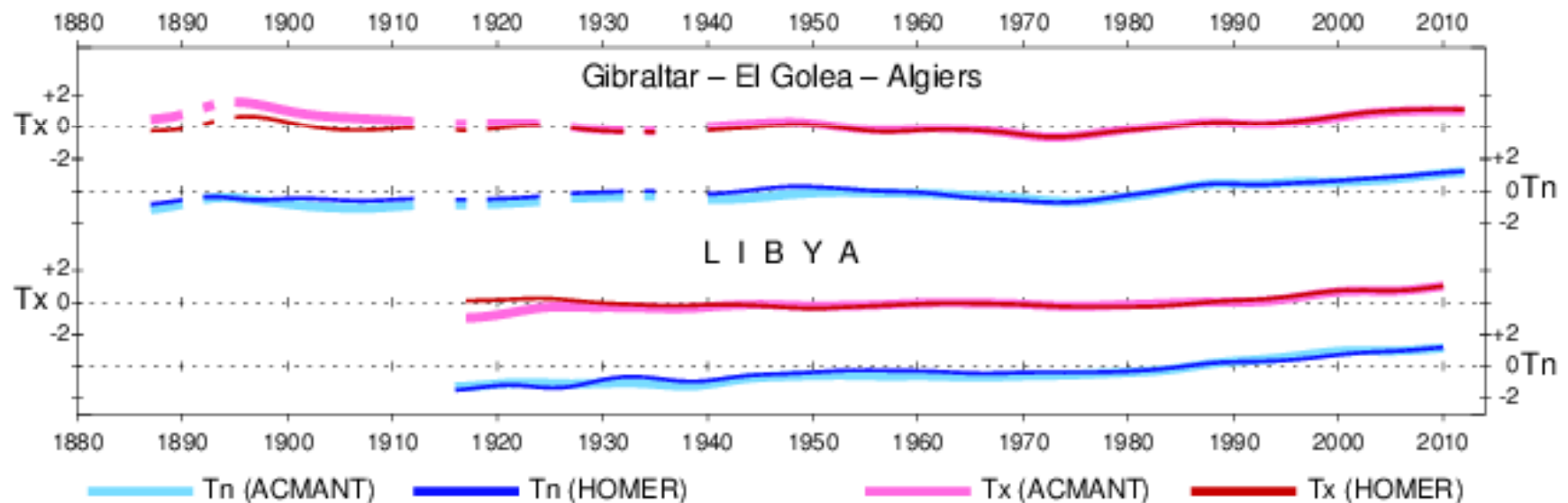




## Homogenisation methods & results... (*cont.*)

The station meta-data over the ancient period are poorly documented in the data sources used for the data recovery, making difficult the attribution of breaks. Nevertheless, certain breaks coincide with station relocations or station-data merging points within the merged-data series been homogenised.

While the two homogenisation methods produce comparable results, discrepancies are also observed, especially in the data-sparse decades of the late-19<sup>th</sup> and early-20<sup>th</sup> centuries .



*Low-pass filtered temperature anomalies (°C) of homogenised series for the average of selected south-western Mediterranean stations (upper panel) and Libyan stations (lower panel)*



## Homogenisation methods & results... (*cont.*)

**Another factor affecting the homogenisation effectiveness is the various data gaps and the intermittent character of the data time series recovered. It is expected that as more station data may additionally be recovered in this geographical area, the two methods' homogenised products will further converge resulting in time series of increased reliability and thus suitable for long-term studies.**

# Conclusions

- **MEDARE wants to contribute by enhancing GMR climate data availability and accessibility**
- **Long-term & high-quality climate series are the basic input that underpin climate products and services**
- **The elaboration of some changes in mean and extreme states of the climate or decadal climate prediction, demand the longest and more reliable climate information**
- **Historical climate series should be contemplated as global cultural heritage to be preserved, developed and made freely accessible**
- **The application of the ACMANT and HomeR methods on the long-term data-merged series leads to similar homogenised Tn and Tx products**
- **The data recovered together with existing data bases and other ongoing data-rescue efforts will provide an insight in the historical climatic variations over the southern and eastern parts of the Mediterranean Basin and will shed more light on the origins and the potential response of the overall Mediterranean climate to natural and anthropogenic forcing**



THANK YOU.....