POLJOPRIVREDNI FAKULTET UNIVERZITET U NOVOM SADU
PFNS
DEPARTMAN ZA RATARSTVO I POVRTARSTVO

UNIVERSITÀ DEGLI STUDI FIRENZE
DISPAA
DIPARTIMENTO DI SCIENZE DELLE PRODUZIONI AGROALIMENTARI E DELL'AMBIENTE

UNIVERSITAET FUER BODENKULTUR WIEN
BOKU
DEPARTMENT FÜR WASSER-ATMOSPHÄRE-UMWELT

EUROPEAN COMMISSION
Horizon 2020
EUROPEAN UNION FUNDING FOR RESEARCH & INNOVATION

Serbia for Excell

H2020-TWINN-2015

Meteorological data: sources, representativeness & use + Brčko

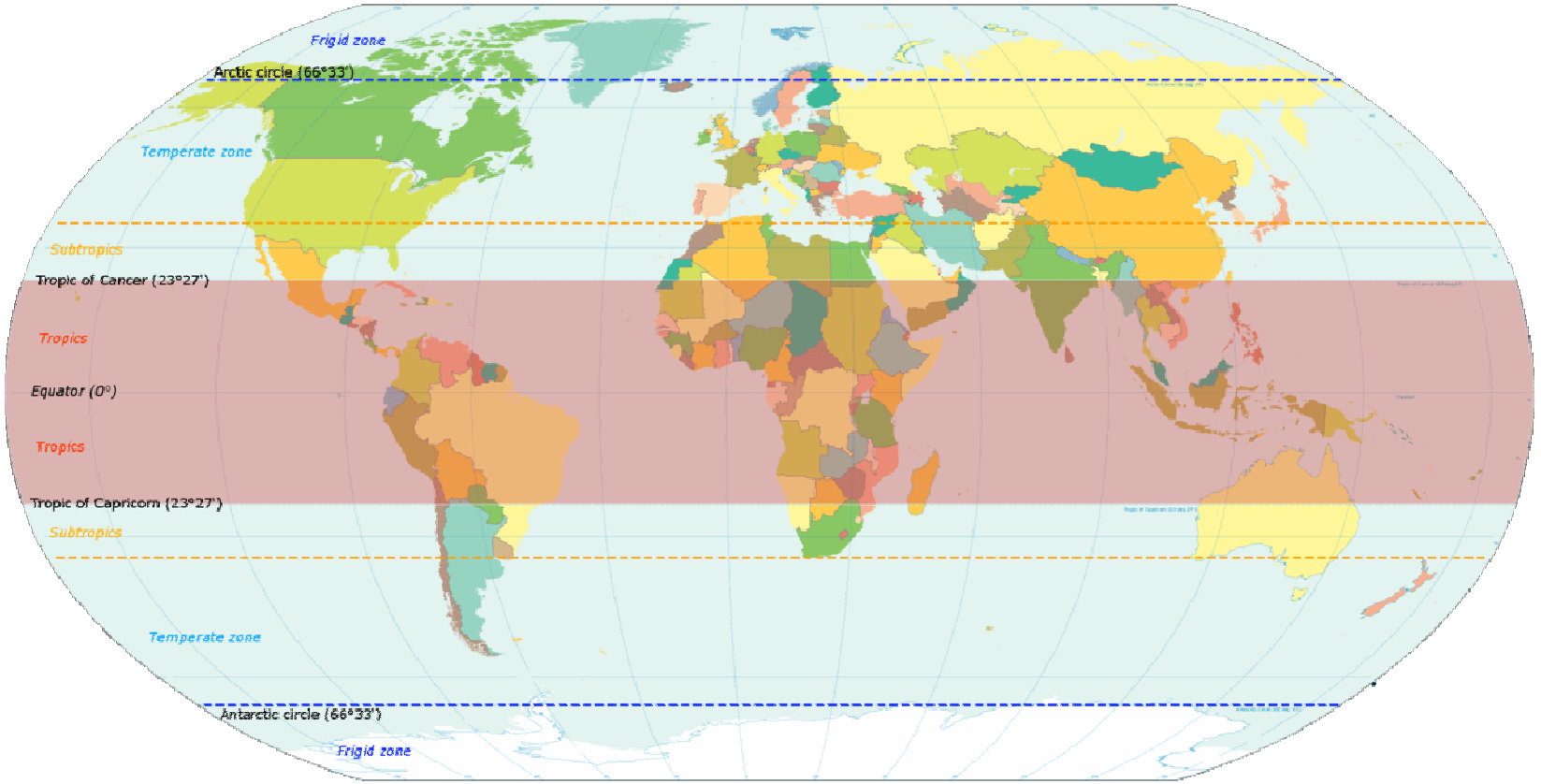
Ao. Prof. Branislava Lalic

Institution: Faculty of Agriculture, University of Novi Sad, Novi Sad, Serbia

Guest lecture

9 May 2018
Vienna, Austria

Meteorological data sources, representativeness & use: Chalanges of tropical weather monitoring and forecasting



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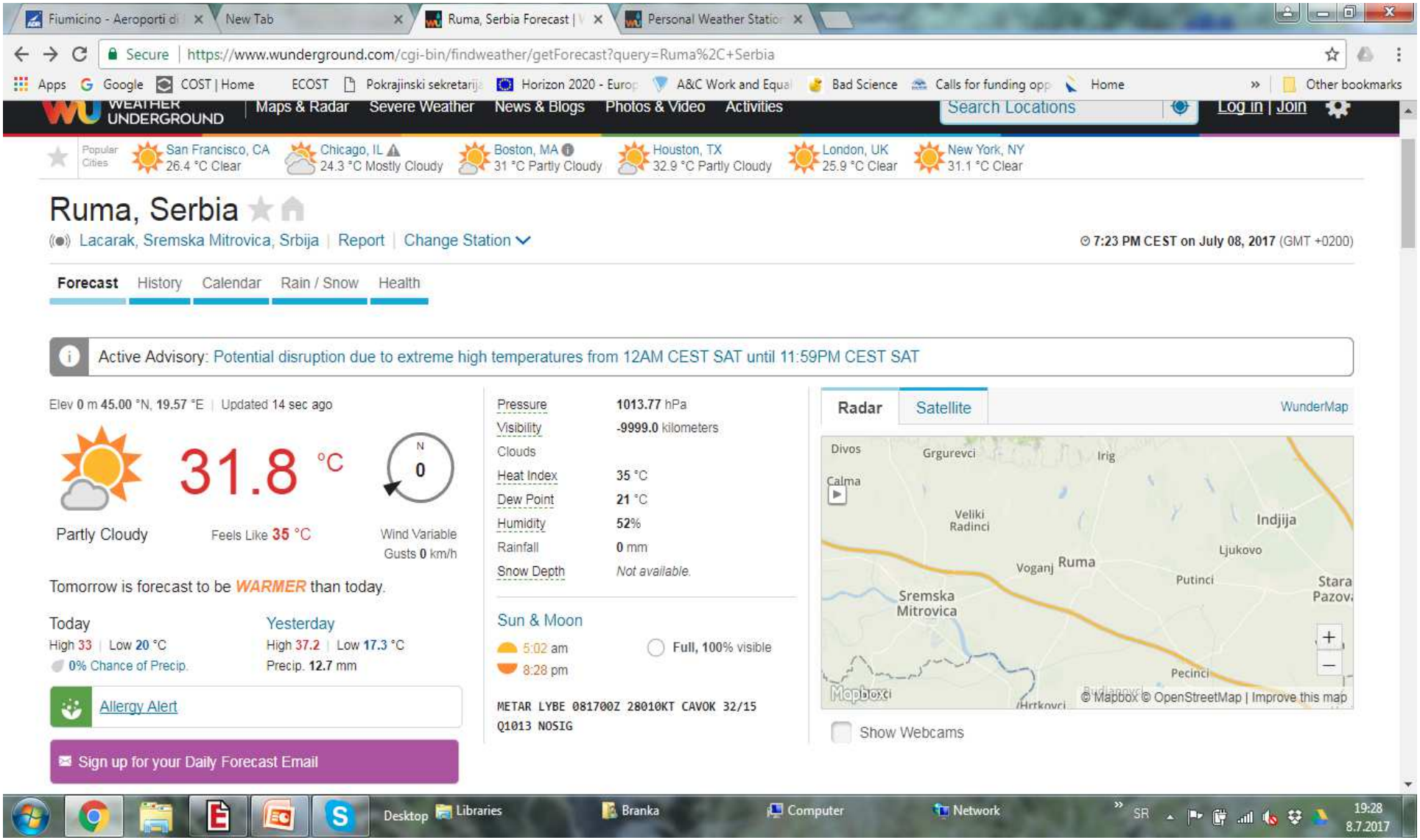
European Commission

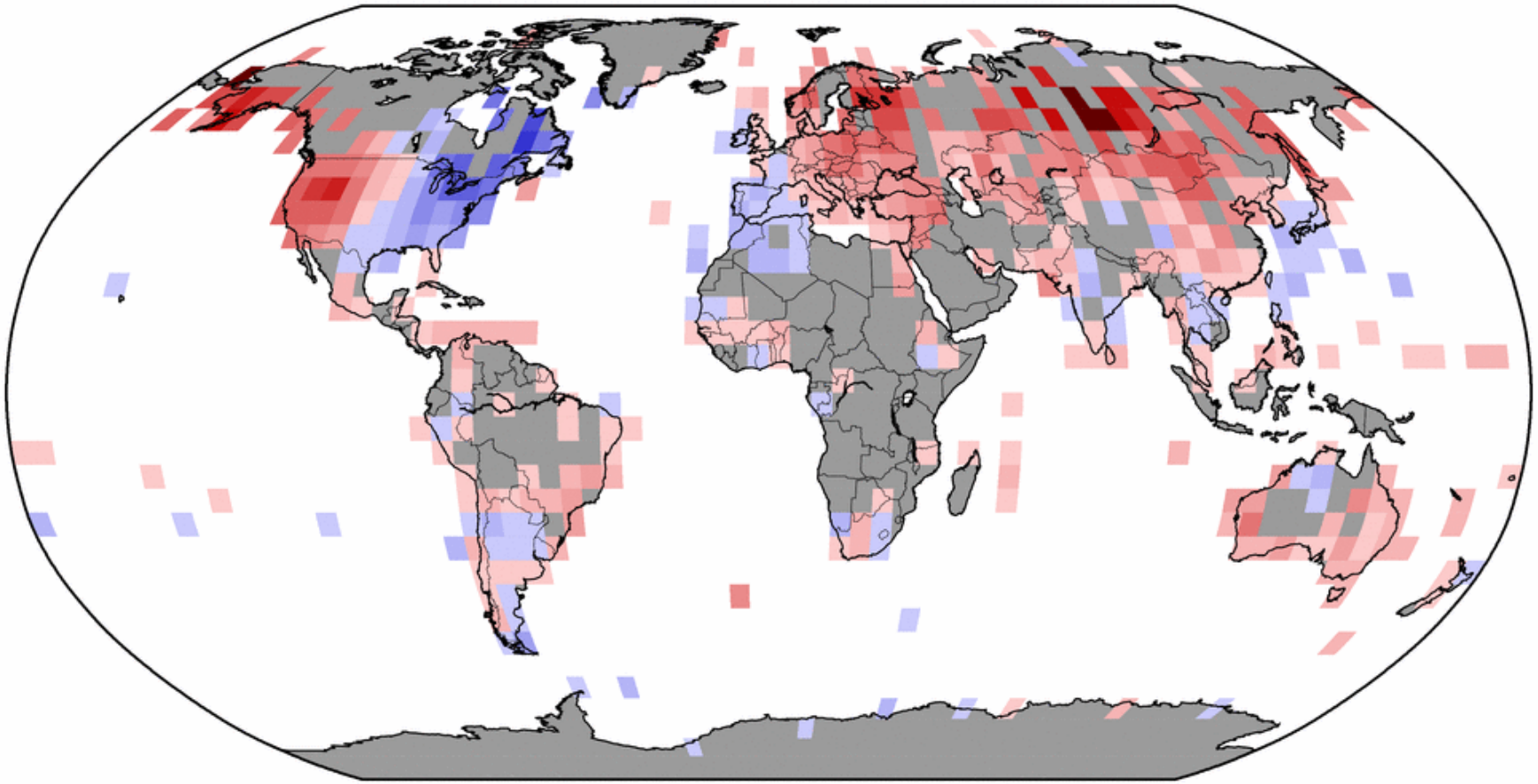
WHEATHER DATA – AVAILABLE MORE THAN EVER



Land–Only Temperature Departure from Average Dec 2014–Feb 2015

(with respect to a 1981–2010 base period)

Data Source: GHCN–M version 3.2.2



−5 −4 −3 −2 −1 0 1 2 3 4 5

Degrees Celsius

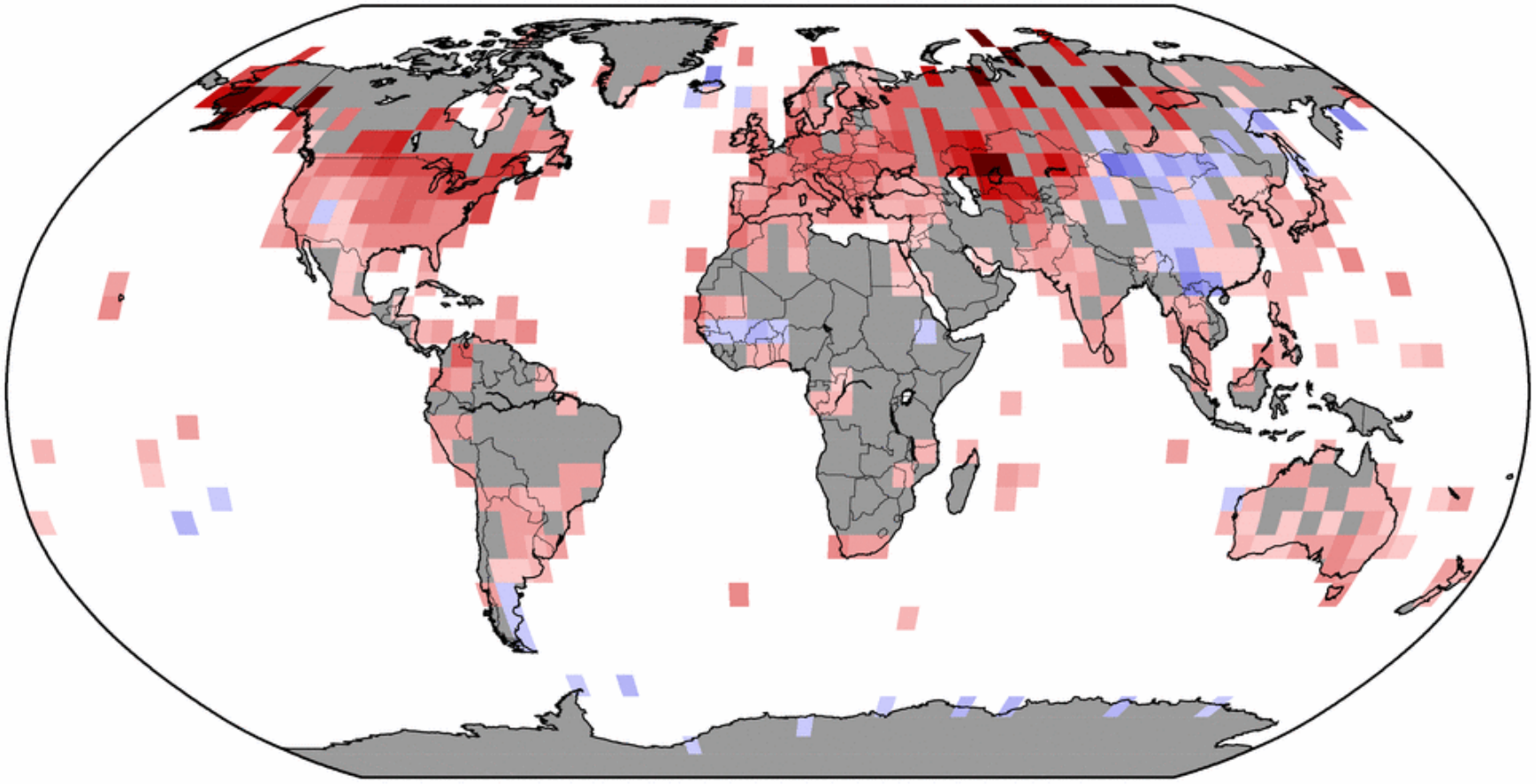
NOAA's National Climatic Data Center
Sun Mar 15 19:10:34 EDT 2015

Please Note: Gray areas represent missing data
Map Projection: Robinson

Land–Only Temperature Departure from Average Dec 2015–Feb 2016

(with respect to a 1981–2010 base period)

Data Source: GHCNM v3.3.0



−5 −4 −3 −2 −1 0 1 2 3 4 5

Degrees Celsius

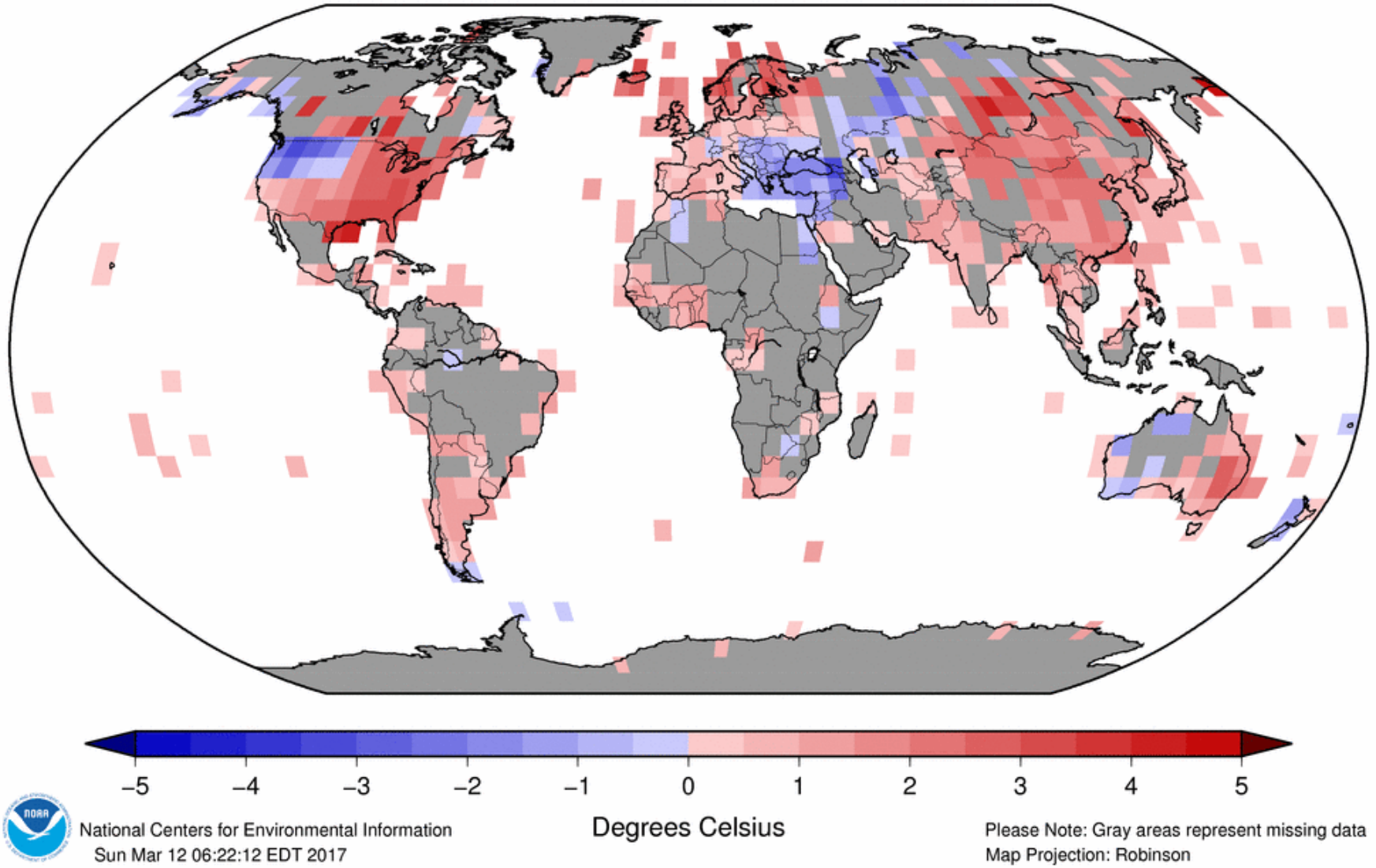
National Centers for Environmental Information
Mon Mar 14 06:20:13 EDT 2016

Please Note: Gray areas represent missing data
Map Projection: Robinson

Land–Only Temperature Departure from Average Dec 2016–Feb 2017

(with respect to a 1981–2010 base period)

Data Source: GHCNM v3.3.0

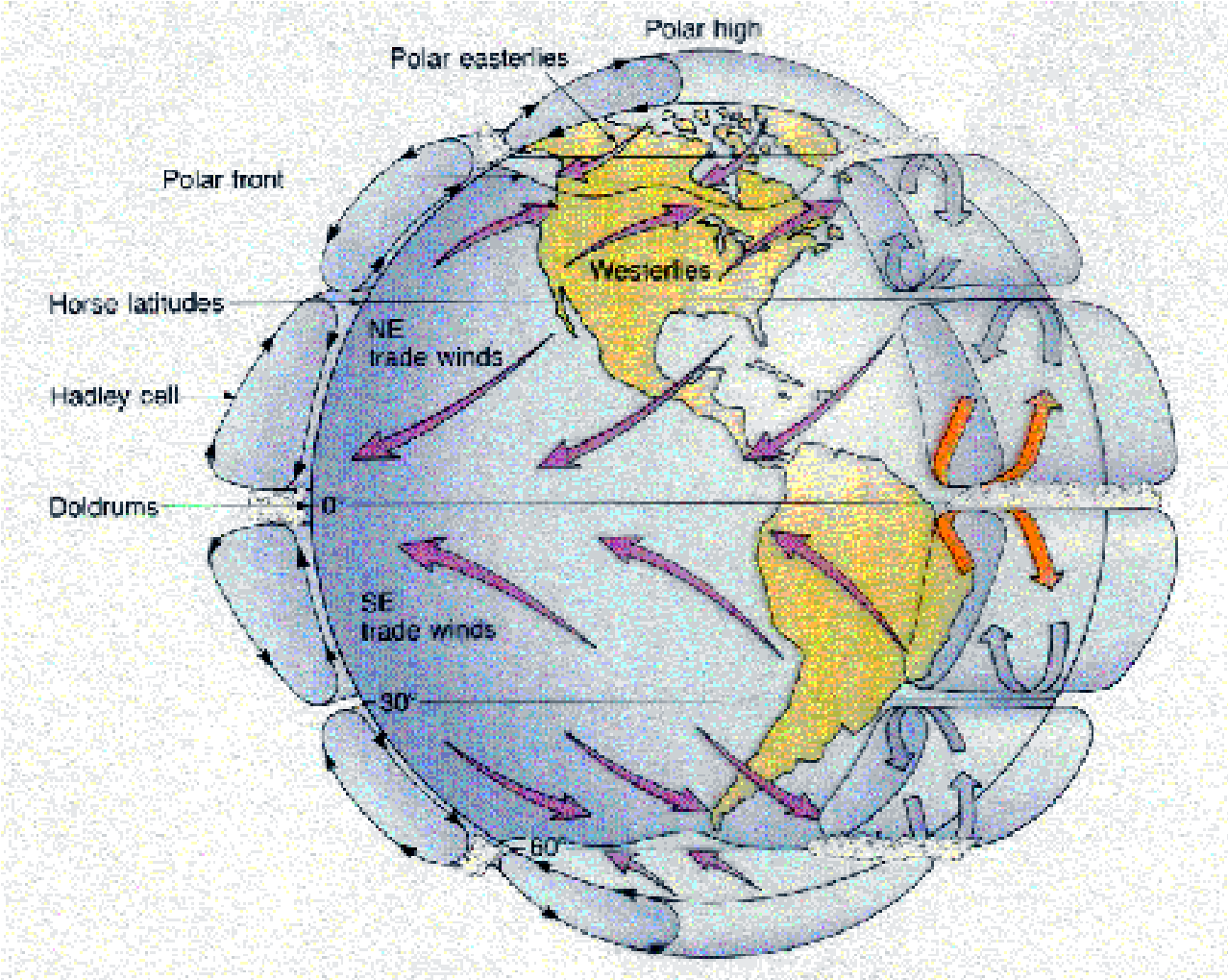


Region	Dates	Change (days)
Novi Sad	13.03.2015.	- 58
	14.01.2016.	
Bačka Topola	19.03.2015.	- 58
	20.01.2016.	
Pančevo	12.03.2015.	- 26
	15.02.2016.	
Ruma	22.02.2015.	- 53
	31.12.2015.*	
Sombor	03.03.2015.	- 73
	21.12.2016.*	

GROWING PROBLEM

Shift in appearance of "four tillers detectable" - growing stage of winter wheat in Serbia (Source: PIS Serbia).

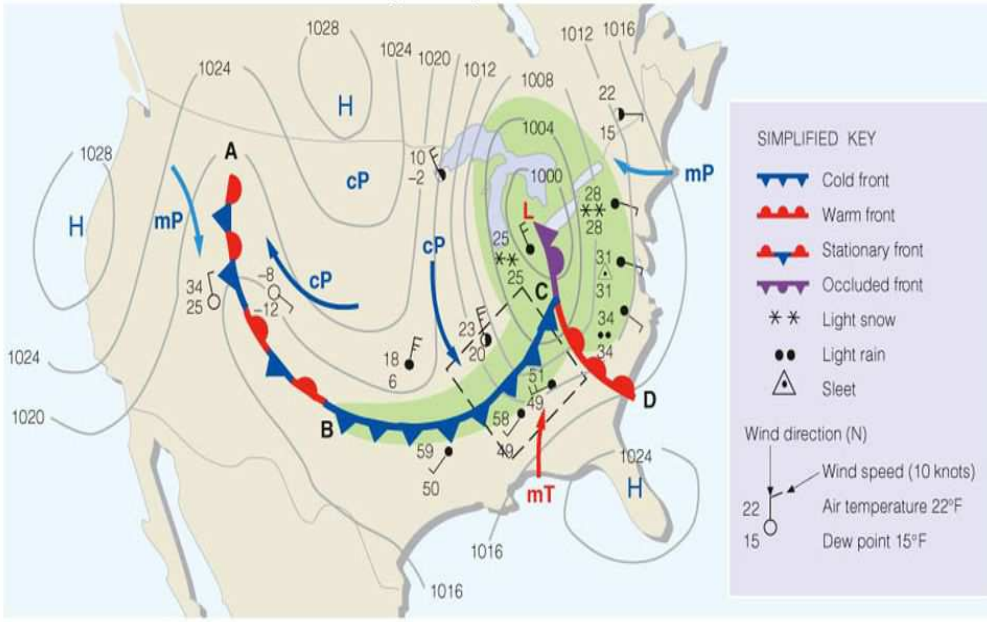
Chalanges of tropical weather monitoring and forecasting

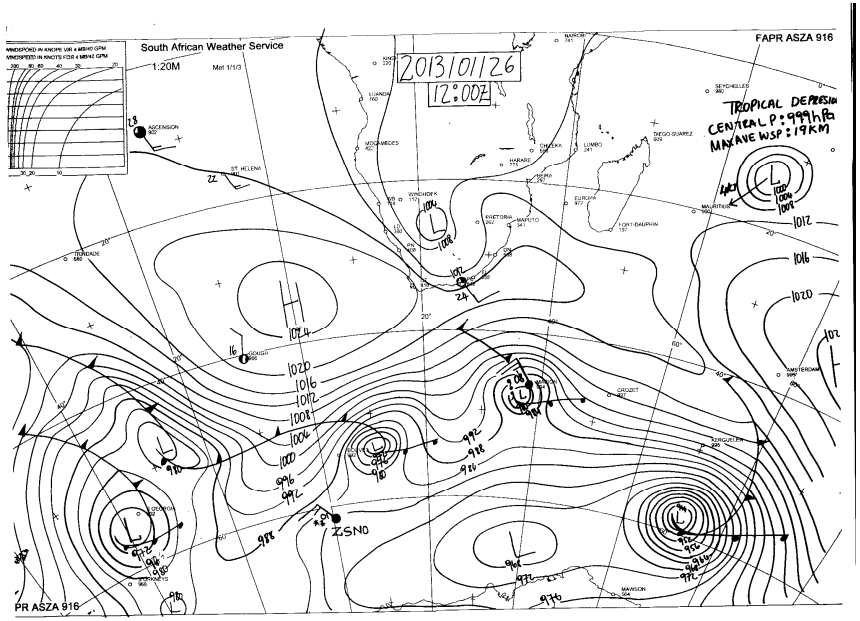


Chalanges of tropical weather monitoring and forecasting

Weather Map

- Shown: surface-pressure systems, air masses, fronts, isobars, winds and air flow (large arrows)
- Green-shaded area: precipitation





Tropical weather systems

Synoptic scale

- Most hazardous - tropical cyclones.

- At high elevations in the Americas, Africa, and Asia – blizzards.

- Cold fronts in the subtropics and tropics (pushed by strong extratropical cyclones during the cool season) bring heavy rain, strong winds and severe weather in prefrontal troughs.

- The monsoon regimes of the tropics generate monsoon depressions, monsoon gyres, and tropical cyclones

Tropical weather systems

Other scales

- Within the large-scale pattern set up by the synoptic environment are mesoscale and convective-scale systems

- Scales of tropical convection occurs at a range of scales: isolated thunderstorms (1-10 km, hour), mesoscale convective systems (100-500 km, day), synoptic-scale superclusters (1000-4000 km, week), and the Madden-Julian Oscillation (~10000 km, weeks to months).

Sources of meteorological data

Measured data

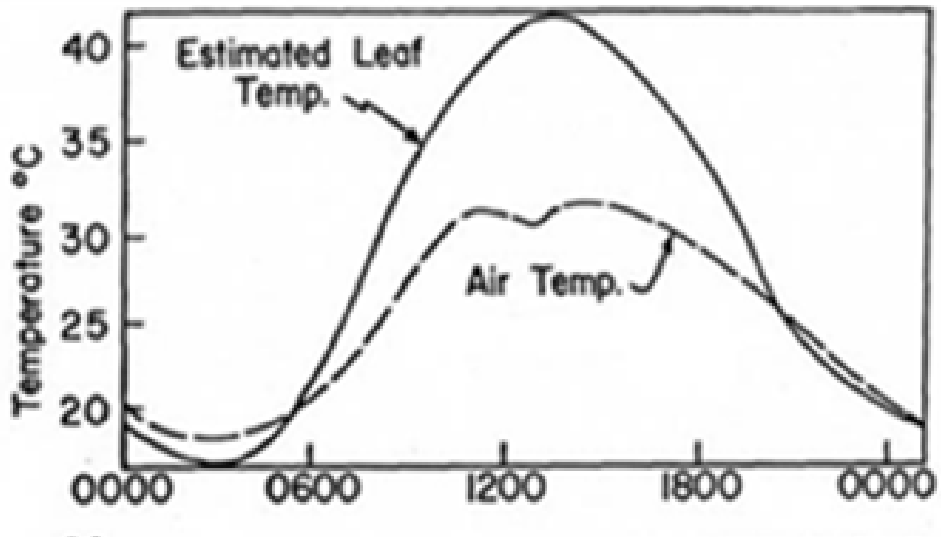
- NHMI observation network – *in situ*
- AWS network for special purposes – *in situ*
- Radars - remote
- Satelite measurements - remote
- GCOS - https://public.wmo.int/en/programmes/global-climate-observing-system

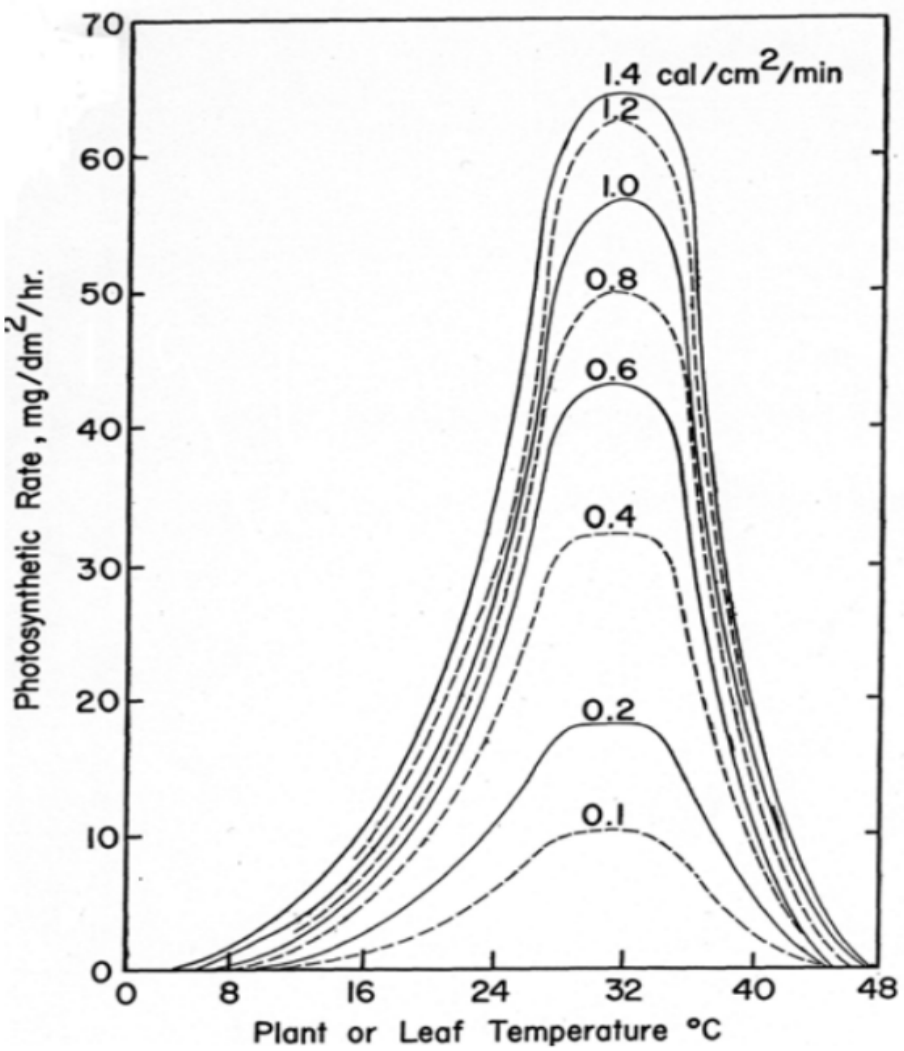
Forecasted data

- Short-range weather forecast (out to 5 days)
- Medium-range weather forecast (out to 15 days)
- Monthly forecast (out to 30 days)
- Seasonal forecast (out to 7 months)
- Climate model simulations (decades)

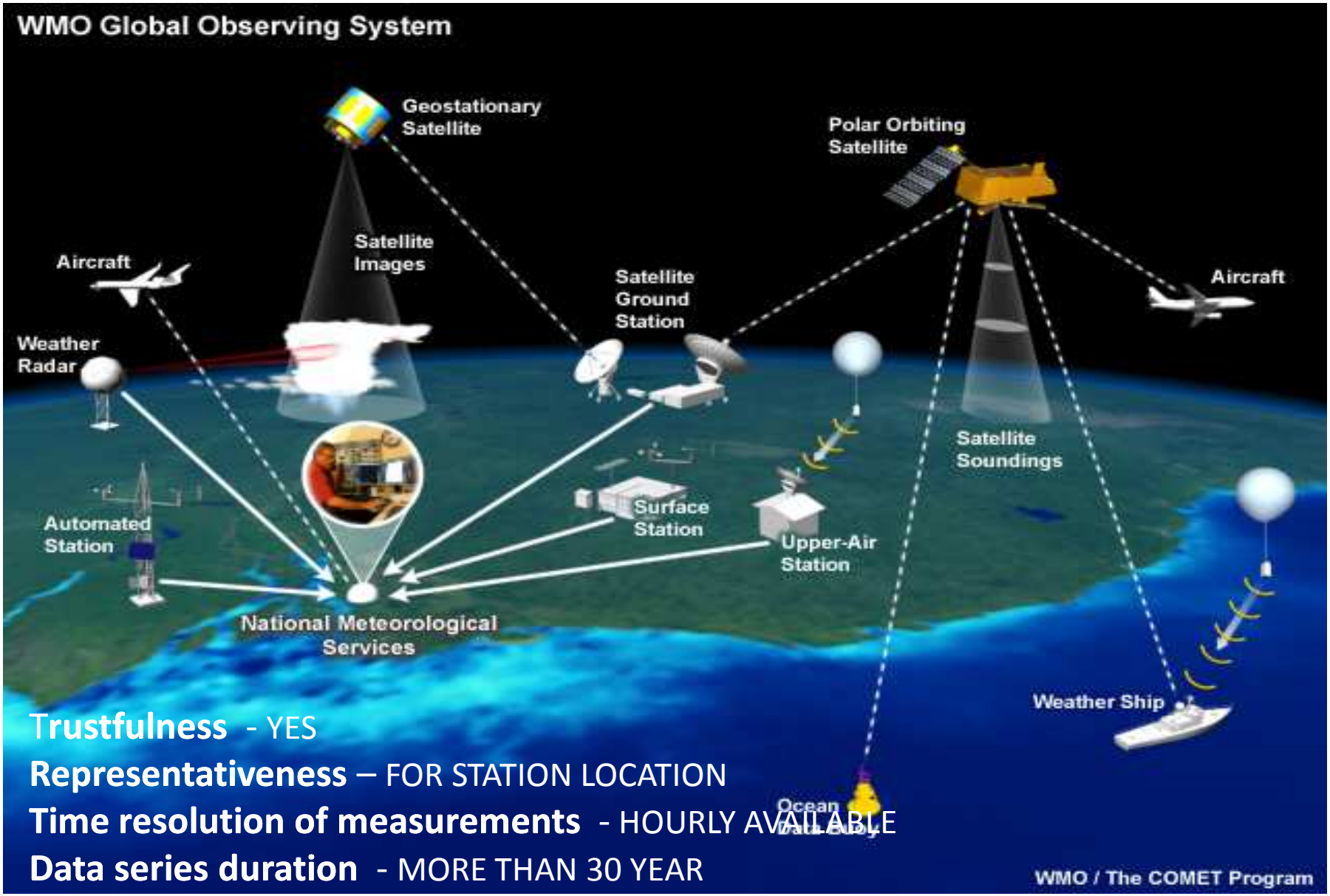
Sources of meteorological data

Trustfulness
Representativeness
Time resolution of measurements
Data series duration





Sources of meteorological data: Measured data



Trustfulness - YES

Representativeness – FOR STATION LOCATION

Time resolution of measurements - HOURLY AVAILABLE

Data series duration - MORE THAN 30 YEAR

Sources of meteorological data: Measured data

NHMI observation network

Trustfulness - YES

Representativeness – FOR STATION LOCATION

Time resolution of measurements - HOURLY AVAILABLE

Data series duration - MORE THAN 30 YEAR

Sources of meteorological data: Measured data

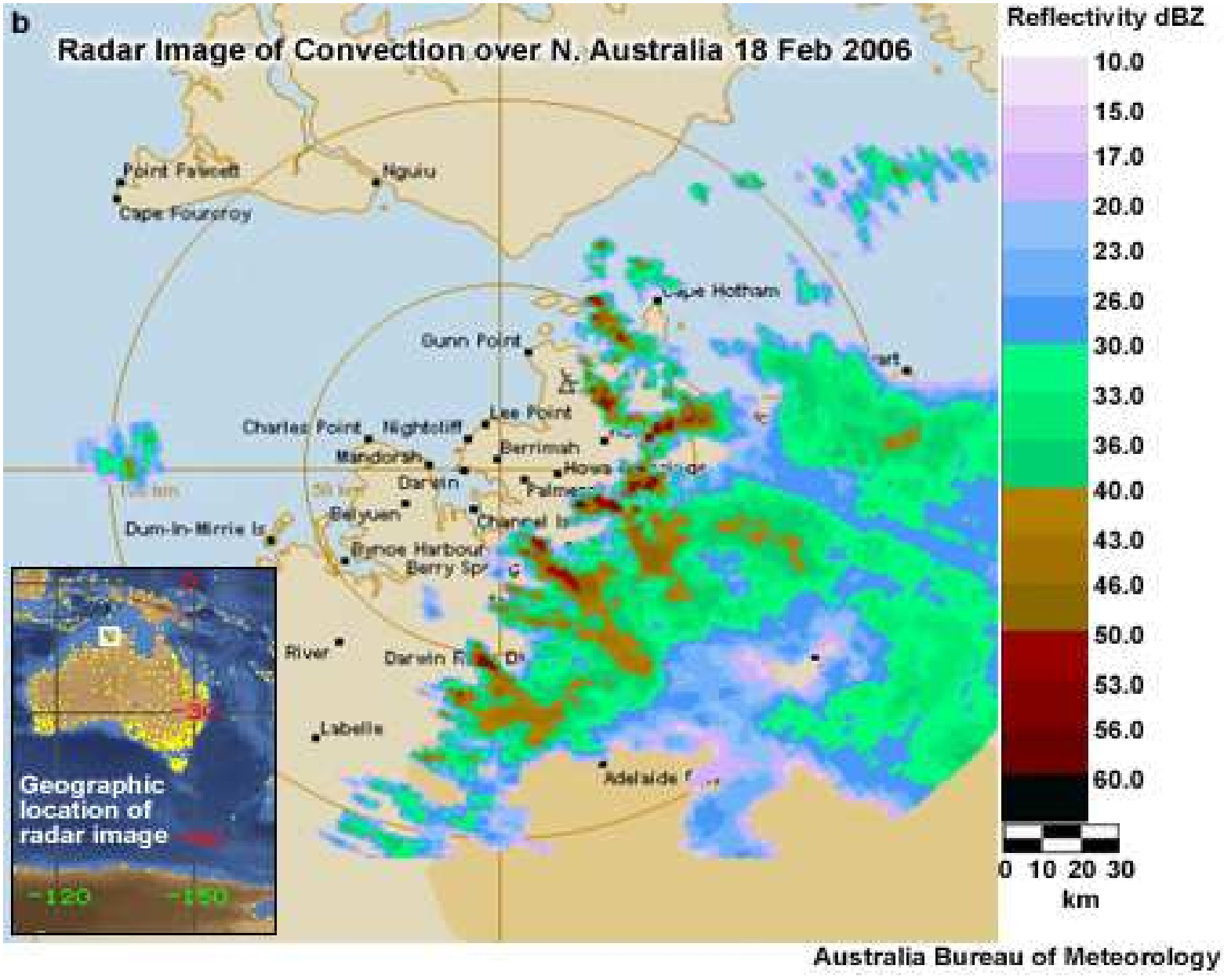
AWS network for special purposes

Trustfulness - YES/NO

Representativeness – DEPENDS ON NETWORK DESIGN (NOT IN CANOPY, SWITCHED LOCATION WITHOUT METADATA AVAILABLE)

Time resolution of measurements - COMMONLY HOURLY AVAILABLE

Data series duration - COMMONLY FOR VEGETATION PERIOD ONLY


b
Radar Image of Convection over N. Australia 18 Feb 2006
Reflectivity dBZ
10.0
15.0
17.0
20.0
23.0
26.0
30.0
33.0
36.0
40.0
43.0
46.0
50.0
53.0
56.0
60.0
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km
Point Fawcett
Cape Fourcroy
Nguiu
Gunn Point
Lee Point
Charles Point
Nightcliff
Berrimah
Mandorah
Darwin
Palmerston
Belyuen
Dum-In-Mirrie Is
Channel Is
Bynoe Harbour
Berry Spr
River
Darwin R
Labelle
Adelaide
Geographic location of radar image
Australia Bureau of Meteorology

Sources of meteorological data: Measured data

Radar measurements

Trustfulness - YES BUT AWARNES OF LIMITATIONS IS IMPORTANT

Representativeness – FOR CERTAIN TYPES OF CLOUDS OUT OF "RADAR SHADOW"

Time resolution of measurements - N/A

Data series duration - N/A

Sources of meteorological data: Measured data

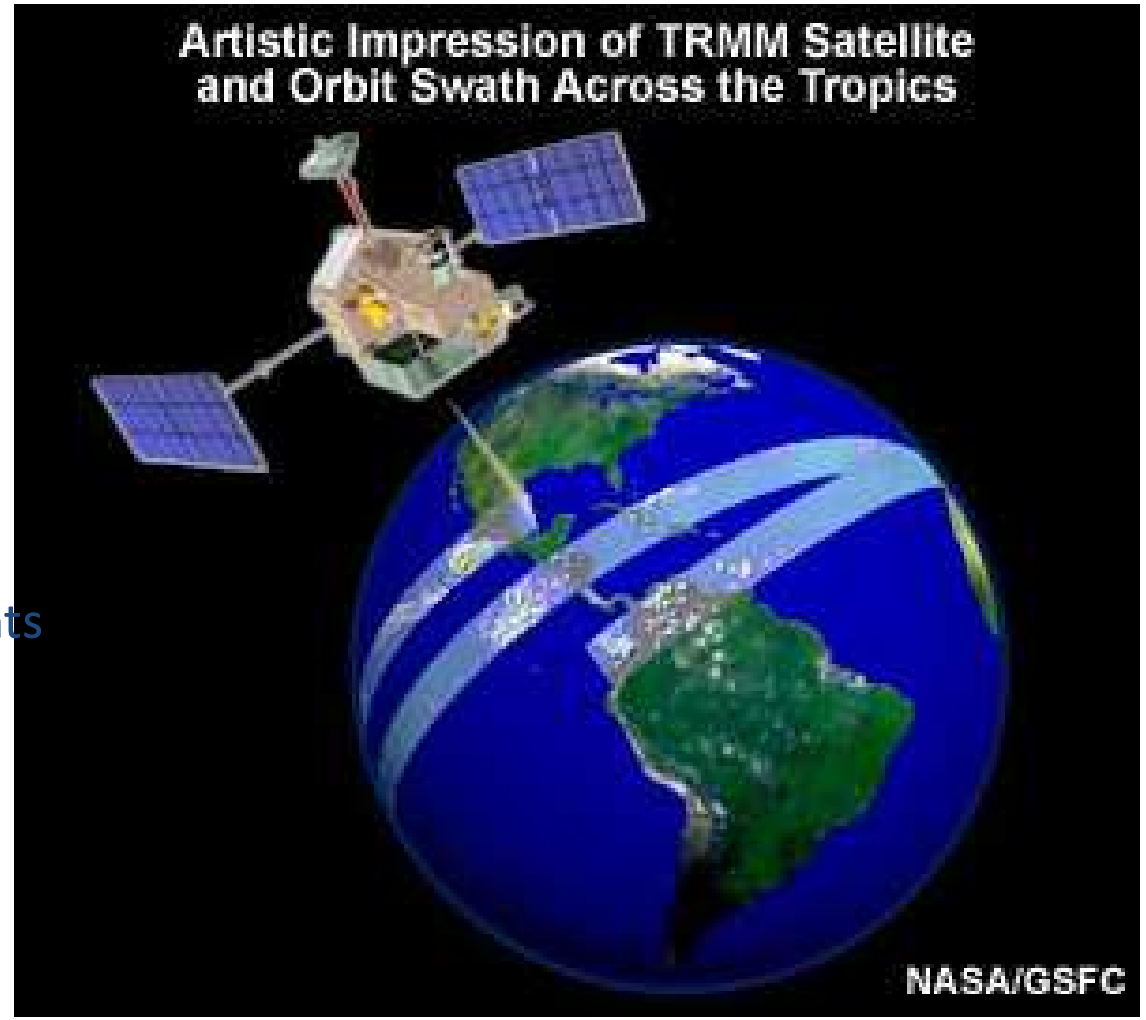
Satelite measurements

Trustfulness - YES (LIMITATIONS ARE IMPORTANT ISSUE)

Representativeness – ON RESOLUTION INDICATED

Time resolution of measurements - N/A

Data series duration - N/A



Sources of meteorological data: Measured data

Global Climate Observing System (GCOS)

Trustfulness - YES

Representativeness – FOR STATION LOCATION

Time resolution of measurements - HOURLY AVAILABLE

Data series duration -

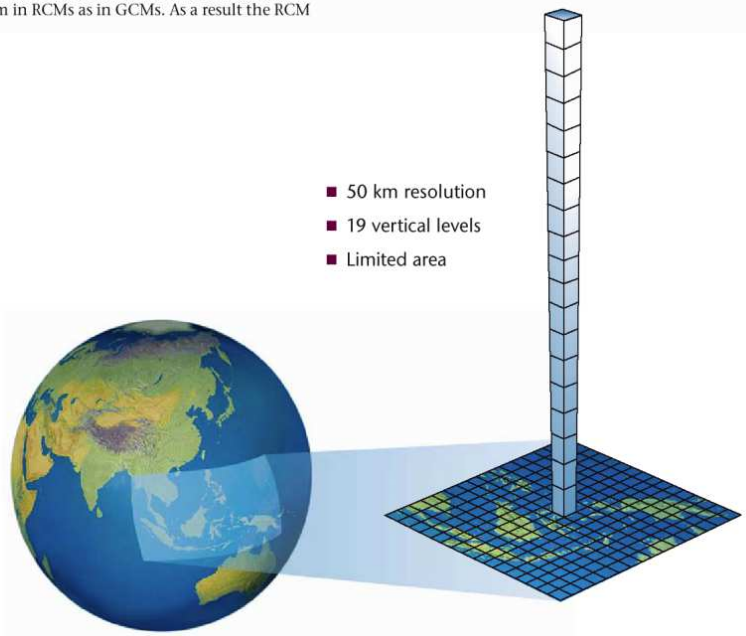
https://public.wmo.int/en/programmes/global-climate-observing-system

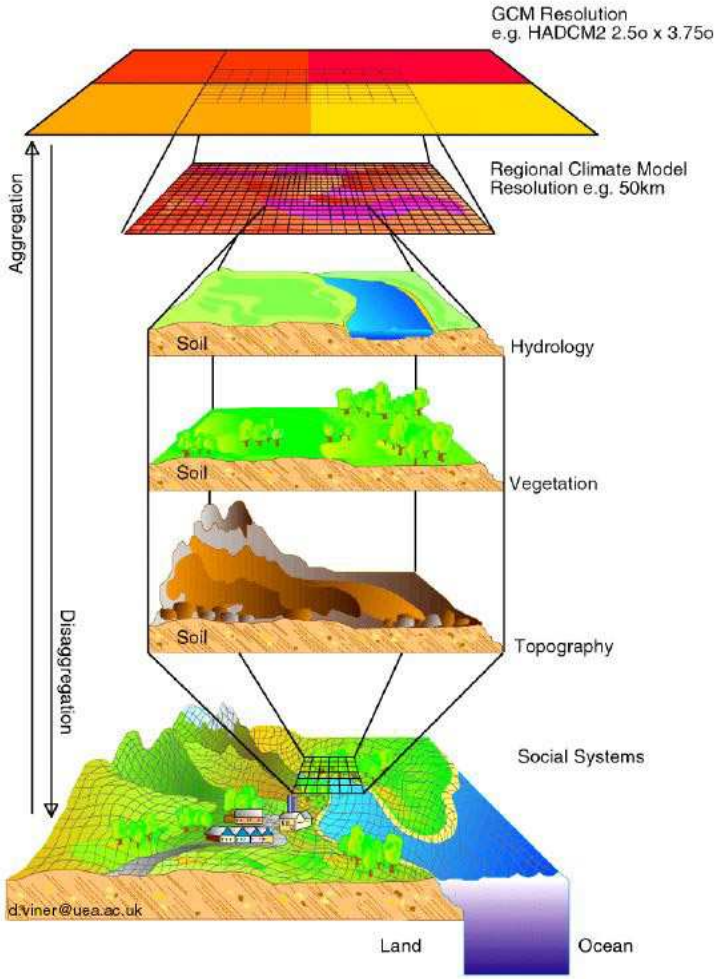
WEATHER FORECAST ACCURACY …

WEATHER FORECAST ACCURACY – EARTH FROM NWP MODEL "PERSPECTIVE"

...

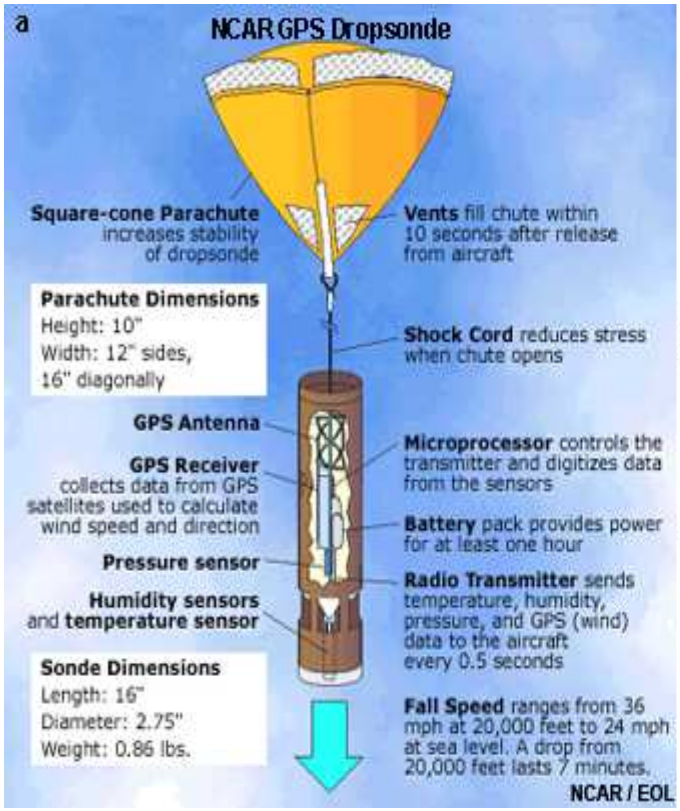
climate system in RCMs as in GCMs. As a result the RCM

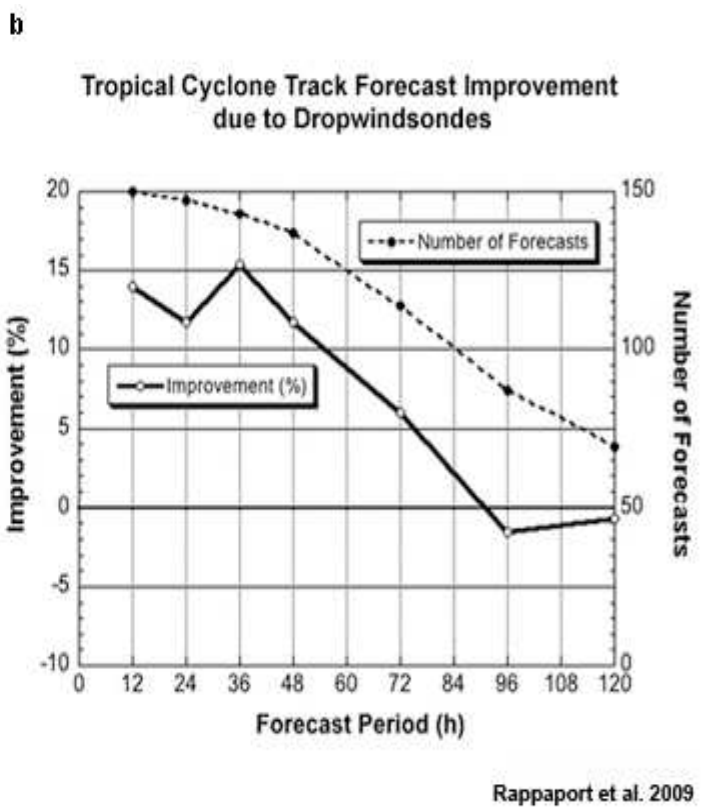




Sources of meteorological data: Forecasted data

Short-range weather forecast





Sources of meteorological data: Forecasted data

♦ AgM - forecasting : ♣ leaf weatness and temperature ♣ canopy air temperature and humidity ♣ soil temperature and moisture ♣ precipitation ...

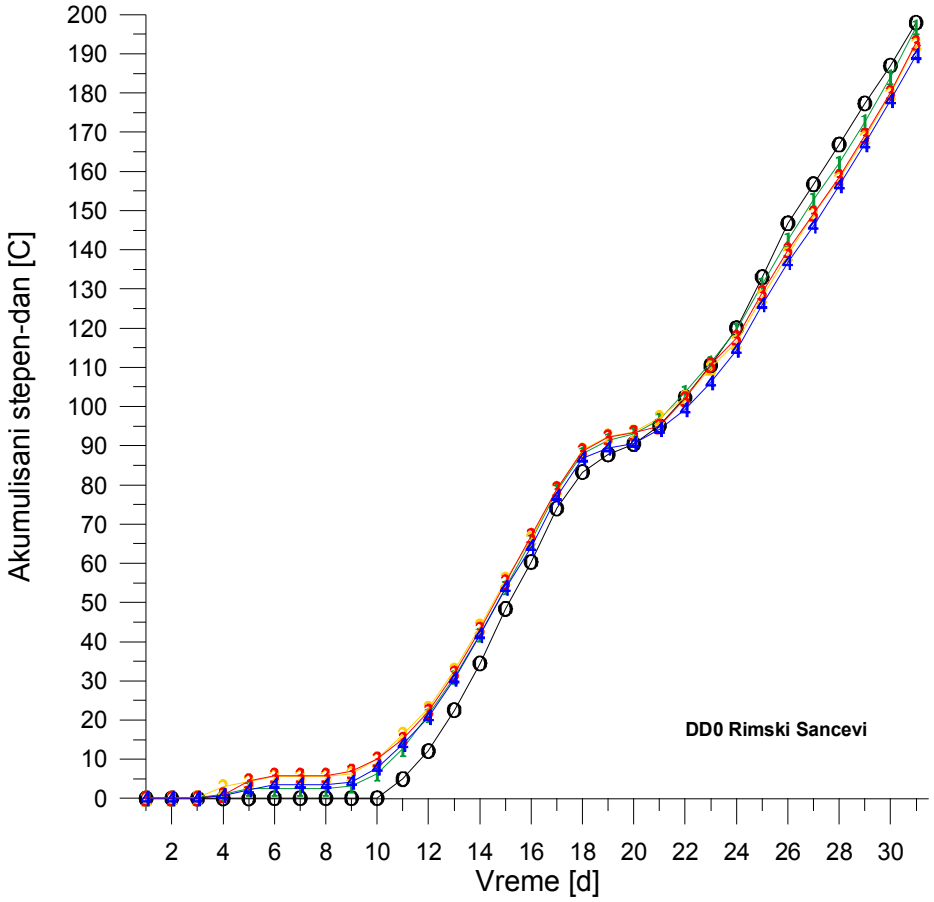
♦ AgM - forecasting application : ♣ fruit vegetation dynamic ♣ meteorological conditions for plant dissease appereance

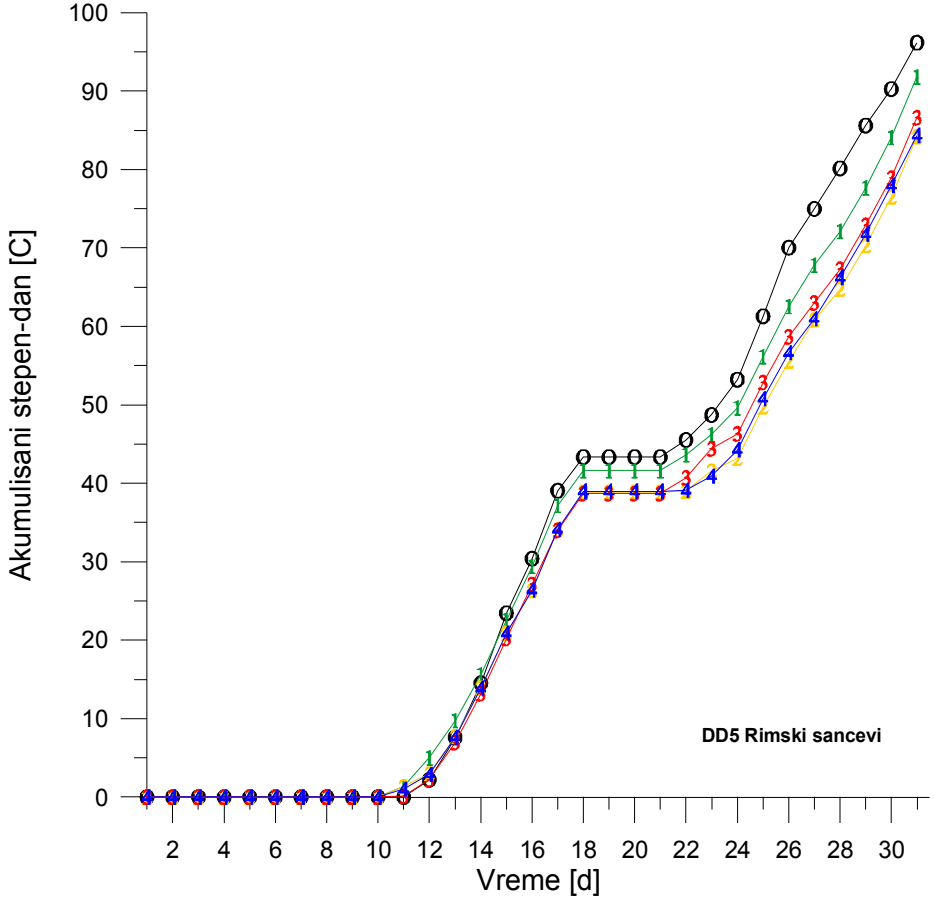
♦ CM forecasting application : ♣ scheduling of farm operations according to weather and crop conditions ♣ optimization of irrigation, fertilization and plant protection application-spraying

♦ CM - forecasting : ♣ crop dynamic on daily level ♣ soil moisture deficit ♣ evapotranspiration ♣ precipitation ...

Sources of meteorological data: Forecasted data

♣ Forecasting fruit vegetation dynamic: **DEGREE-DAYS ACCUMULATION**

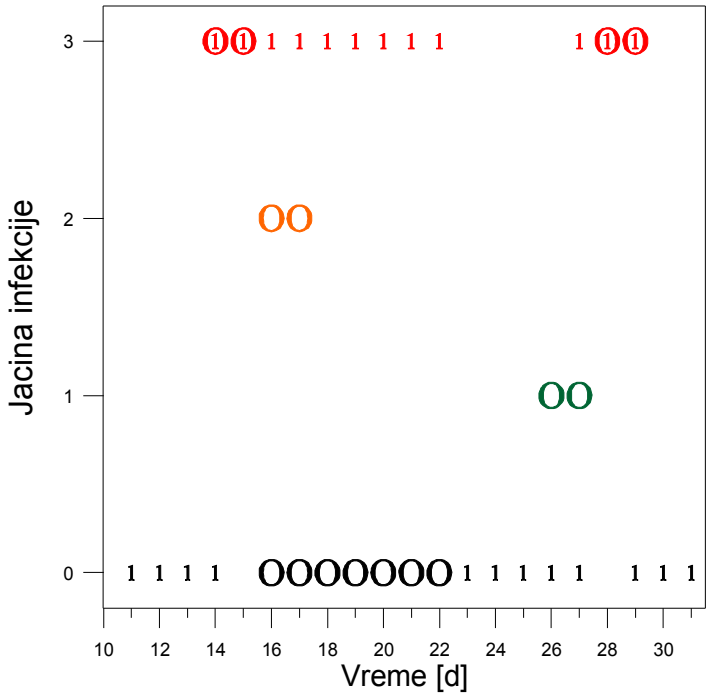




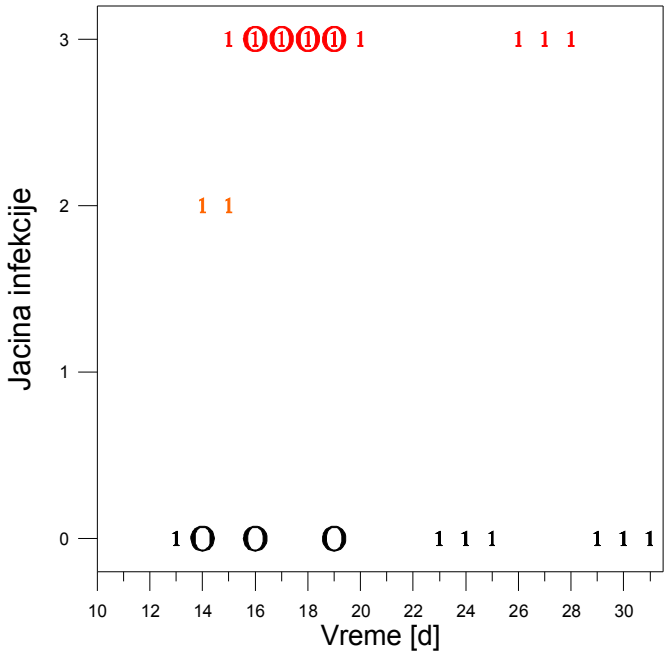
Sources of meteorological data: Forecasted data

♣ Forecasting met. conditions for plant dissease appereance**: APPLE SCAB**

Rimski Šančevi (Serbia)



Goettlesbrunn (Austria)



Lalic, B. Francia, M., Eitzinger, J., Podrascanin, Z., Arsenic, I., 2015: Effectiveness of Short-term Numerical Weather Prediction in Predicting Growing Degree Days and Meteorological Conditions for Apple Scab Appearance, *Meteorological Applications*, DOI: 10.1002/met.1521.

Sources of meteorological data: Forecasted data

Monthly and seasonal weather forecast

Long range forecasts - expected future atmospheric and oceanic conditions, averaged over periods of one to three months.

The long range forecasts are produced by the IFS **coupled ocean-atmosphere** model.

Earth system variability which have long time scales (months to years)

ENSO (El Nino Southern Oscillation) cycle. Although ENSO is a coupled ocean-atmosphere phenomenon centered over the tropical Pacific the influence of its fluctuations extends around the world.

(Source: ECMWF)

Sources of meteorological data: Forecasted data

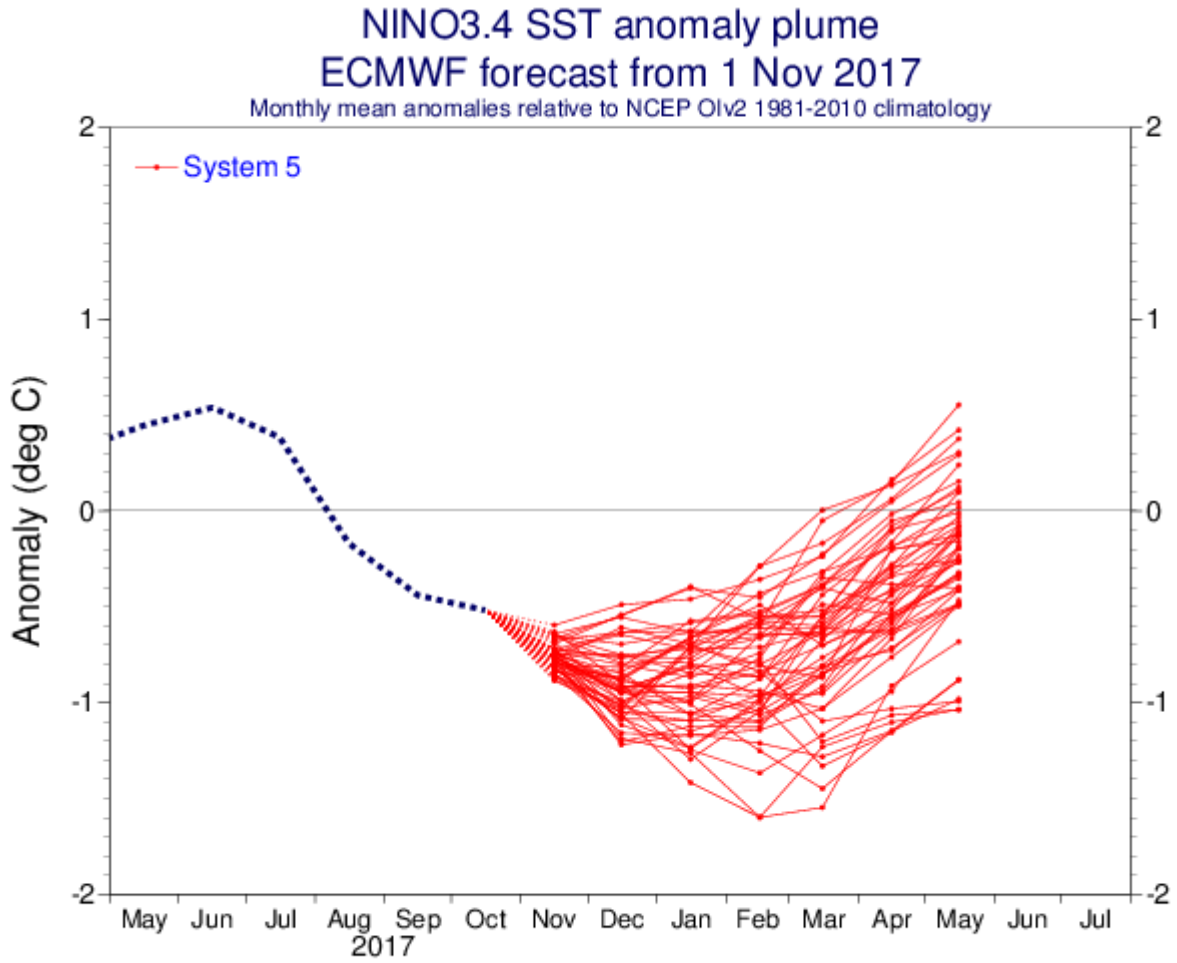
Monthly and seasonal weather forecast

Ensemble forecast
Control run

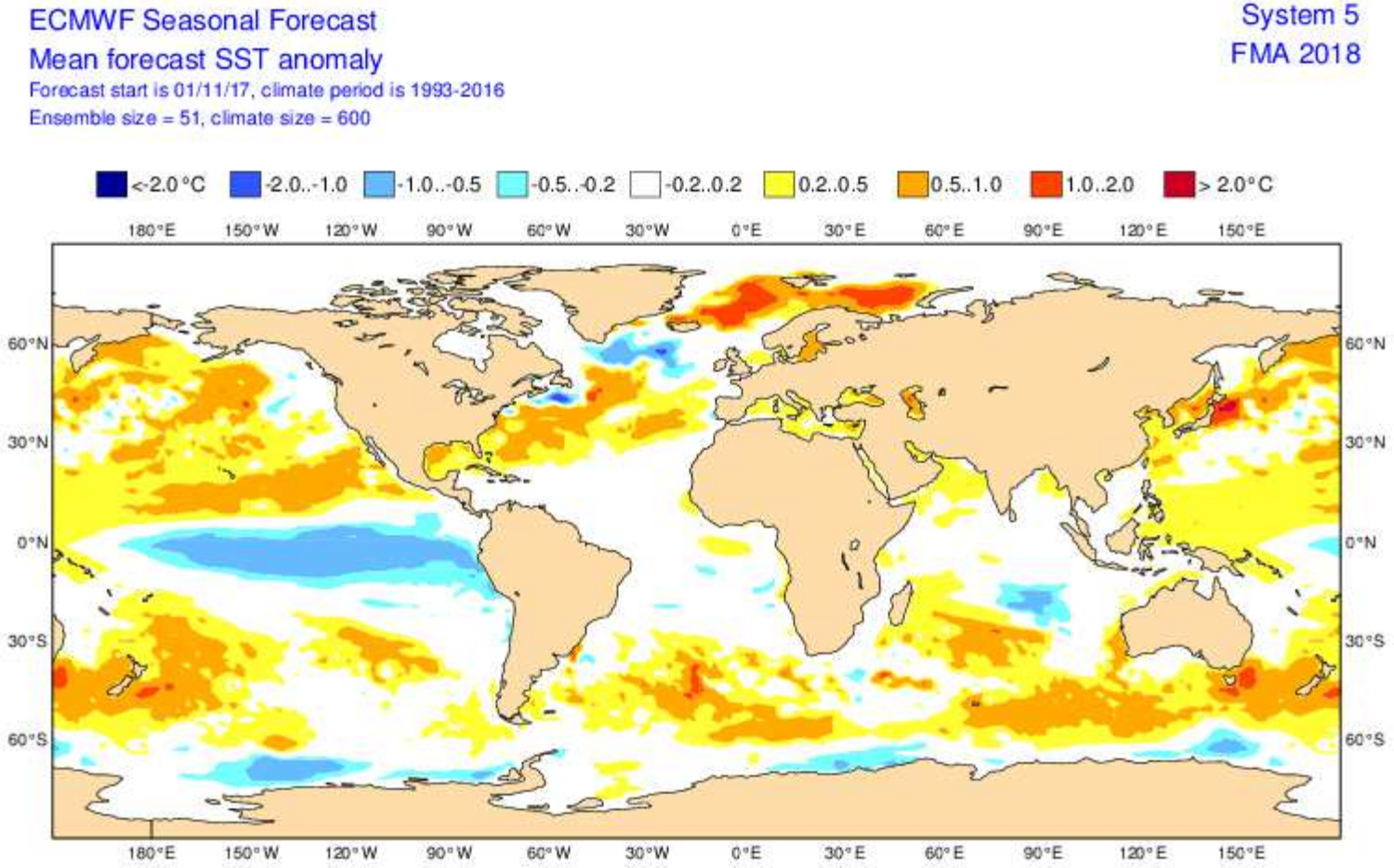
"Anomalies are calculated from the 51 member model forecast distribution relative to the model climatological PDF calculated from a set of 25 member ensemble re-forecasts covering the 24 year period 1993-2016. For each forecast product several verification scores are also provided, calculated from the full 36 year period of the re-forecast 1981-2016. "

(Source: ECMWF)

Sources of meteorological data: Monthly and seasonal weather forecast

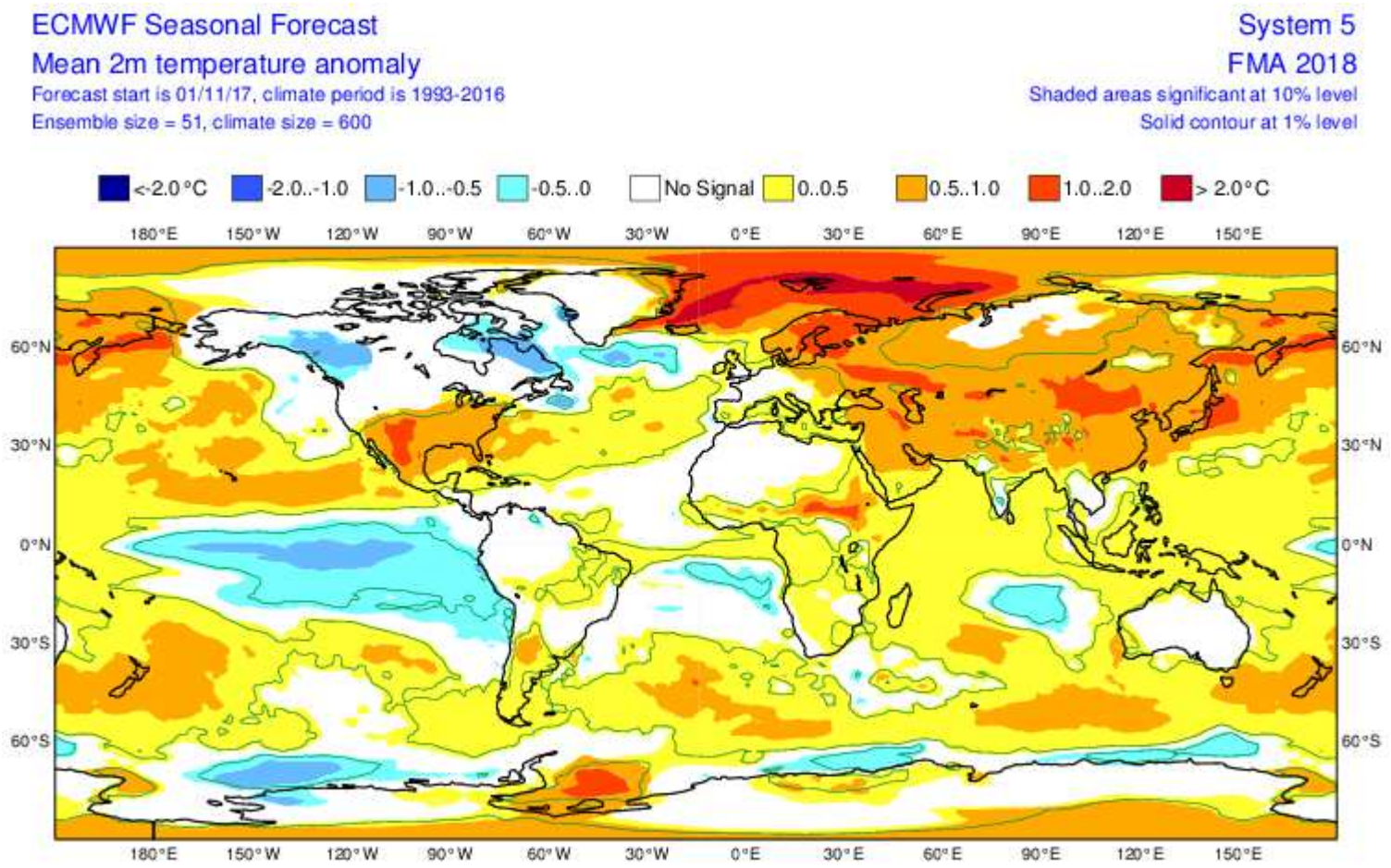


Sour recast



https://www.ecmwf.int/en/forecasts/charts/catalogue/seasonal_system5_public_standard_ssto?time=2017110100,2208,2018020100&stats=ensm

Sources of meteorological data: Monthly and seasonal weather forecast



https://www.ecmwf.int/en/forecasts/charts/catalogue/seasonal_system5_public_standard_2mtm?time=2017110100,2208,2018020100&stats=ensm

"This project has received funding from the *European Union's Horizon 2020 research and innovation programme under grant agreement No 691998".*