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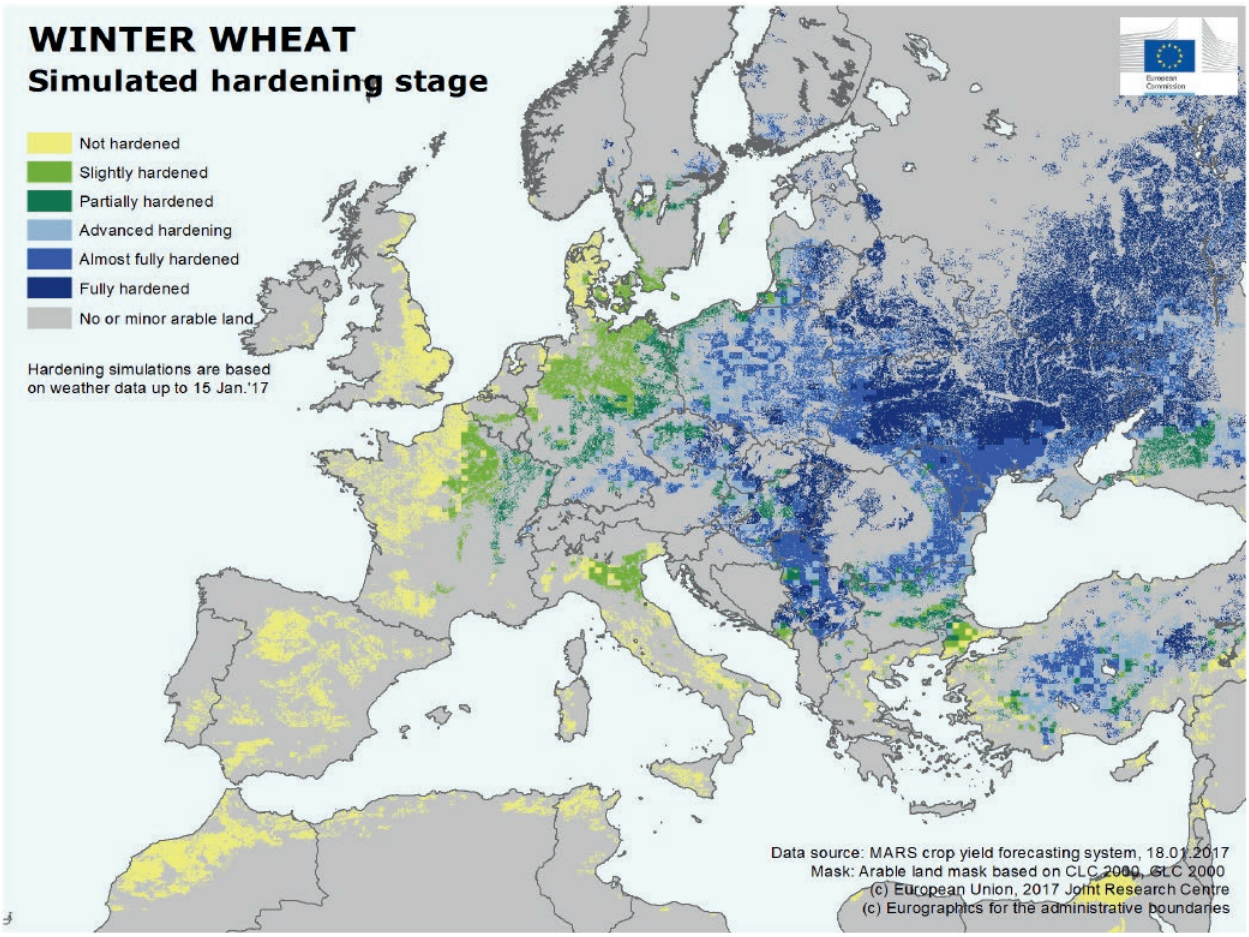
JRC MARS Bulletin
Crop monitoring in Europe
January 2017

Minor frost damages so far

Improved hardening of winter cereals in central Europe

Our recent model simulations indicate a substantial increase in the frost tolerance of winter cereals in central Europe and the Black Sea region due to the colder-than-usual weather conditions in January so far. Winter cereals in southern and western Europe are generally not hardened, whereas in central and eastern Europe hardening varies from advanced to full frost tolerance.

Frost damages have been relatively minor so far and, in accordance with the latest weather forecast, no further frost-kill damages are expected between now and the end of January.



1 Winter hardening and frost-kill analysis

2 Agro-meteorological overview

3 Atlas

Joint Research Centre

1. Winter hardening and frost-kill analysis

Hardening is the biophysiological process whereby the cellular starch of winter cereals is transformed into glucose, thereby raising the freezing point of the cellular liquids and increasing the low-temperature tolerance of the plants.

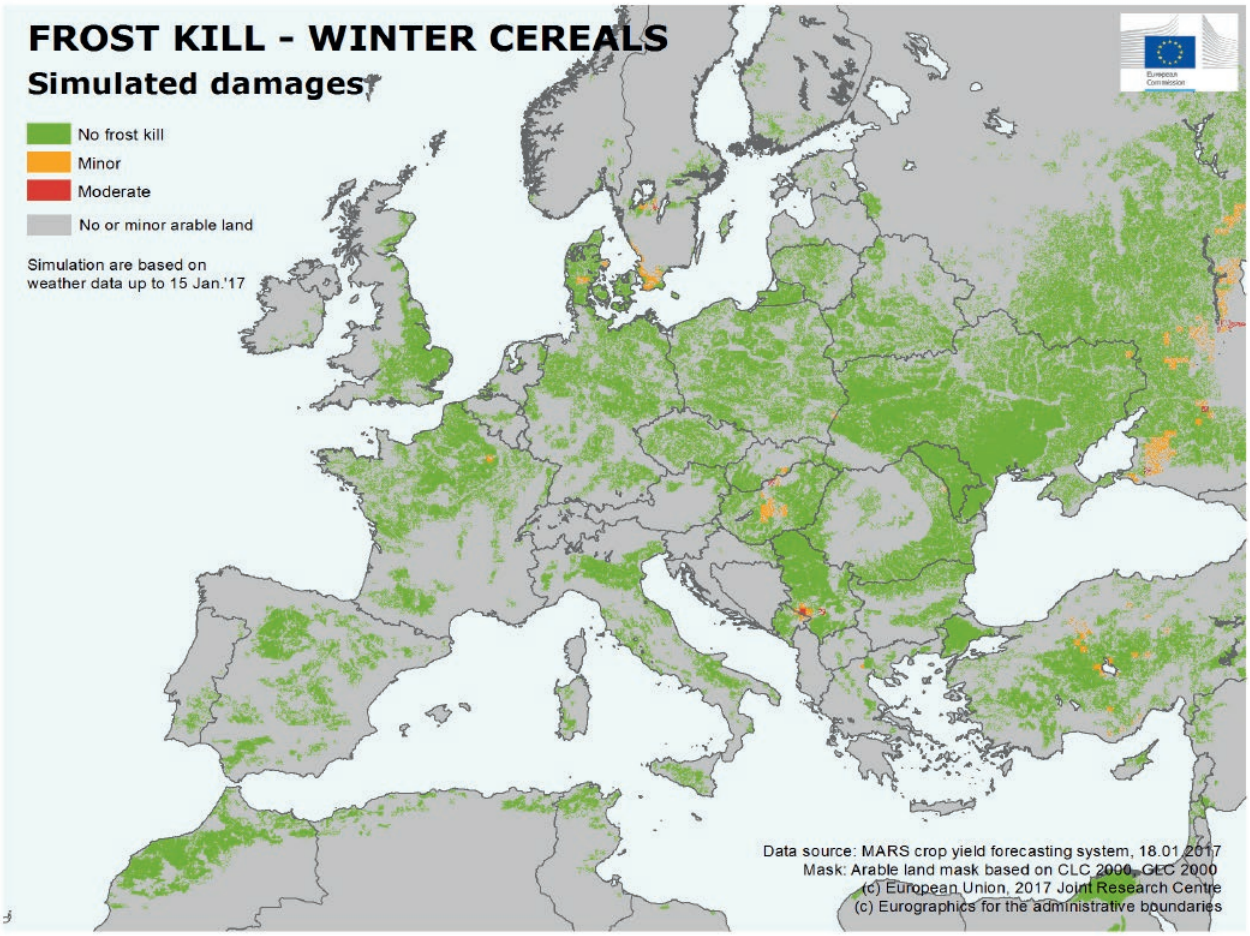
Winter cereals in southern and western Europe are generally not hardened. In the Mediterranean region, the western half of France, the United Kingdom, Denmark and the Benelux countries, winter crops have so far acquired little low-temperature tolerance due to mild air and soil temperatures during the winter. These regions run the highest risk of frost-kill damage in the event of severe frost in the topsoil.

Frost tolerance is slight to moderate in north-eastern France, northern and central Germany, southern Sweden, the coastal part of Poland, central Hungary and southern Bulgaria, as well as in some areas of southern Russia.

In central and eastern regions of Europe, hardening varies from advanced to full frost tolerance. In southern Germany, western Poland, most of the Czech Republic and southern Romania, hardening is predominantly advanced, but with high spatial variability depending on the local conditions. The winter crops gained almost full low-temperature tolerance in eastern Poland, the north-western part of the Balkan Peninsula, northern Romania and southern Ukraine. The winter crops are fully hardened in eastern Hungary, most of Slovakia, western Romania, most of Belarus and northern Ukraine, as well as in eastern Turkey and the central, northern and eastern regions of European Russia.

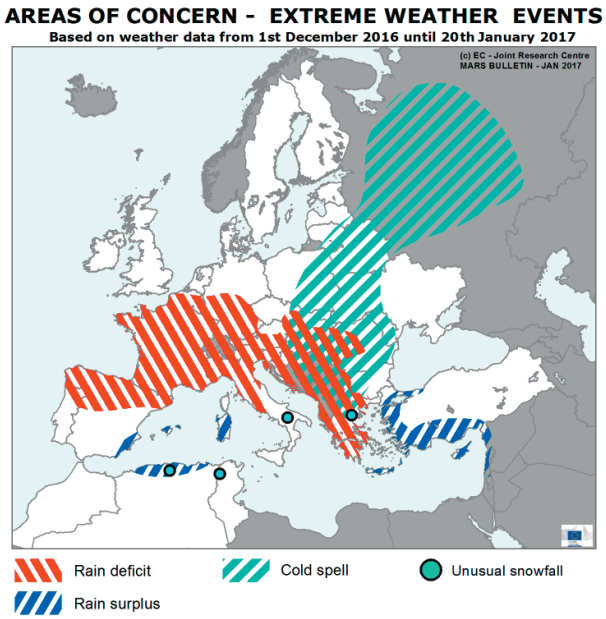
Frost damages have been relatively minor so far. On 6 January 2017, an intense cold-air intrusion reached central areas of Europe, causing extreme freezing temperatures between southern Scandinavia and the Balkan Peninsula. According to our model, the sharp temperature drop, combined with weak snowfall in some regions, resulted in frost damages in parts of Hungary, Slovakia, southern Sweden, Denmark and Romania. Frost damage could also have occurred locally in Poland, the Czech Republic and Germany. This cold spell lasted until 11 January. In Belarus and Ukraine, the snow cover provided adequate protection for winter wheat. Minimal additional frost-kill events occurred in Turkey and Russia.

On the basis of the latest weather forecast, no further frost-kill damages are expected between now and the end of January, despite significantly colder-than-usual weather conditions in most of Europe. The hardening status of winter cereals is expected to improve, primarily in central Europe.



2. Agro-meteorological overview

Meteorological review (1 December 2016 – 16 January 2017)



A pronounced cold spell occurred during the **first half of January**. This period was among the coldest on our records (since 1975) in south-eastern Europe, Hungary and Slovakia. Average daily temperatures in the most affected regions of south-eastern Europe dropped to more than 4 °C below the long-term average and even to 8 °C below the long-term average in parts of the central Balkans. Minimum temperatures dropped below – 20 °C in many parts of the central Balkans, the Carpathians and surrounding regions, Slovakia, eastern Poland, Belarus, the Baltic countries and western Ukraine. In some parts of south-eastern Europe, such as Bosnia and Herzegovina, Serbia and central Romania, temperatures even fell below – 25 °C. Major parts of France, Italy and the western half of Turkey were also affected.

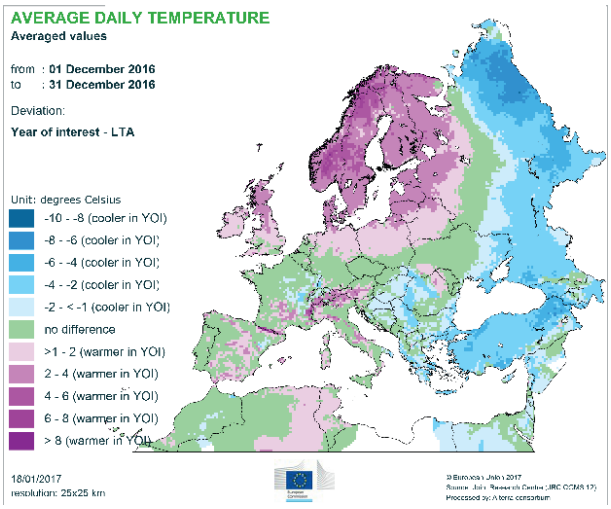
A cold-weather anomaly prevailed in **eastern Europe in the first and second dekads of December**, with average temperatures generally between 2 °C and 4 °C below the long-term average. Minimum temperatures generally dropped below – 20 °C.

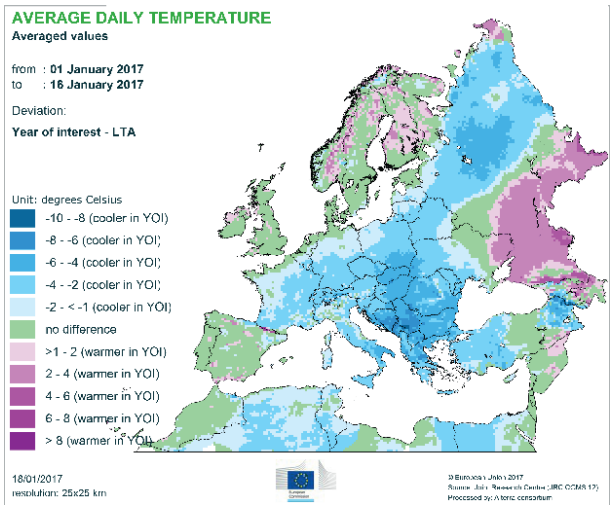
A warm-weather anomaly prevailed in December over northern Europe, with average temperatures generally up to 6 °C above the long-term average. During the first half of January, warmer-than-usual weather continued in parts of Scandinavia and also prevailed in southern European Russia and eastern Ukraine.

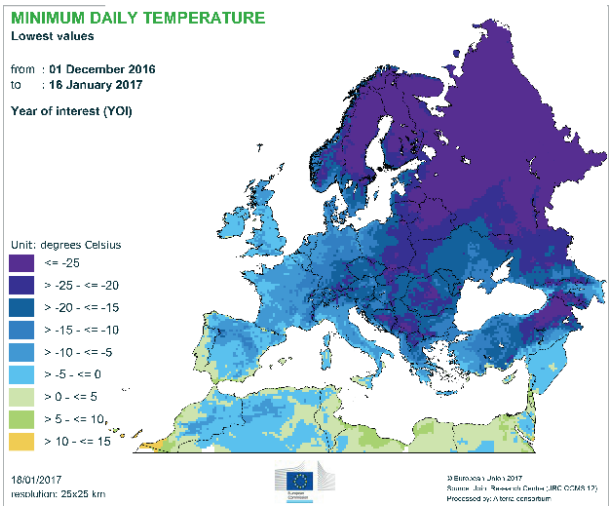
Substantially drier-than-average conditions were recorded in major parts of western Europe, southern Germany, central and northern Italy and the central and western parts of the Balkans. In most of these areas, cumulative precipitation during the review period was less than 40 mm, and even less than 20 mm in northern Spain, south-eastern France, southern Germany, Austria, Hungary, Romania, northern Italy and the central part of the Balkans. Drier-than-usual conditions were also experienced in southern Scandinavia, the Baltic countries and southern European Russia.

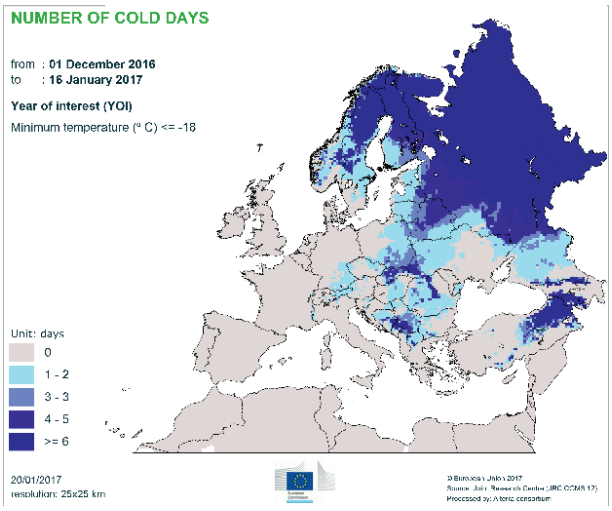
A wet-weather anomaly was observed in south-eastern Spain, Sardinia, along the western Scandinavian coast, south-western Turkey and regionally in eastern Europe. Precipitation cumulates in these regions generally exceeded 80 mm. Locally in south-eastern Spain and western Turkey, heavy rainfall events resulted in overall cumulates of more than 150 mm.

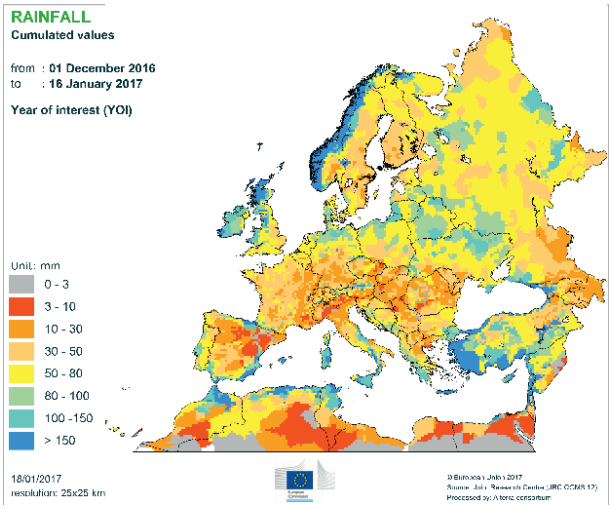
A snow layer covered major parts of eastern Europe in December and was also recorded regionally in south-eastern and central Europe. In January, the snow cover further extended to most of south-eastern, central and northern Europe, southern Italy, eastern France, part of the British Isles and Turkey. Due to the extremely cold weather anomaly over south-eastern Europe, snow also covered several regions surrounding the Adriatic Sea, the Ionian Sea, the Aegean Sea and the Black Sea.

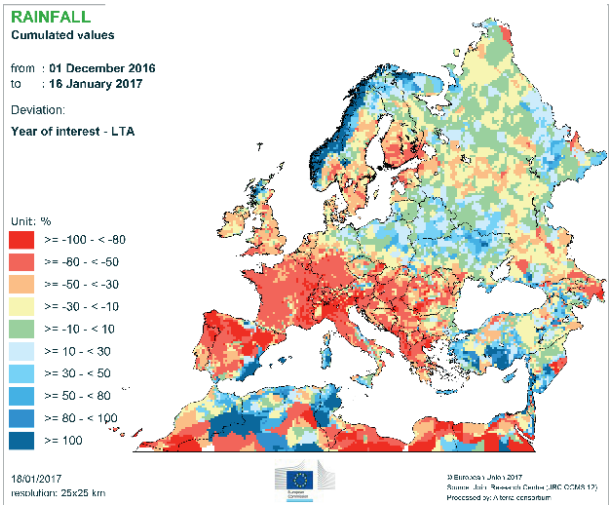


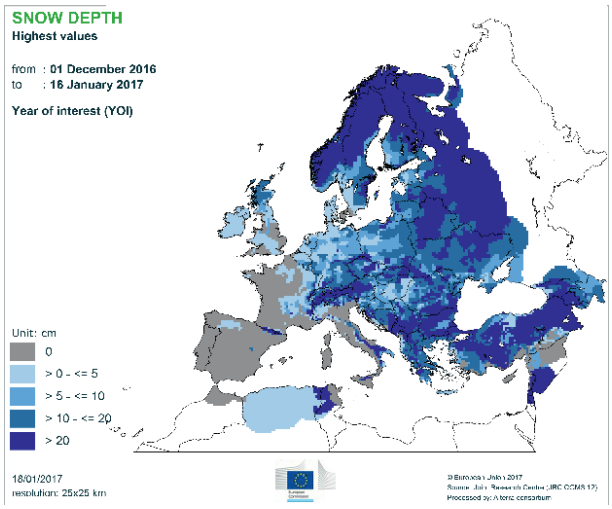


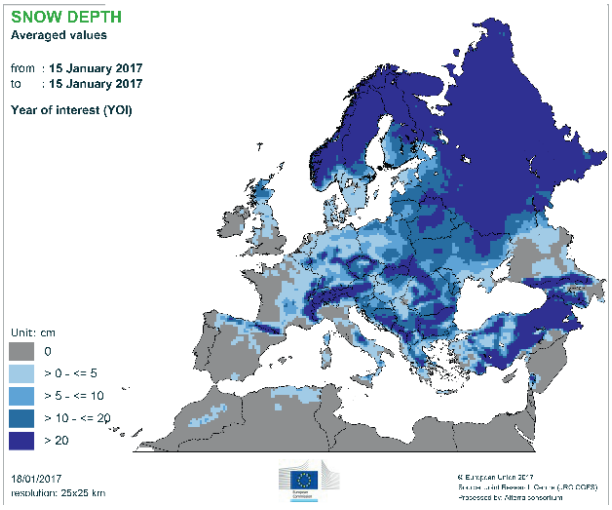

MINIMUM DAILY TEMPERATURE
Lowest values
from : 01 December 2016
to : 16 January 2017
Year of interest (YOI)
Unit: degrees Celsius
<= -25
> -25 - <= -20
> -20 - <= -15
> -15 - <= -10
> -10 - <= -5
> -5 - <= 0
> 0 - <= 5
> 5 - <= 10
> 10 - <= 15
18/01/2017
resolution: 25x25 km


NUMBER OF COLD DAYS
from : 01 December 2016
to : 16 January 2017
Year of interest (YOI)
Minimum temperature (° C) <= -18
Unit: days
0
1 - 2
3 - 3
4 - 5
>= 6
20/01/2017
resolution: 25x25 km


RAINFALL
Cumulated values
from : 01 December 2016
to : 16 January 2017
Year of interest (YOI)
Unit: mm
0 - 3
3 - 10
10 - 30
30 - 50
50 - 80
80 - 100
100 -150
> 150
18/01/2017
resolution: 25x25 km

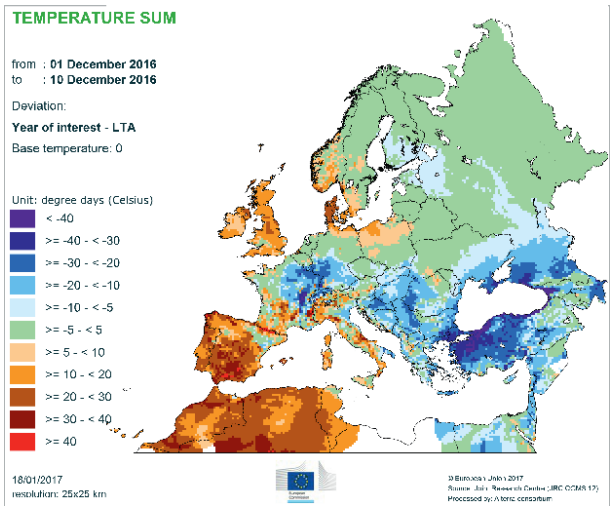

RAINFALL
Cumulated values
from : 01 December 2016
to : 16 January 2017
Deviation:
Year of interest - LTA
Unit: %
>= -100 - < -80
>= -80 - < -50
>= -50 - < -30
>= -30 - < -10
>= -10 - < 10
>= 10 - < 30
>= 30 - < 50
>= 50 - < 80
>= 80 - < 100
>= 100
18/01/2017
resolution: 25x25 km

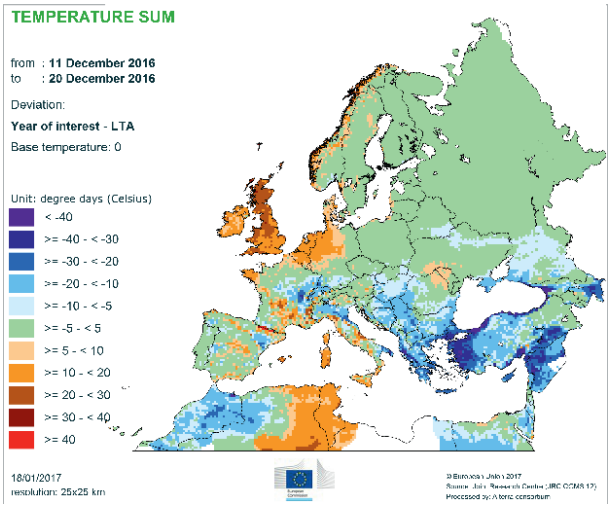

SNOW DEPTH
Highest values
from : 01 December 2016
to : 16 January 2017
Year of interest (YOI)
Unit: cm
0
> 0 - <= 5
> 5 - <= 10
> 10 - <= 20
> 20
18/01/2017
resolution: 25x25 km

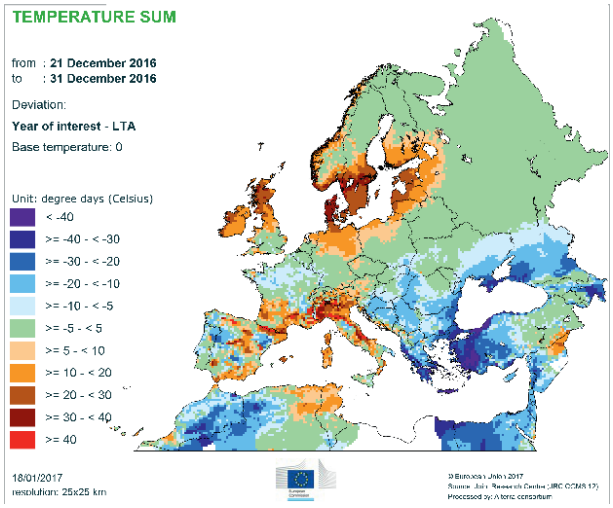

SNOW DEPTH
Averaged values
from : 15 January 2017
to : 15 January 2017
Year of interest (YOI)
Unit: cm
0
> 0 - <= 5
> 5 - <= 10
> 10 - <= 20
> 20
18/01/2017
resolution: 25x25 km

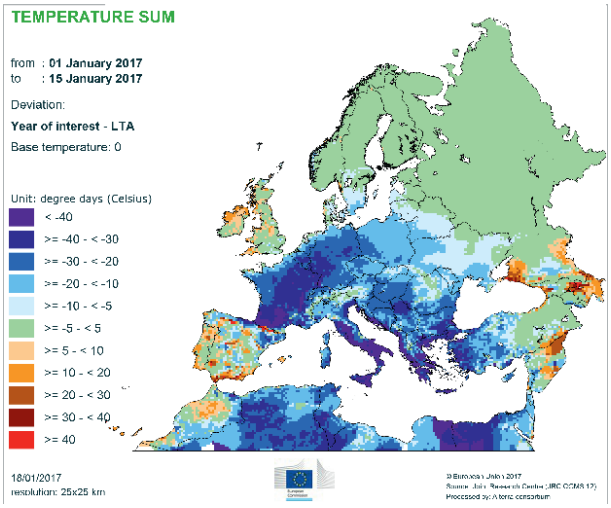
3. Atlas

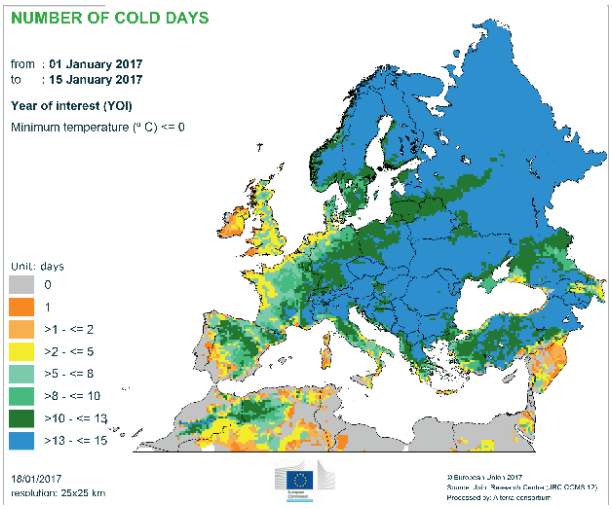
Temperature regime

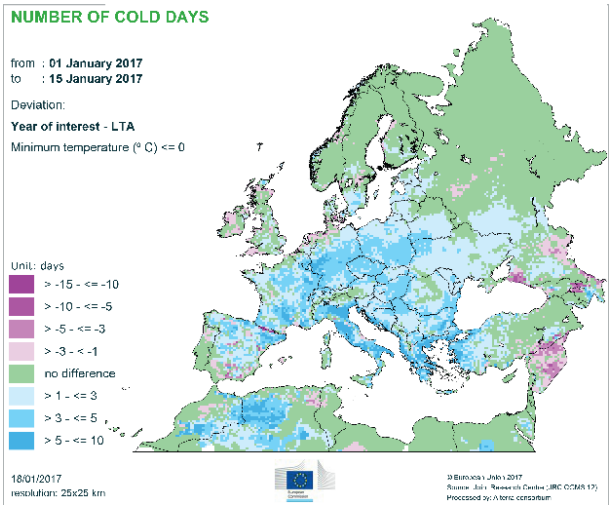




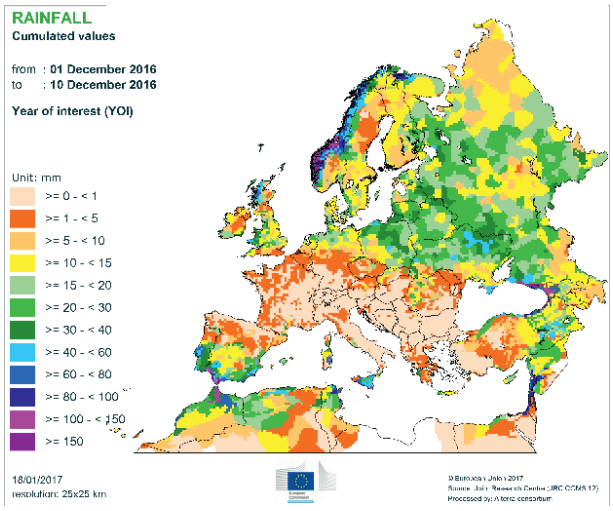


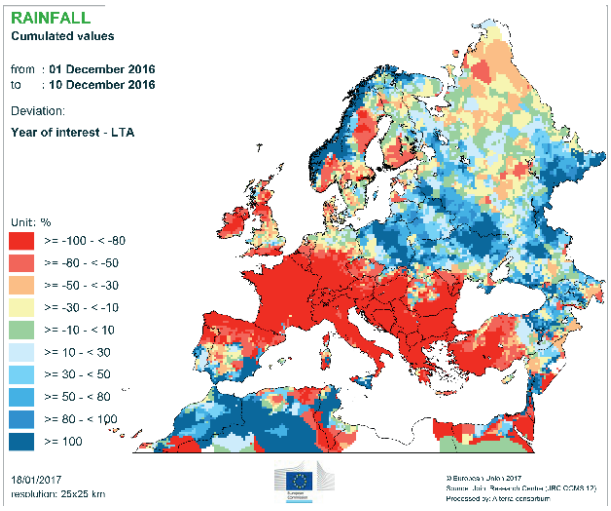


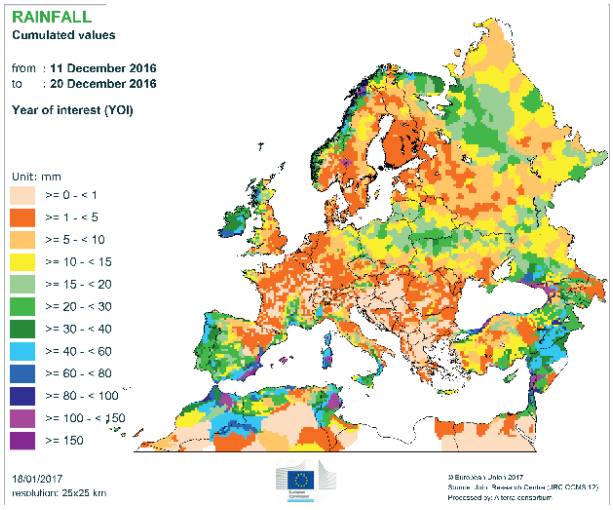


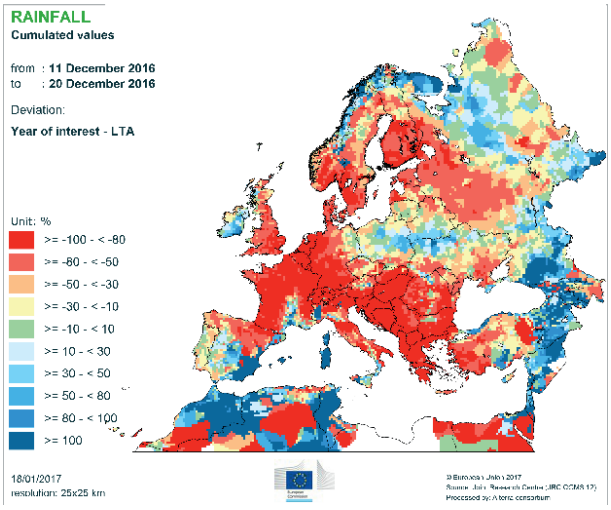


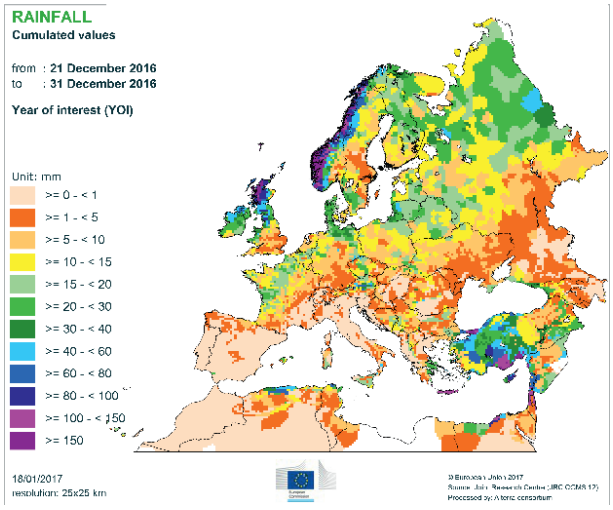
Precipitation regime

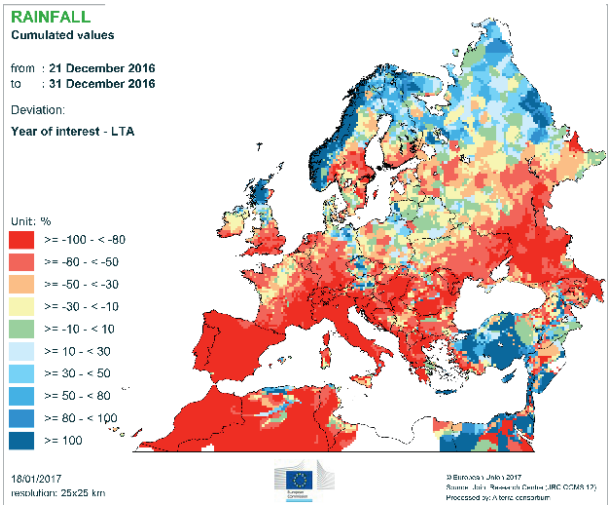


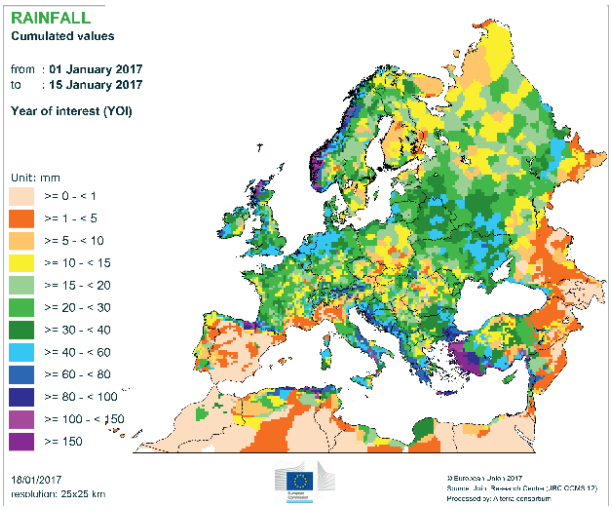


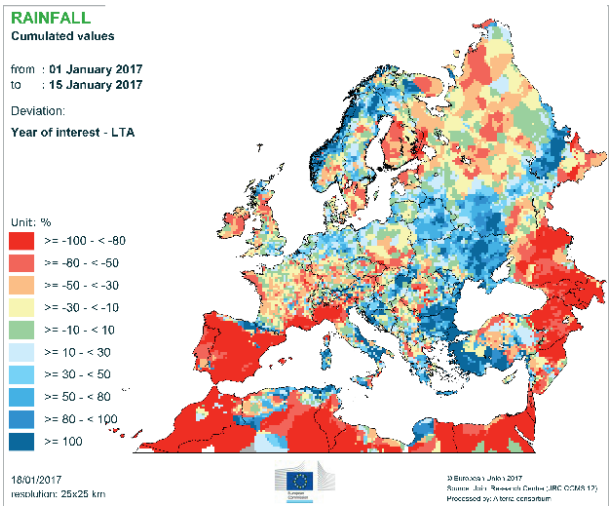


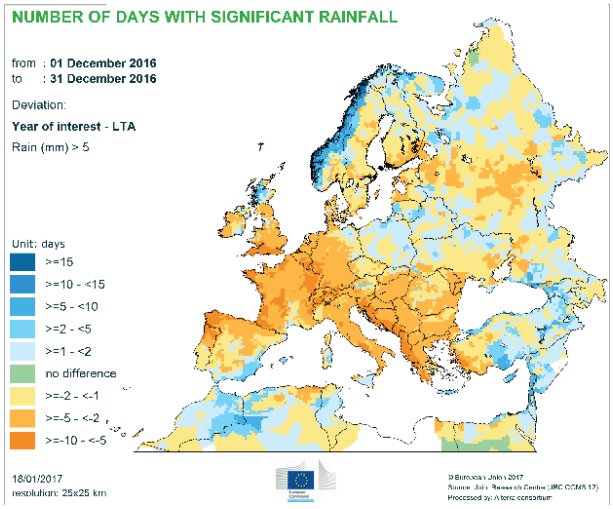


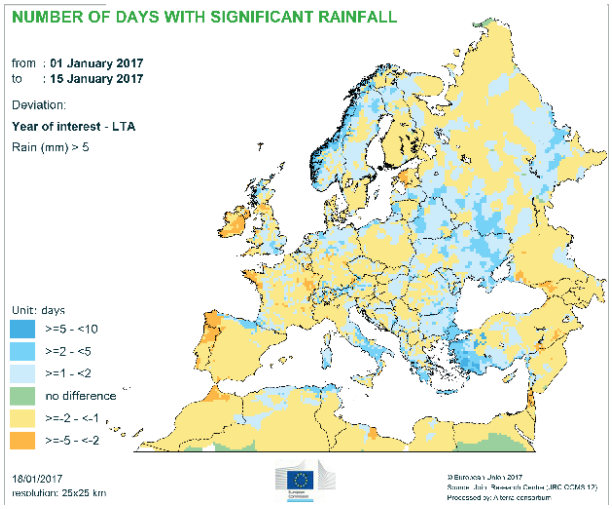





RAINFALL
Cumulated values
from : 01 January 2017
to : 15 January 2017
Year of interest (YOI)
Unit: mm
>= 0 - < 1
>= 1 - < 5
>= 5 - < 10
>= 10 - < 15
>= 15 - < 20
>= 20 - < 30
>= 30 - < 40
>= 40 - < 60
>= 60 - < 80
>= 80 - < 100
>= 100 - < 150
>= 150
18/01/2017
resolution: 25x25 km


RAINFALL
Cumulated values
from : 01 January 2017
to : 15 January 2017
Deviation:
Year of interest - LTA
Unit: %
>= -100 - < -80
>= -80 - < -50
>= -50 - < -30
>= -30 - < -10
>= -10 - < 10
>= 10 - < 30
>= 30 - < 50
>= 50 - < 80
>= 80 - < 100
>= 100
18/01/2017
resolution: 25x25 km


NUMBER OF DAYS WITH SIGNIFICANT RAINFALL
from : 01 December 2016
to : 31 December 2016
Deviation:
Year of interest - LTA
Rain (mm) > 5
Unit: days
>=15
>=10 - <15
>=5 - <10
>=2 - <5
>=1 - <2
no difference
>=-2 - <-1
>=-5 - <-2
>=-10 - <-5
18/01/2017
resolution: 25x25 km


NUMBER OF DAYS WITH SIGNIFICANT RAINFALL
from : 01 January 2017
to : 15 January 2017
Deviation:
Year of interest - LTA
Rain (mm) > 5
Unit: days
>=5 - <10
>=2 - <5
>=1 - <2
no difference
>=-2 - <-1
>=-5 - <-2
18/01/2017
resolution: 25x25 km

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JRC MARS Bulletins 2017

Date	Publication	Reference
23 Jan	Agromet analysis	Vol. 25 No 1
20 Feb	Agromet analysis	Vol. 25 No 2
27 Mar	Agromet analysis and yield forecast	Vol. 25 No 3
24 Apr	Agromet analysis, remote sensing, yield forecast and sowing conditions	Vol. 25 No 4
22 May	Agromet analysis, remote sensing, yield forecast and pasture analysis	Vol. 25 No 5
26 Jun	Agromet analysis, remote sensing, yield forecast, pasture update and rice analysis	Vol. 25 No 6
24 Jul	Agromet analysis, remote sensing, yield forecast and pasture update	Vol. 25 No 7
21 Aug	Agromet analysis, remote sensing, yield forecast, pasture update and rice analysis	Vol. 25 No 8
25 Sep	Agromet analysis, remote sensing and yield forecast	Vol. 25 No 9
23 Oct	Agromet analysis, remote sensing and yield forecast	Vol. 25 No 10
27 Nov	Agromet analysis, yield forecast and sowing conditions	Vol. 25 No 11
18 Dec	Agromet analysis	Vol. 25 No 12

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*MARS stands for Monitoring Agricultural Resources

Technical note:
The long-term average (LTA) used within this bulletin as a reference is based on an archive of data covering 1975–2015.

Mission statement: As the science and knowledge service of the European Commission, the Joint Research Centre's mission is to support EU policies with independent evidence throughout the whole policy cycle.

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