From climate monitoring to climate watch – Europe's approach and challenges

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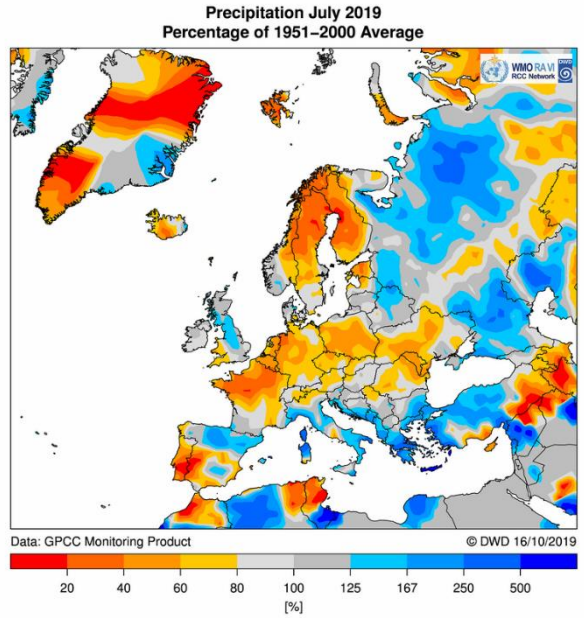
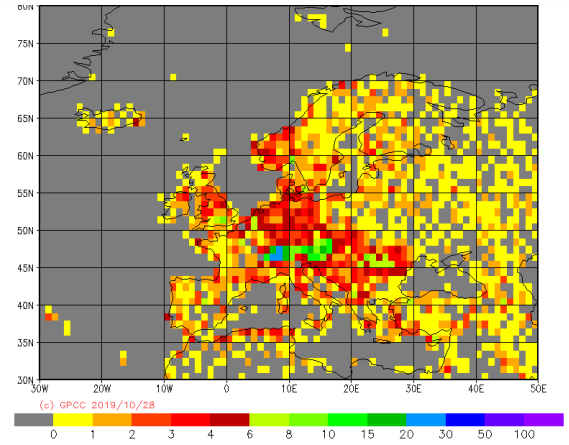
Overview

- Climate Observations – underlying basis for climate monitoring
- Climate Monitoring – putting data into a context
- Early Warning Systems – preparing for bad weather
- Climate Watch – early hints on extreme events, beyond weather forecast
- Challenges

Climate Observations

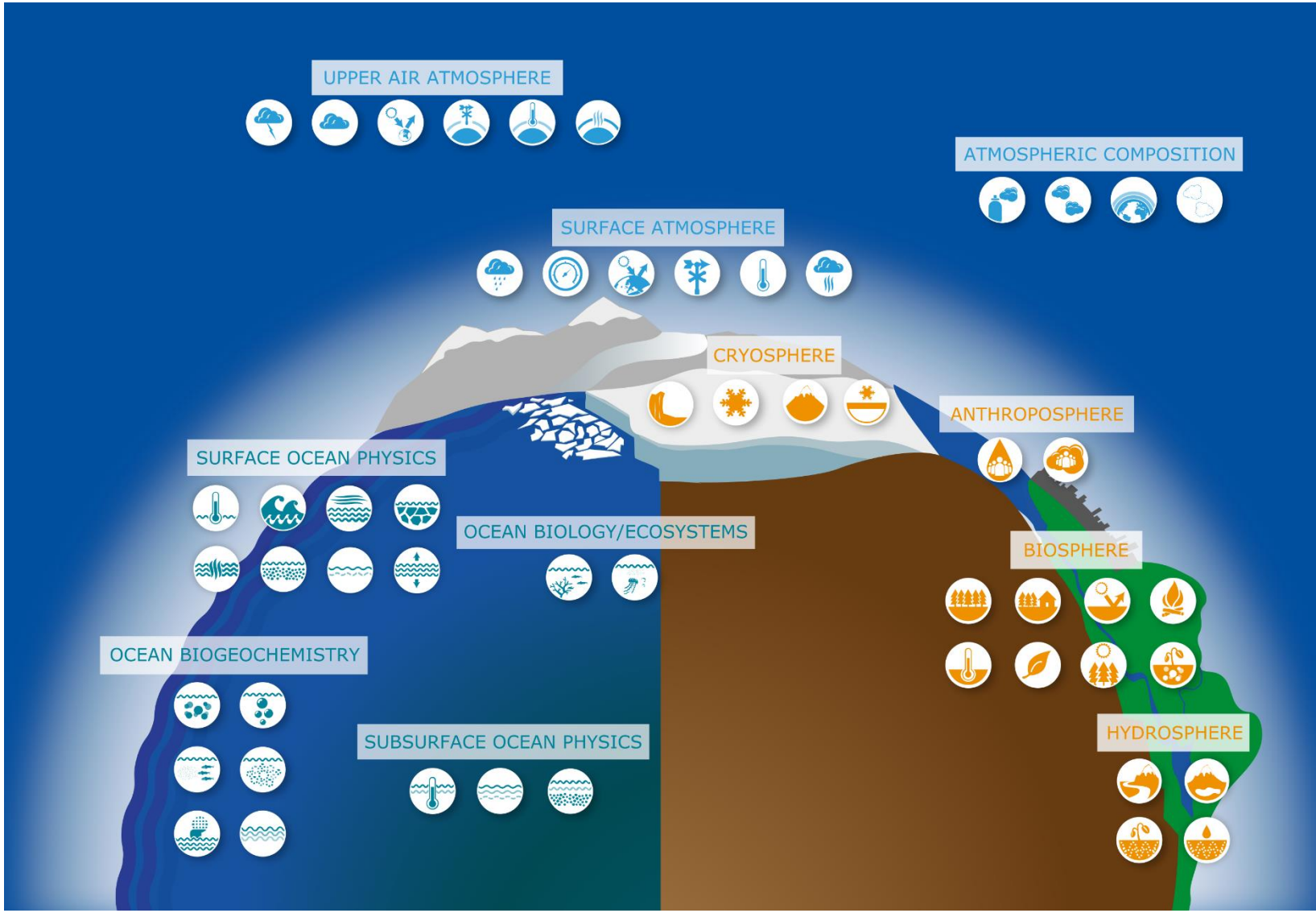
- „Weather is what you get, climate is what you expect“
- „Climate“ is statistics: average, mean, medium, extremes, percentiles
- The climate system comprises atmosphere, oceans and land
  - Global Climate Observing System (GCOS)
  - System of observing systems
  - In situ and remote sensing





Climate Observations

- Today **54 GCOS Essential Climate Variables (ECVs)** have been identified to characterize the climate system (at a global scale)
- „The Global Observing System for Climate: Implementation Needs" (GCOS-200) or **GCOS IP2016 identifies 201 actions needed for a functional and robust GCOS**



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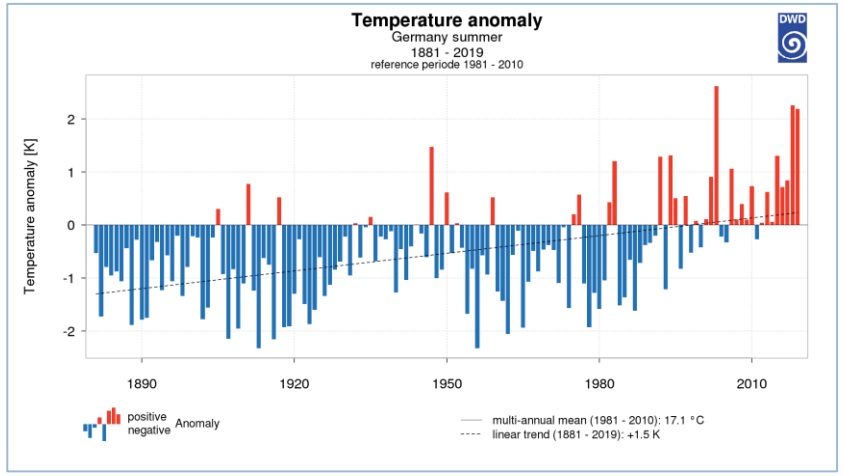
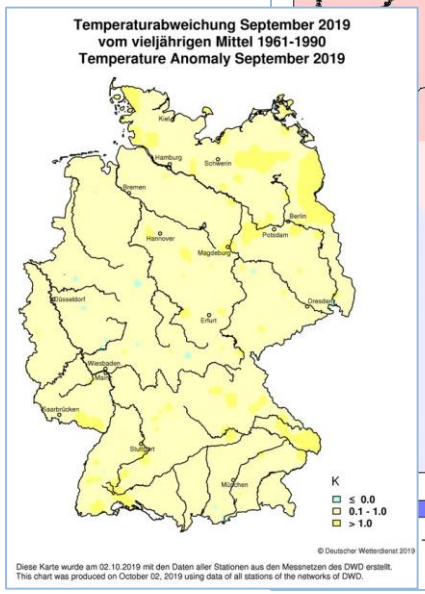
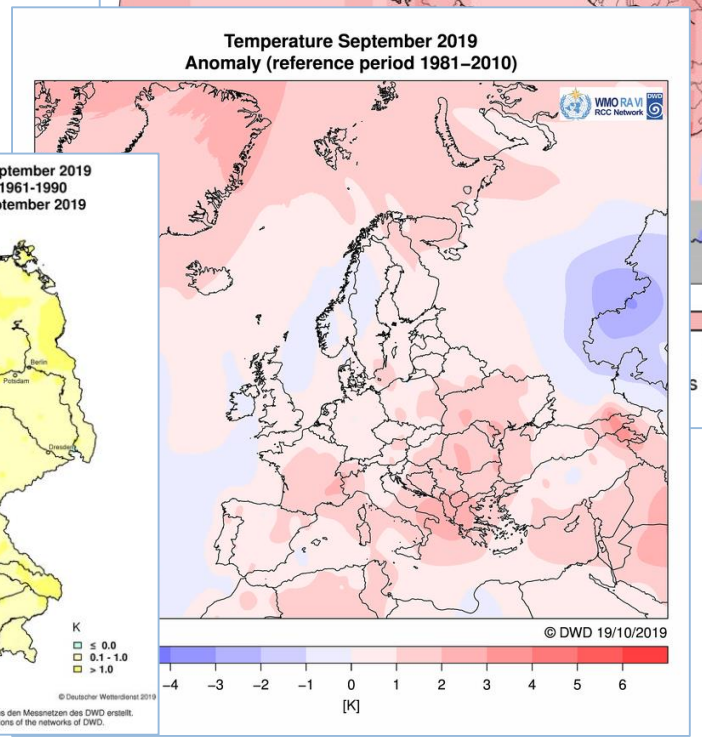
Measurement Domain	Essential Climate Variables (ECVs)
Atmospheric	Surface: Air temperature, Wind speed and direction, Water vapour, Pressure, Precipitation, Surface radiation budget. Upper-air: Temperature, Wind speed and direction, Water vapour, Cloud properties, Earth radiation budget, Lightning. Composition: Carbon Dioxide (CO_2), Methane (CH_4), Other long-lived greenhouse gases (GHGs), Ozone, Aerosol, Precursors for aerosol and ozone.
Oceanic	Physics: Temperature: Sea surface and Subsurface, Salinity: Sea Surface and Subsurface, Currents, Surface Currents, Sea Level, Sea State, Sea Ice, Ocean Surface Stress , Ocean Surface heat Flux Biogeochemistry: Inorganic Carbon, Oxygen, Nutrients, Transient Tracers, Nitrous Oxide (N_2O), Ocean Colour Biology/ecosystems: Plankton, Marine habitat properties
Terrestrial	Hydrology: River discharge, Groundwater, Lakes, Soil Moisture Cryosphere: Snow, Glaciers, Ice sheets and Ice shelves, Permafrost Biosphere: Albedo, Land cover, Fraction of absorbed photosynthetically active radiation, Leaf area index, Above-ground biomass, Soil carbon, Fire, Land Surface Temperature Human use of natural resources: Water use, GHG fluxes

Climate Monitoring

- Putting data into a context
- At least 30 years of observations
- Reference periods
- Time series
- Communicating information
  - Climate Services → GFCS

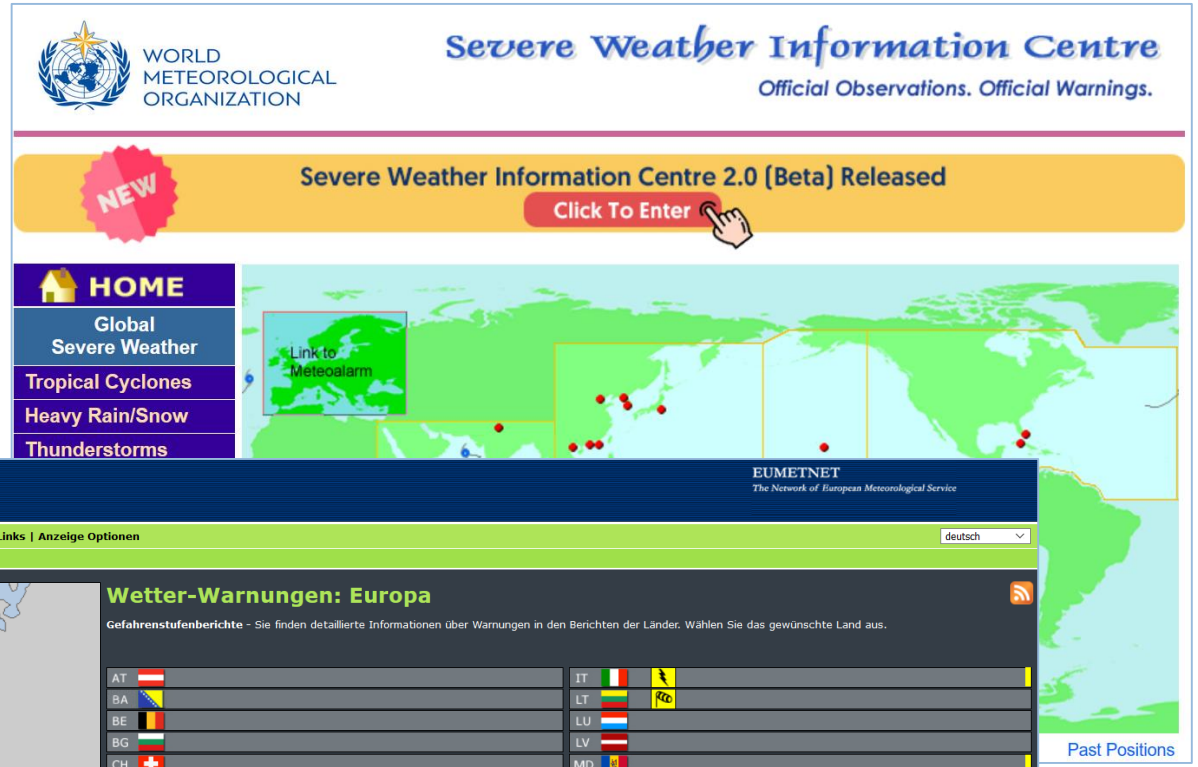


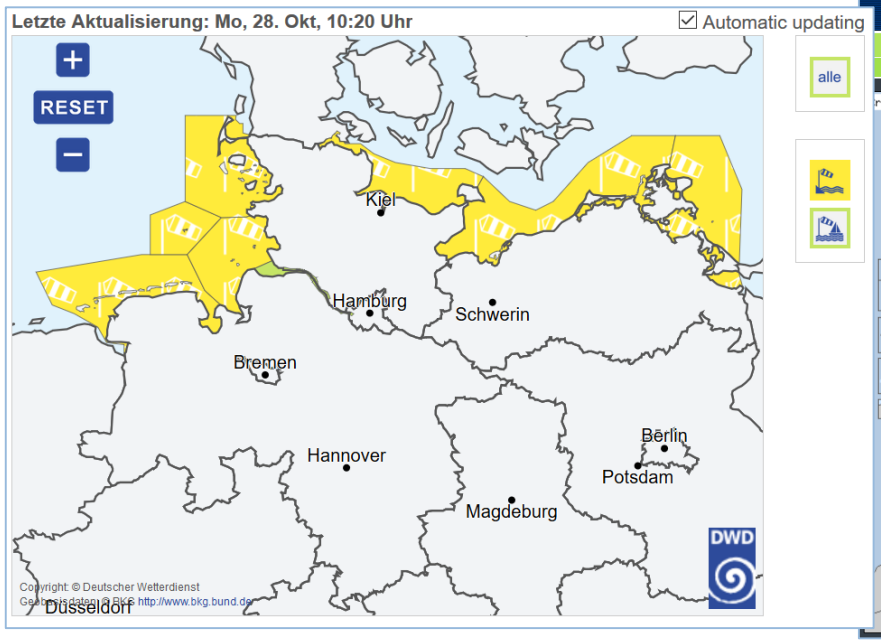


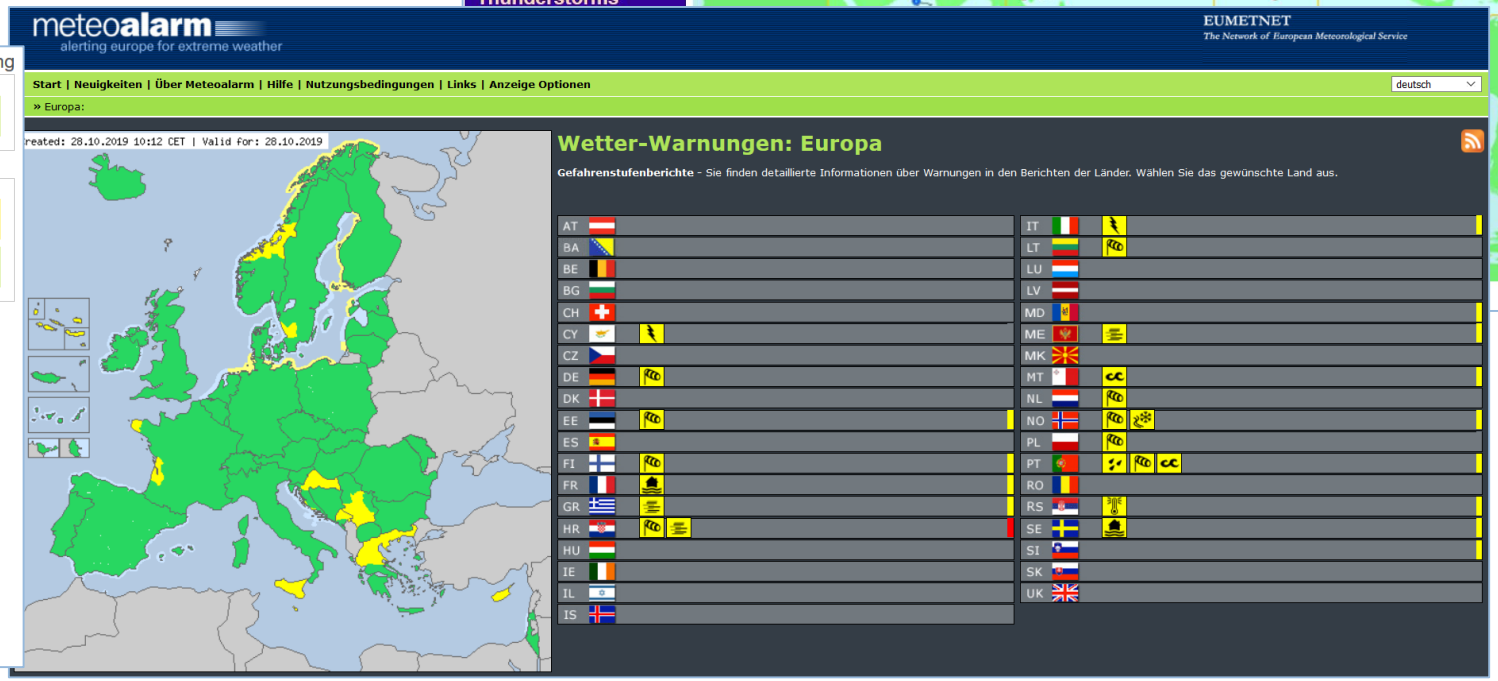


Early Warning Systems

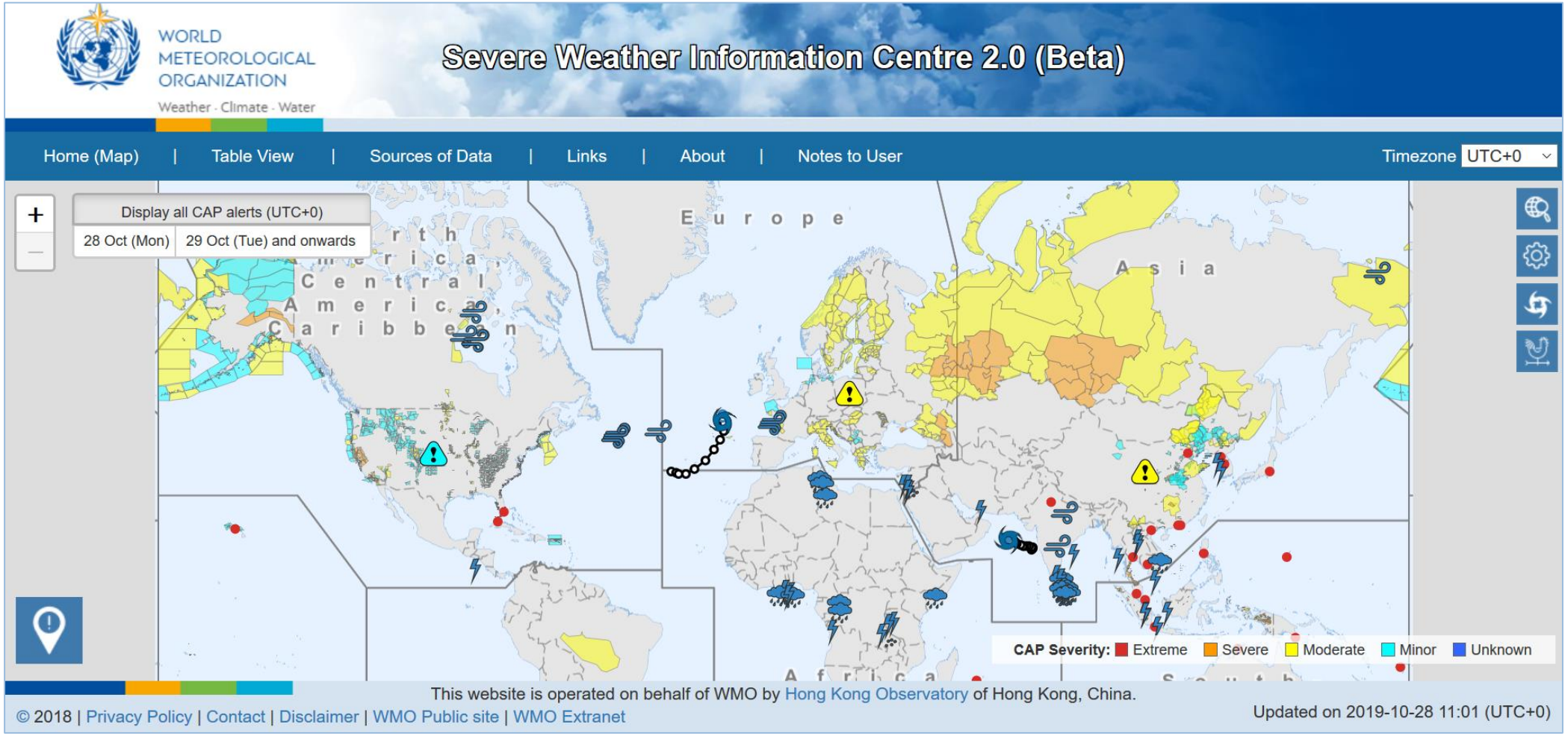
- From meteorological and hydrological towards **Multi-hazard Early Warning Systems (MHEWSs)**
- Are about extremes derived from climate information (statistics, long time series)







Early Warning Systems



Climate Watch System (CWS)

- **Mandatory function of any WMO Regional Climate Centre (RCC)**
- Example from WMO RA VI (Europe) RCC Network
- Goal: efficient monitoring and warning against extreme climate events
- Task: provides advisories and statements to inform users about evolving or foreseen climate anomalies at the regional and national levels, thus allowing them to make informed decisions.
- Input: RCC forecast and monitoring products
- RCC Network Node on Climate Monitoring issues advisories to NMHSs (after coordination with partners)
- NMHSs are responsible for tailored advisories/ warnings to end-users

Climate Watch Advisory

WMO RA VI RCC Network

Guidance on heavy precipitation **ID: 201901-t**

Area concerned: Greece, Turkey, Cyprus, Lebanon, Syria

Initial statement issued on 5 April 2019
Termination issued on 23 April 2019

Valid: Begin: on 5 April 2019 End: 23 April 2019

To: **Climate Watch focal points of NMHSs Greece, Turkey, Cyprus, Lebanon, Syria**

The RA VI RCC Network Offenbach Node on Climate Monitoring (RCC-CM) is responsible for providing Climate Watch guidance information for NMHSs' own consideration for issuing climate advisories for their territory.

After having consulted the consortium partners of the RCC-CM and RCC-LRF (RA VI RCC Network Toulouse and Moscow Node on Long-Range Forecasting), RCC-CM issues the following guidance information:

Due to the results from monthly forecasts we announce:

"The termination of the Climate Watch Advisory on heavy precipitation in the eastern Mediterranean subregion. "

This information should be used as guidance for the National Meteorological and Hydrological Services (NMHS) in a pre-operational mode. It is up to the above mentioned NMHSs to closely monitor the status and evolution of the current climate conditions and to consider issuing a national Climate Watch Advisory. RCC-CM would appreciate feedback from NMHS whether this information was helpful. Also, any suggestion on further pieces of information needed by NMHSs is highly welcomed!
Attached we provide you with a template for a national climate watch advisory as agreed among the climate watch pilots and RCC-CM.

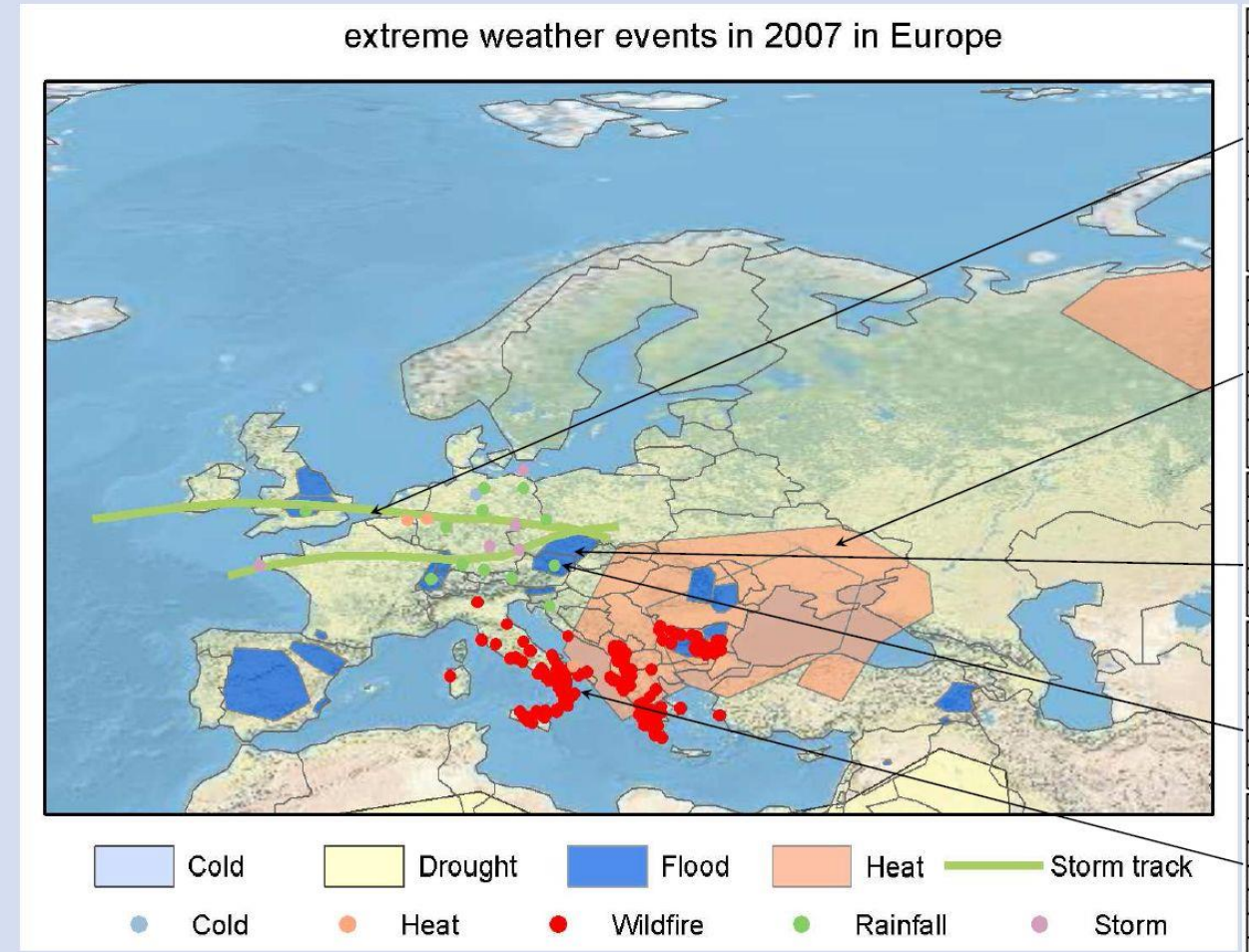
Please note that further information can be obtained from RCC-CM website (www.dwd.de/rcc-cm) concerning Climate Monitoring and from RCC-LRF websites (http://elaboration.seasonal.meteo.fr/en/content/bienvenue, http://neacc.meteoinfo.ru/forecast) concerning Long-Range Forecast or by e-mail to rcc.cm@dwd.de or rcc-lrf-mf@meteo.fr.
For ECMWF member's further information on monthly forecasts after logging in is provided at http://www.ecmwf.int/ ->Forecasts

We will monitor the evolution of the anomaly, issue updates if significant change arise and close the advice when no clear signal can be detected in the forecasts.

On behalf of the RCC-CM Team

Climate Watch System (CWS)

- Enhancing CWAs by adding information on impact of similar past events
- Since 2011 gathering of information on extreme events
  - Only major events with size of >1,000km and duration of ≥3days
- Source: mainly reports from media and NMHSs
- 2019: Res. 12 (WMO Cg-18): Cataloguing hazardous events



field	value
category	storm
begin	2007-01-17
end	2007-01-19
killed	46
damage (Million US$)	9,010
cyclone	Kyrill
source	EM-DAT
affected countries	NL, PL, SI, DK, AT, BY, BE, FR, DE, CH, GB, DE, CZ, UA

field	value
category	heat
begin	2007-07-01
end	2007-07-31
killed	506
source	EM-DAT
affected countries	MK, RS, SK, AL, AT, BA, HU

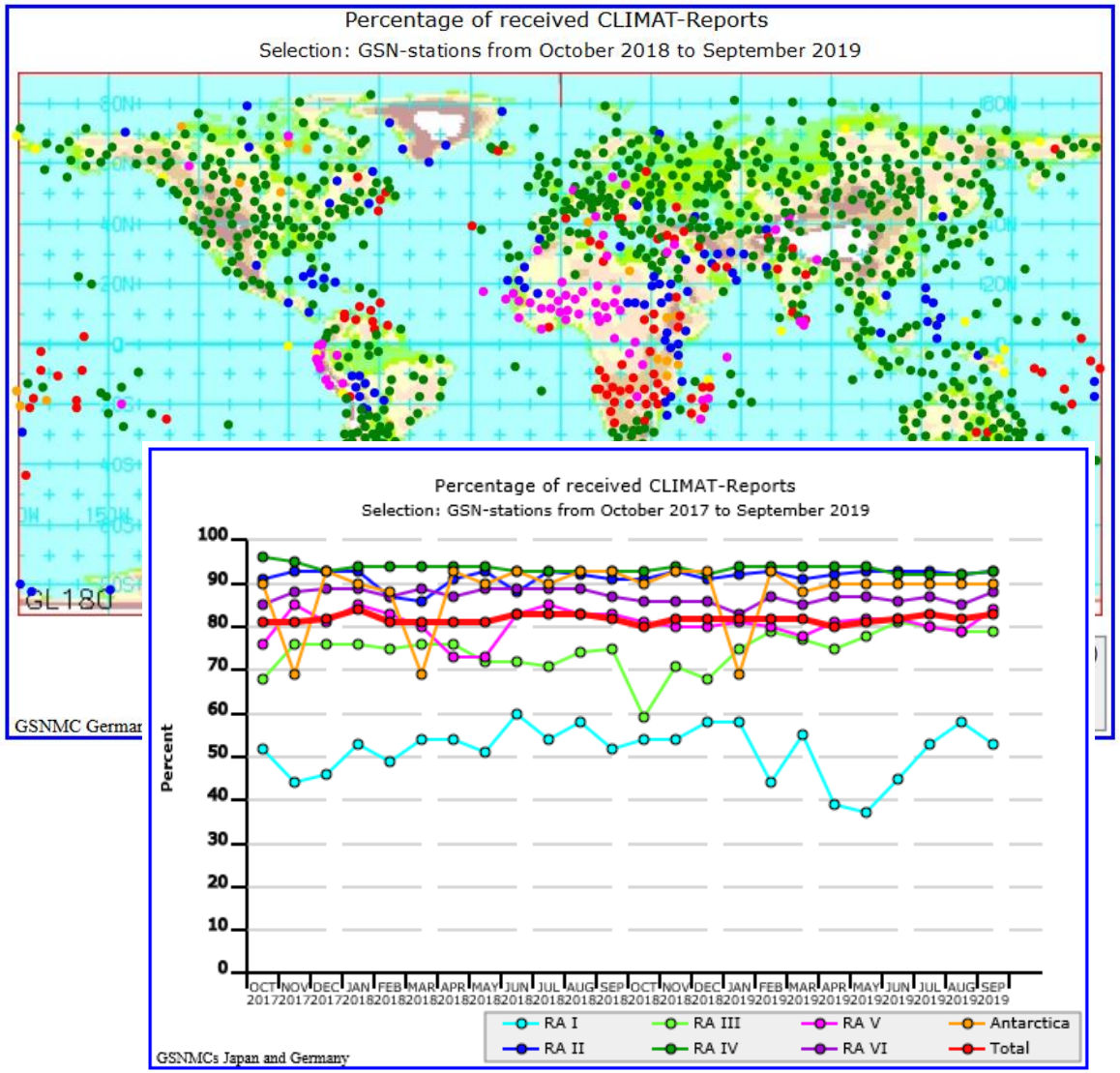
field	value
category	flood
begin	2007-09-06
end	2007-09-10
source	DFO
affected countries	CZ

field	value
category	rainfall
begin	2007-09-05
end	2007-09-08
source	KIT
cyclone	Xaver
affected countries	AT

field	value
category	wildfire
begin	2007-07-01
end	2007-08-31
source	EM-DAT
killed	11
affected countries	IT

Gaps – in observing systems

- Meteorological observing systems relevant to loss and damage are in place for more than 100 years in many countries
- Still there are gaps
  - Land areas without observations – mostly also no or very little population
  - Challenge to maintain observations over long enough time periods
  - Challenge to exchange information – lack of connectivity to communications networks
  - Digitizing historical data for electronic access/ use and data rescue
- Example GCOS Surface Network (GSN) performance



Gaps – in observing systems

- Resolution 74 (WMO Cg-18, 2019):
  Closing the Capacity Gap: Scaling up effective Partnerships for Investments in sustainable and cost-efficient Infrastructure and Service Delivery
  - Alliance for Hydromet Development to be launched at COP 25
  - Supported by WMO Country Support Initiative (WMO CSI)
  - Works towards development of a "Systematic Observation Financing Facility" (SOFF)

https://www.flickr.com/photos/deutscherwetterdienst/

Thank you for your attention!

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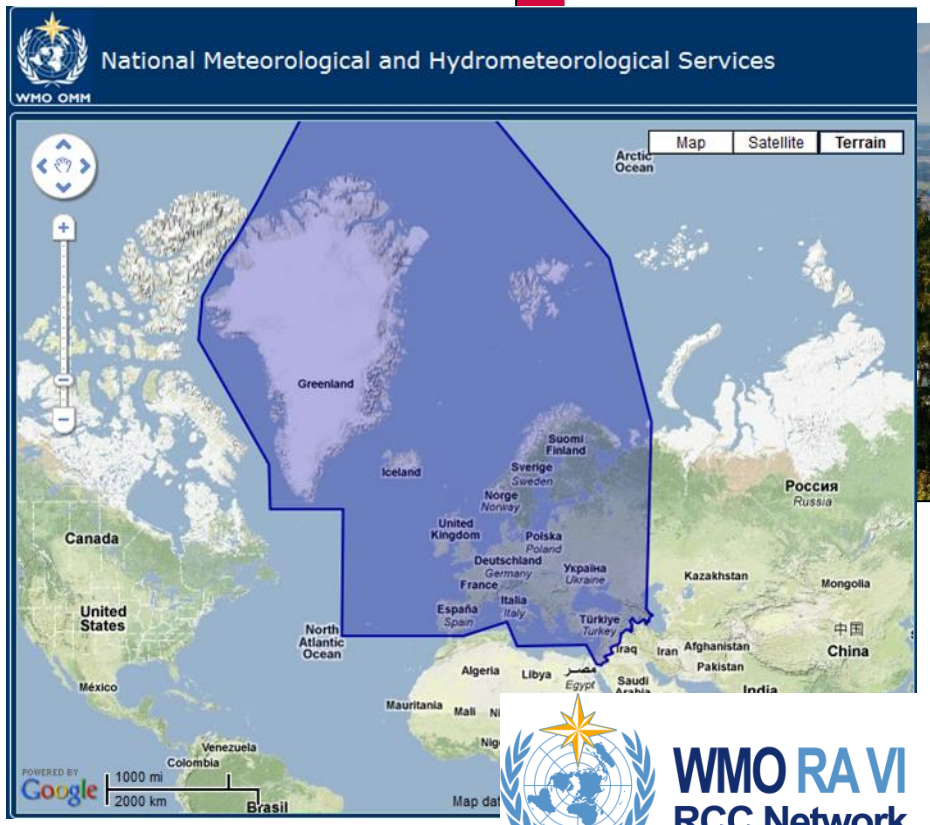

WMO RA VI
RCC Network