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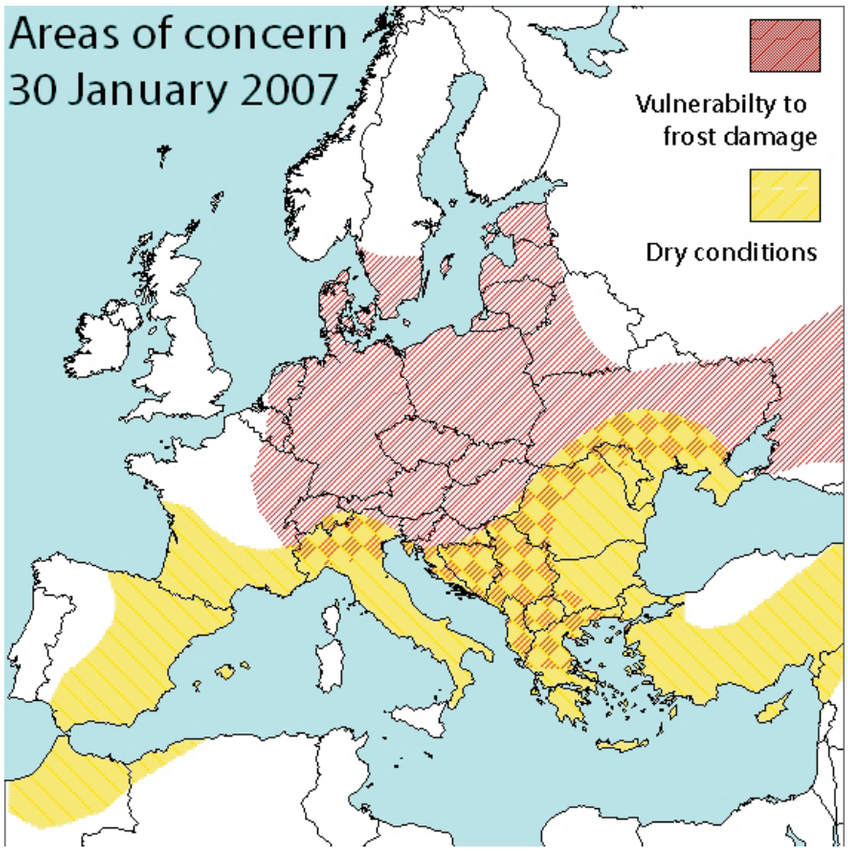
MARS AGROMETEOROLOGICAL Crop Monitoring in Europe

1st November 2006 to 31st January 2007

Vol. 15, No 1

Unseasonable mild temperatures increased vulnerability of winter crops to frost damages. Dry conditions in Mediterranean areas



Contents

1. Agrometeorological overview

Persistent anomalous warm autumn and winter, particularly in eastern Europe and northern Italy. No relevant frost events. Wet at higher latitudes, quite dry in the Mediterranean Basin and Black Sea.

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MARS bulletin: http://agrifish.jrc.it/marsstat/bulletins/2007.htm
MARS agrometeorological database: http://www.marsop.info

ipsc

Publication issue

The first 2007 printed MARS analysis (Vol. 15, No 1) of the agricultural campaign covers the period 1 November 2006 to 31 January 2007.

It makes a synthesis of the major issues pertaining to:

— meteo and agrometeorological situation,

— winter crop sowings and development.

Previous related analysis available:

— Climatic updates, 10/12/2006 to 13 /01/2007 (CU2007/01)

Next printed issue:

Vol. 15, No 2 : February-March 2007 analysis and forecasts; available early April 2007.

Contributions

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MARS stands for Monitoring Agriculture with Remote Sensing

Technical note:

The long-term average used within this bulletin as a reference is based on an archive of data covering 1975–2006.

The CNDVI is an unmixed normalised vegetation index on the base of Corine land cover 2000 mainly for arable land or grassland.

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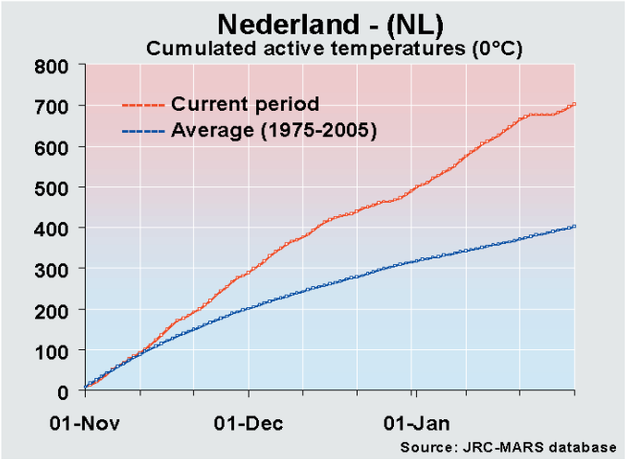
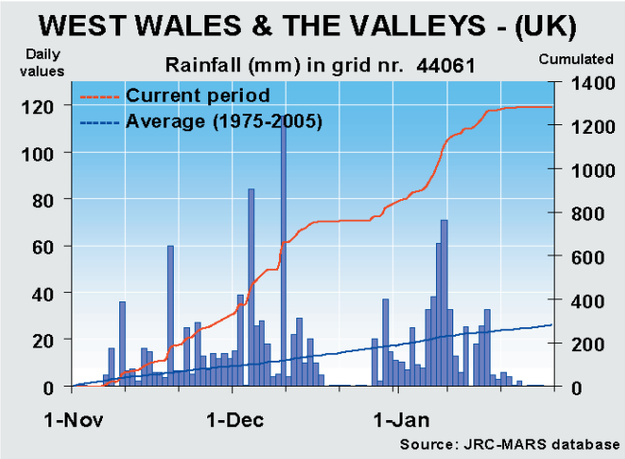
Temperatures

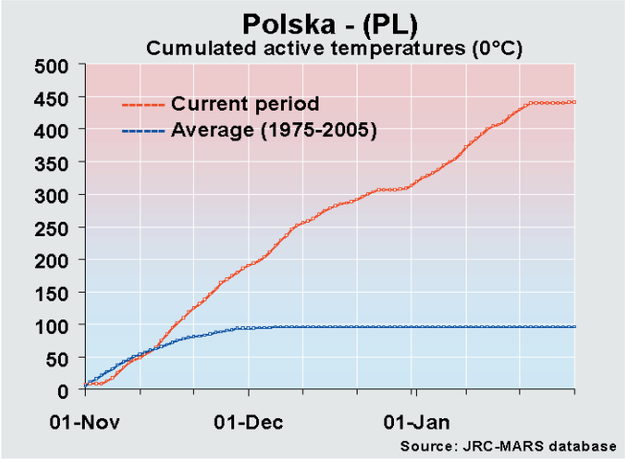
Following a mild October, the warmer period continued until 20–22 January. The higher-than-seasonal temperatures favoured rapid germination and tillering of the new winter cereals but also exposed the new plants to a higher risk of frost damage (due to the reduced 'hardening' process). The effects of the anomalous but more favourable thermal conditions also determined a growth of the pasture canopy and, in many cases, an earlier sprouting of natural vegetation. The most relevant anomalies were recorded in the Baltic States, Denmark and northern Germany where, at the end of January, a surplus of 300–350 GDD (as compared to the LTA) was accumulated, equivalent in many cases to around 300–400 %.

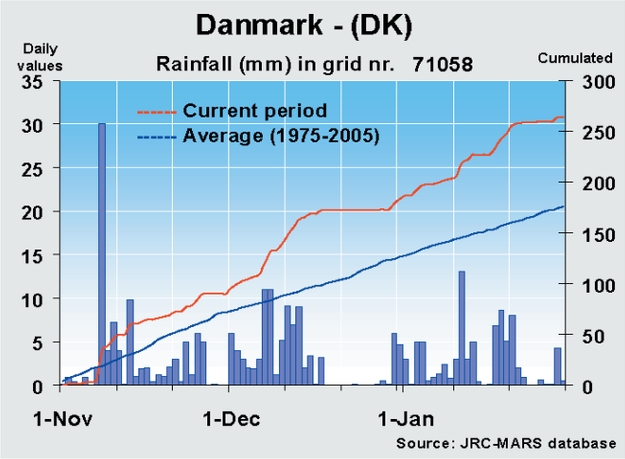
In **November**, warmer-than-seasonal conditions mainly occurred in the second half of the month and affected the area between Portugal and the Baltic Sea; on the other hand, southern Italy, Greece and Turkey were slightly colder than average. In Germany, Denmark, Poland and the Netherlands, the mean temperatures were, on average, 4–5 °C above the seasonal values and, in many cases, reached the highest values for the period since 1975. Only in 1994 were similar conditions recorded. In these areas, the minimum temperatures remained below the 0 °C threshold for only 3–5 days. At the end of the month, the cumulated active temperatures (Tbase 0 °C) were 80–100 °C above the long-term average.

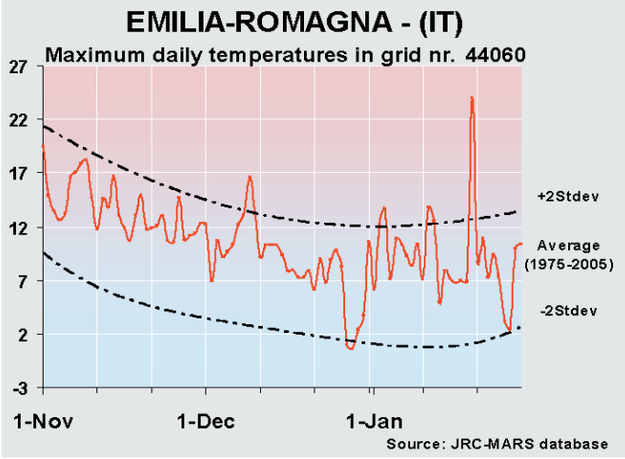
In **December**, the warm anomaly was even more significant than in November: the phenomenon affected the whole continent, particularly the Baltic States and the eastern EU where both the maximum and minimum temperatures were 10–12 °C above the seasonal values. They remained above the seasonal average for the whole month. The most relevant anomalies occurred around the Baltic Sea basin where, at the end of December, 120–160 GDD above the average were recorded. More seasonal conditions occurred in the Iberian Peninsula and western France. Those mild thermal conditions interrupted in many cases the winter cereal dormancy, increasing the risk of frost damage, but fortunately no relevant frost events occurred or they were mainly concentrated at higher altitude. A relative higher-than-normal frequency of frost events was recorded in France and Spain where, in the second half of the month, more seasonal conditions were re-established. The New Year started without a significant change. A persistent high pressure system over the Mediterranean area pushed cold air to higher latitudes. Thus, during the first and second dekad of **January**, warmer-than-seasonal conditions also persisted. Again, the more continental part of the EU experienced anomalous mild temperatures. An extreme warm wave affected Italy between 19 and 26 January when a very warm wind (*Föhn*) determined an anomalous, sudden and rapid increase of temperatures which reached values not registered since 1975: 17–20 °C and even 22 °C above the seasonal average! In the last part of the month, the general circulation changed definitively, cold arctic air irrupted the continent and a rapid drop of temperatures was registered, which was more significant in the western part of Europe (mainly Spain).

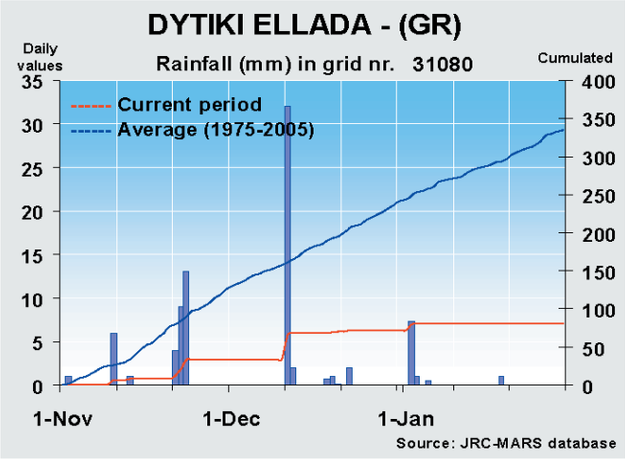

Nederland - (NL)
Cumulated active temperatures (0°C)
Current period
Average (1975-2005)
800
700
600
500
400
300
200
100
0
01-Nov
01-Dec
01-Jan
Source: JRC-MARS database

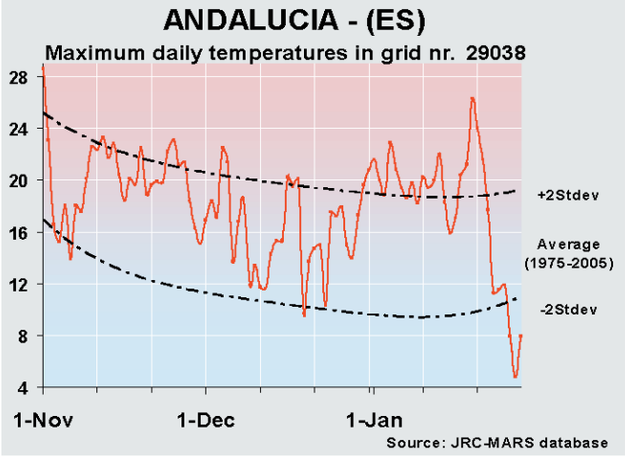

WEST WALES & THE VALLEYS - (UK)
Daily values
Rainfall (mm) in grid nr. 44061
Cumulated
Current period
Average (1975-2005)
120
100
80
60
40
20
0
1400
1200
1000
800
600
400
200
0
1-Nov
1-Dec
1-Jan
Source: JRC-MARS database

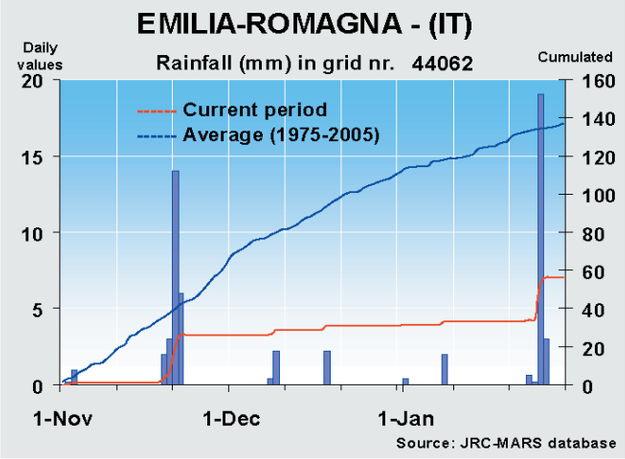

Polska - (PL)
Cumulated active temperatures (0°C)
Current period
Average (1975-2005)
500
450
400
350
300
250
200
150
100
50
0
01-Nov
01-Dec
01-Jan
Source: JRC-MARS database


Danmark - (DK)
Daily values
Rainfall (mm) in grid nr. 71058
Cumulated
Current period
Average (1975-2005)
35
30
25
20
15
10
5
0
300
250
200
150
100
50
0
1-Nov
1-Dec
1-Jan
Source: JRC-MARS database


EMILIA-ROMAGNA - (IT)
Maximum daily temperatures in grid nr. 44060
27
22
17
12
7
2
-3
+2Stdev
Average
(1975-2005)
-2Stdev
1-Nov
1-Dec
1-Jan
Source: JRC-MARS database


DYTIKI ELLADA - (GR)
Daily values
Rainfall (mm) in grid nr. 31080
Cumulated
Current period
Average (1975-2005)
35
30
25
20
15
10
5
0
400
350
300
250
200
150
100
50
0
1-Nov
1-Dec
1-Jan
Source: JRC-MARS database


ANDALUCIA - (ES)
Maximum daily temperatures in grid nr. 29038
28
24
20
16
12
8
4
+2Stdev
Average
(1975-2005)
-2Stdev
1-Nov
1-Dec
1-Jan
Source: JRC-MARS database


EMILIA-ROMAGNA - (IT)
Daily values
Rainfall (mm) in grid nr. 44062
Cumulated
Current period
Average (1975-2005)
20
15
10
5
0
160
140
120
100
80
60
40
20
0
1-Nov
1-Dec
1-Jan
Source: JRC-MARS database

Rainfall and Climatic Water Balance

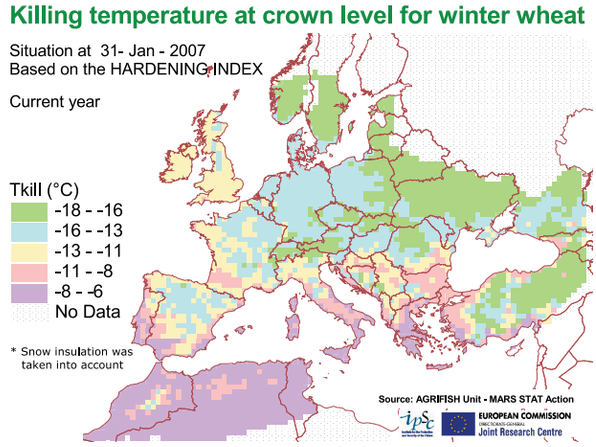
The particular synoptic circulation (persistent high-pressure system based on the central Mediterranean) which characterised the whole period pushed the main Atlantic rainy fronts towards higher latitudes. Therefore, in all the areas close to the Atlantic coastline (Normandy, Ireland, Scotland, Wales, northern Germany, Scandinavia, Denmark, Poland and the Baltic States) the cumulated values were largely higher than the seasonal norm: on average + 50–60 % as compared to the LTA, but in some cases also + 100–150 % (northern Poland, southern Sweden and Scotland). For the same reason, in the other areas, a north-to-south gradient was evident and the Mediterranean regions (mainly eastern Spain, southern France, Italy, Greece and Turkey) experienced a significant deficit: on average – 50 to – 70 % as compared to the LTA. At higher latitudes, the rain was persistent practically for the whole period with some intense events (> 80–100 mm/day). On the other hand, in southern Europe, there were few significant rainy days (> 5 mm/day) scattered over the three months. Moreover, in these areas, the water supply deficit was even more increased due to the higher potential evapotranspiration. Therefore, in general, the climatic water balance presented larger deficits. It must be emphasised that the impacts of the shortage of rain supply in this season will be evident only in the next months when the crop water requirement will be significant.

Frost risk analysis: minimal frost damages

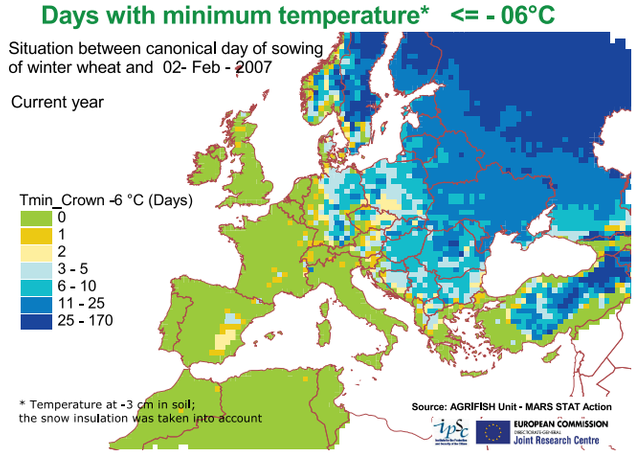
The unusually warm period minimised frost damages for most of the continent. Fortunately, the decrease of crop resistance to frost induced by the temperatures above + 10 °C (de-hardening) was not followed by sudden frost episodes. In fact, in most cases, the fewer-than-usual frosty days occurred gradually after several cool and often sunny days in which the re-hardening process was possible. For the moment, the highest risk for further frost damages (lower hardening index plus significant probability of occurrence of some frosty days) seems to be in the southern part of the lower Danube basin.

The analysis of minimum temperature adjusted for the soil depth – 3 cm (crown level) is showing a clearly milder situation compared with the last five years for Belarus, Ukraine and adjacent areas of Russia. Short moderate frost events (about – 9 °C), with possible impact on winter barley, occurred in south-eastern Spain, eastern Germany, Poland, Hungary, Romania and Bulgaria.

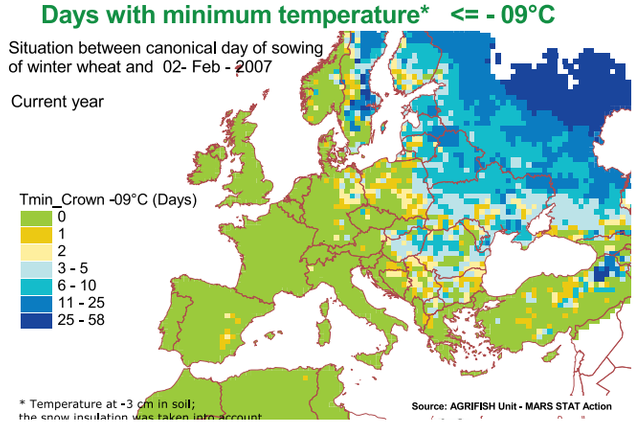
Killing temperature at crown level for winter wheat



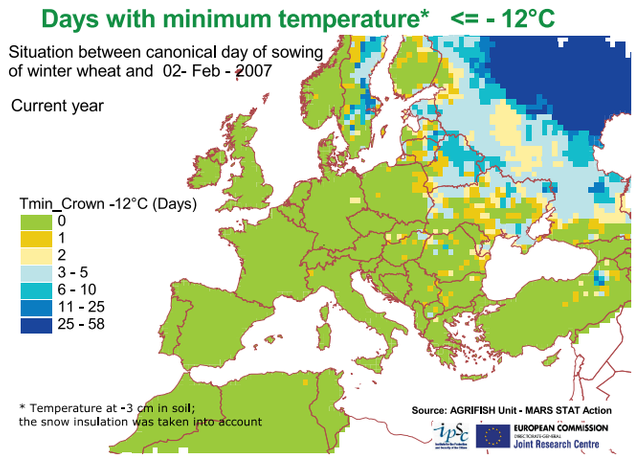
Days with minimum temperature* <= - 06°C



Days with minimum temperature* <= - 09°C



Days with minimum temperature* <= - 12°C



2. Synthesis of the 2006/07 sowing campaign

EU-27

Winter wheat: favourable conditions for sowings, except for some problems of soil moisture excess in Portugal and some areas in France and Germany. Mild thermal conditions for crop establishment

In general, winter wheat experienced favourable sowing conditions all over Europe, except in Portugal and some scattered areas around the border between France and Germany where soil water excesses were recorded during almost all the sowing period. This could have made field access difficult and led to delayed sowing in these regions.

Early sowing has probably been hampered by soil moisture excesses in the western part of the Iberian Peninsula, in the Netherlands, in southern Norway and in a belt covering central France and central Germany.

Problems for sowing planned for the canonical period could have been created by the intense precipitations occurring in Portugal, central Spain (Castilla-La Mancha, Extremadura, Comunidad de Madrid), in France (Bretagne and Provence), around the border between France and Germany, and in Ireland, FYROM and Greece.

Conditions for late sowing have been characterised by water excesses in the northern part of the Iberian Peninsula, in Alentejo (PT), in Extremadura (ES), in the central and eastern part of France and in eastern Greece.

Where the crop was sown in September (e.g. Ireland, northern UK, Greece), the germination and emergence phases experienced mild thermal conditions and satisfactory soil moisture. Problems due to insufficient water availability during the germination phase could have verified in eastern Europe, and in some scattered regions in Italy, Greece and the Balkans. In fact, in these cases, precipitations were recorded at more than 30 % lower with respect to the long-term average. In general, higher-than-average temperatures were recorded after sowing in the whole of Europe, especially in the period between the second dekad of November and the first of December.

Barley: no real problems of field accessibility have affected sowings

Barley experienced favourable conditions for winter sowing. Soil water excesses have been limited both in terms of affected surfaces and in terms of length of warning periods. In general, high temperatures have been recorded for the whole of Europe in the emergence and post-emergence phases. Cumulated precipitations in the period between 1 November and 31 December have been decidedly lower than average around the border between Spain and France (Cataluña, Aragon, Provence-Alpes-Cote d'Azur, Languedoc-Roussillon), southern Germany, eastern France, Italy, Hungary, southern Slovakia and Greece.

Early sowing has generally been carried out under favourable conditions. Only in small areas of southern Portugal, central France, eastern Poland, the Netherlands and FYROM could accessibility problems have been encountered due to excess soil moisture.

Sowing in the standard period in Ireland, south-western UK, southern (Provence-Alpes-Cote d'Azur) and eastern (Lorraine, Champagne-Ardenne, Bourgogne, Franche-Comte, Alsace) France probably suffered because of soil water excess causing field accessibility problems.

Above-average precipitations have been recorded in the northern Iberian Peninsula, southern Germany, southern Austria and southern Norway and Sweden during the period when late sowing is usually carried out.

Rapeseed: no soil moisture excess during the sowing period

Water excesses could have threatened soil conditions during the canonical period of sowing in Poland, in north-eastern Slovakia and central France. For early sowing, the problem verified only in north-eastern and south-eastern Poland (Warminsko-Mazurskie, Podlaskie, Podkarpackie), in eastern France (especially Lorraine, Alsace, Franche-Comte) and in northern Germany.

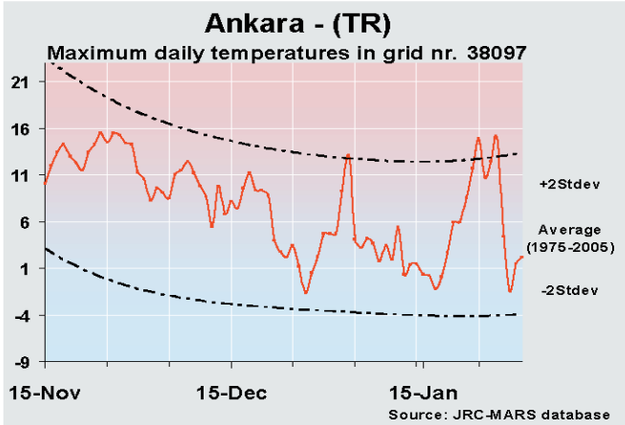
Late sowing in Hungary and Slovakia could have suffered from insufficient water availability during the germination and emergence phases.

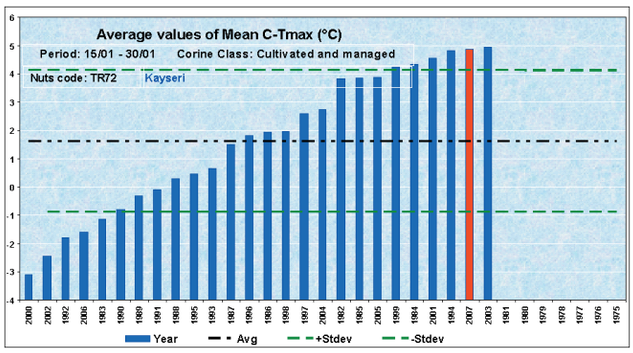
In the case of sowing carried out in the standard period, higher-than-average temperatures characterised the period immediately after sowing in southern Spain. Late sowing experienced warm conditions in the emergence and post-emergence stages.

Black Sea Area

Turkey: a cold spell in December was followed by warm weather in January

The beginning of the 2006–07 agricultural season in Turkey, from November to the present time, has been characterised, in quick succession, by both exceptionally low and high temperatures. In the second half of December 2006, minimum temperatures reached record levels below – 12 °C in the central and eastern highlands of the country partly affecting, to the east, the main cultivation areas of winter cereals. This cold spell was associated with widespread snow cover and occurred when the crop was emerging and in the first phases of tillering. Even though there might have been a negative impact on the conditions of the first leaves, it is still too early to quantify any possible damage. On the other hand, the beginning of January saw the establishment of warm weather over most of the country. Temperatures increased to reach a peak in the third week of January, exceeding 10 °C for a limited period. This evolution may have had marginal effects on the hardening of durum wheat. The combined effect of cold and warm weather may place winter cereals and especially durum wheat in conditions of higher susceptibility to an unfavourable evolution of the season, especially concerning the occurrence of frost events in the absence of snow cover. This same climatic trend was observed in the coastal regions of the Black Sea to the north and the Mediterranean to the south even though it did not reach the extreme levels reported inland. No particular event can be pointed out for the western Aegean coast.



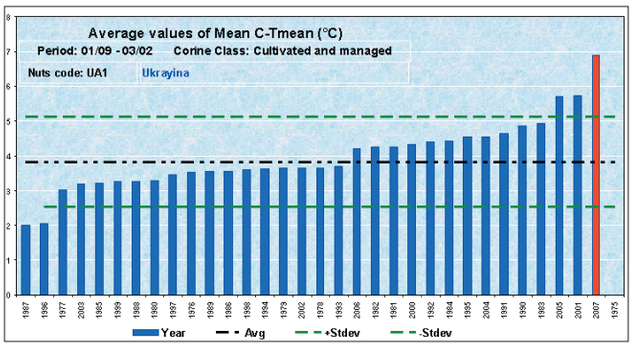


Ukraine: warm period continued, water balance improved but still remaining in deficit around the Black Sea regions

For all the agricultural areas of Ukraine, January 2007 was the warmest for the last 32 years. This situation is a continuation of the warm period which started in September. The number of days with average temperatures below 0 °C was the lowest in our records. Only three days with temperatures below – 8 °C were recorded since the beginning of the year and no direct frost kill event affecting winter wheat was detected until now. In spite of the warmer period, at the beginning of February the potential resistance to frost of the winter wheat crops was good for most of Ukraine except Crimea, where the hardening index was moderate (but no exceptional frost is foreseen for the next week in this area).

January's precipitation improved the poor water balance to a certain extent (calculated from September 2006) but the southern regions around the Black Sea remain in deficit. Regarding the possible evolution of this situation, it seems that the long-term forecast for a somehow wetter February/March reduces the chances of occurrence for the pessimistic scenario of a spring drought following a dry winter.

The development stage of winter crops is anticipating but this is rather a disadvantage because of the reduced water availability and the frost risk still present for the rest of the winter.



Eastern countries

Russia: too favourable conditions for winter crop

The period under analysis is the dormant period of winter crop growth.

The current winter is extremely warm in the European part of Russia. The air temper ature during November–January was near 0 °C everywhere, which is about 8–12 °C above normal. Only during the last dekad of January did the air temperature drop to normal values (– 10 to – 15 °C). As a result, snow cover was established only in the middle of January with an average delay of two months.

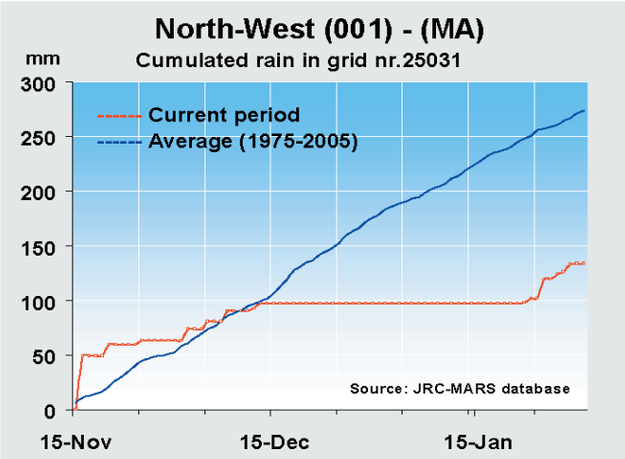
The amount of precipitation was higher than normal, and higher than in the previous season everywhere. Due to the high air temperature, precipitation took place mainly in the form of rain. These conditions lead to high soil-water content.

High air temperature and the availability of moisture lead to advanced crop development with higher-than-normal amounts of biomass accumulated before the winter. However, due to the absence of low temperatures, the crop is weak, and its resistance to frost and diseases is low. Thus, in spite of good crop development before the winter, the risk of low crop yield remains high. The situation is strongly dependent on meteorological conditions in the coming two months.

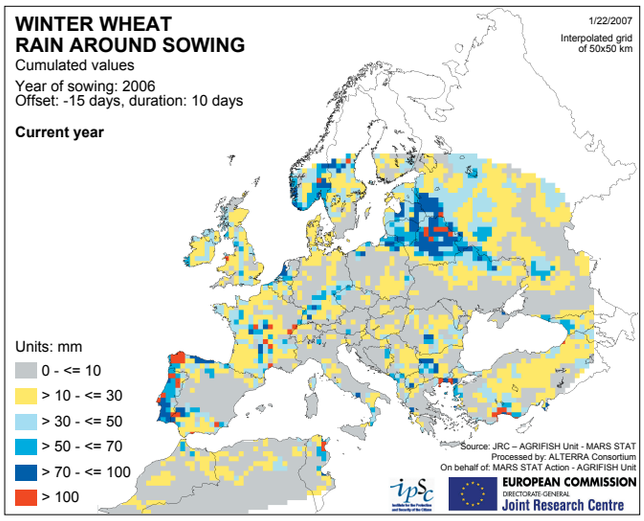
Maghreb

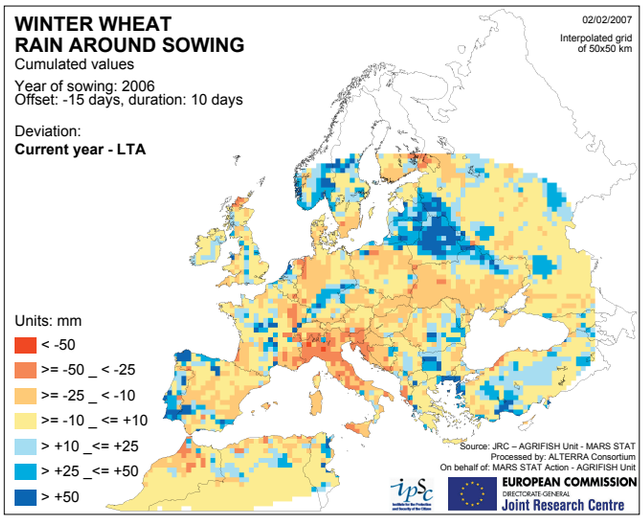
Maghreb: dry an mild weather in the west, favourable conditions elsewhere

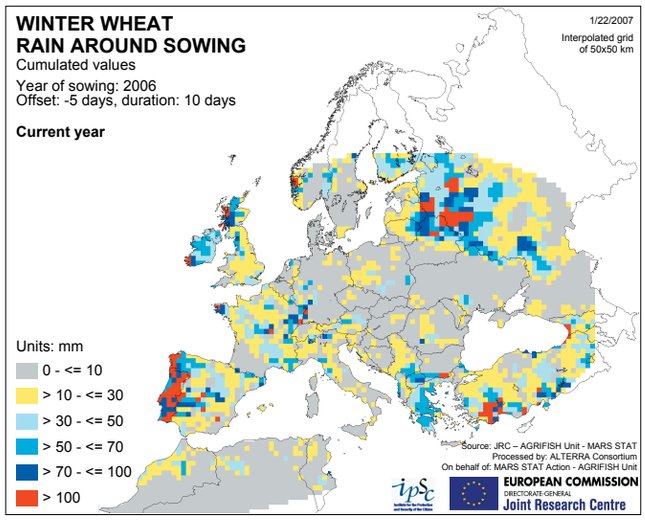
Precipitation has been scarce over most of western Maghreb at the onset of the 2006–07 agricultural season, especially in the most relevant winter cereal cultivation areas of Morocco. Better conditions were reported on the central coast of Algeria and in western Tunisia. Temperatures were milder than average over most of the region, ranging from the Atlantic to the Tunisian Mediterranean coast. The dry and mild weather may affect the hardening of winter cereals in the west (Morocco) increasing susceptibility to frost events and cold spells further on in the winter. For the rest of the region, the climate should not affect the positive progress of the agricultural season.

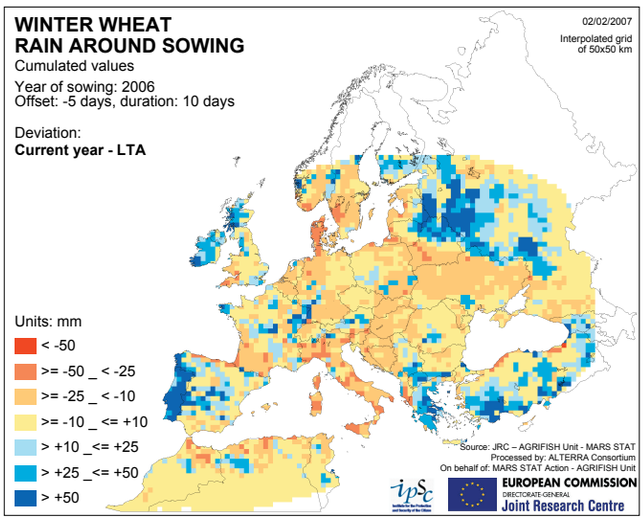


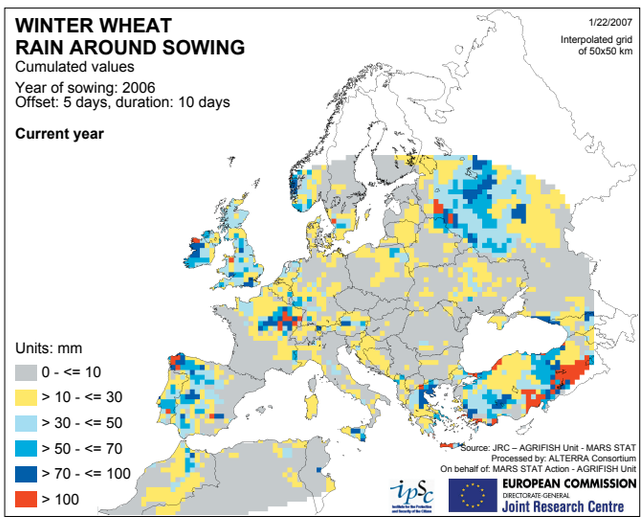
3. Climatic Conditions at winter wheat sowing

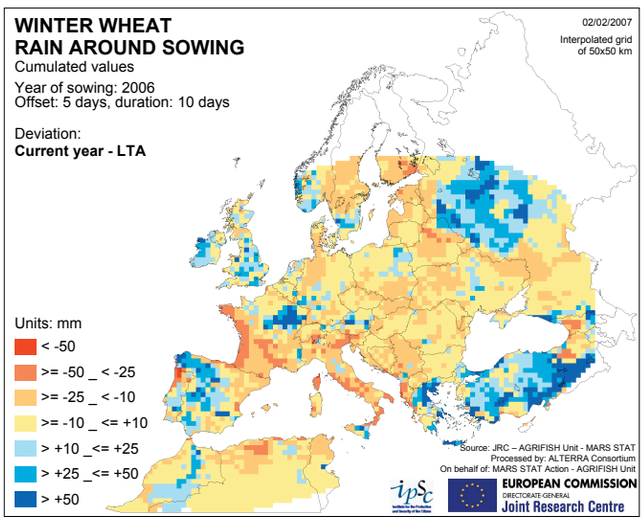




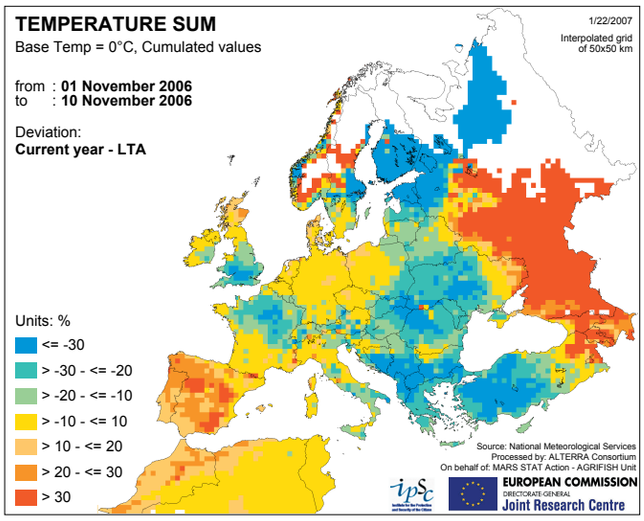


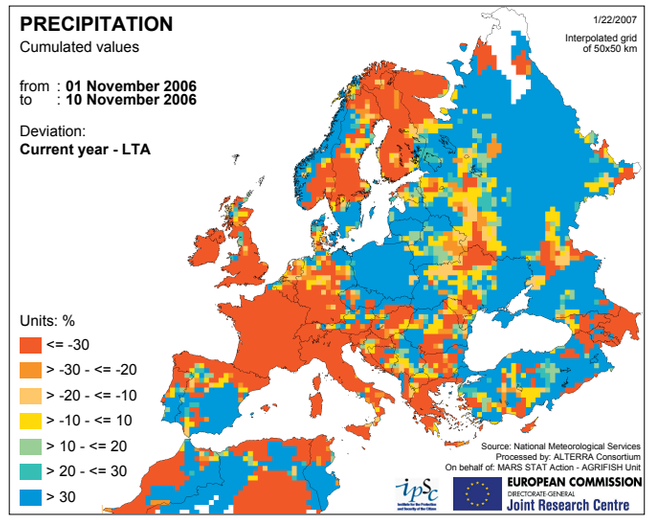


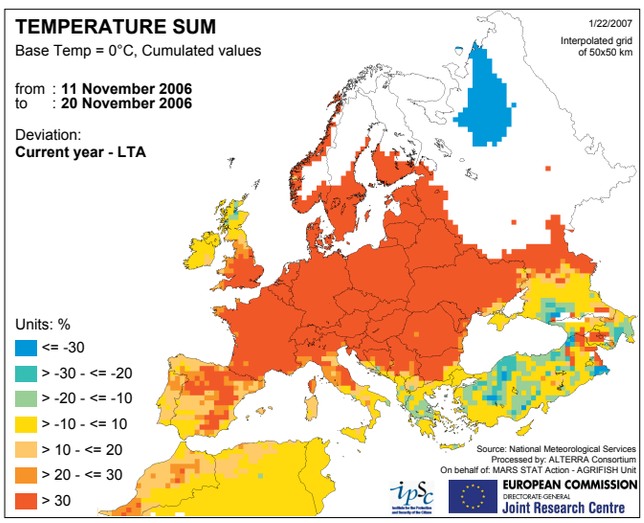


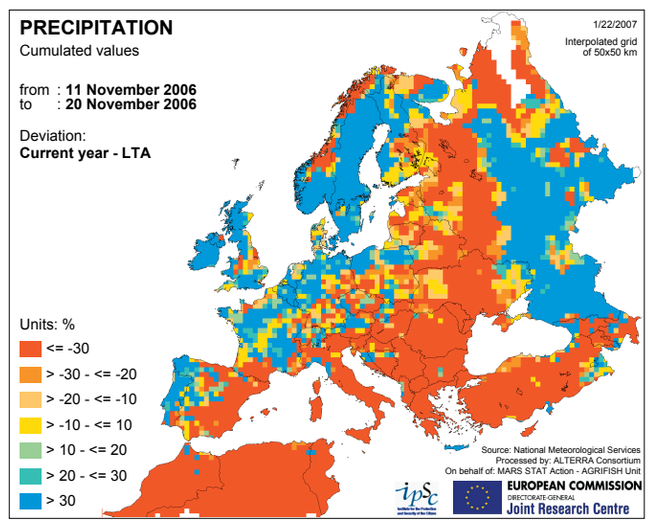


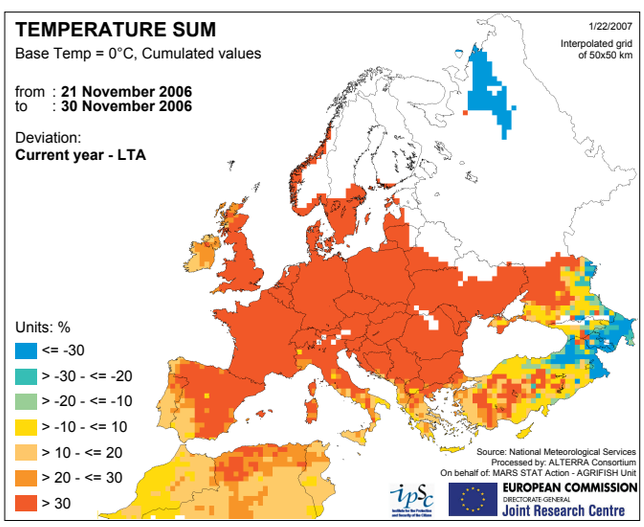
4. Temperature and Precipitation in November 2006

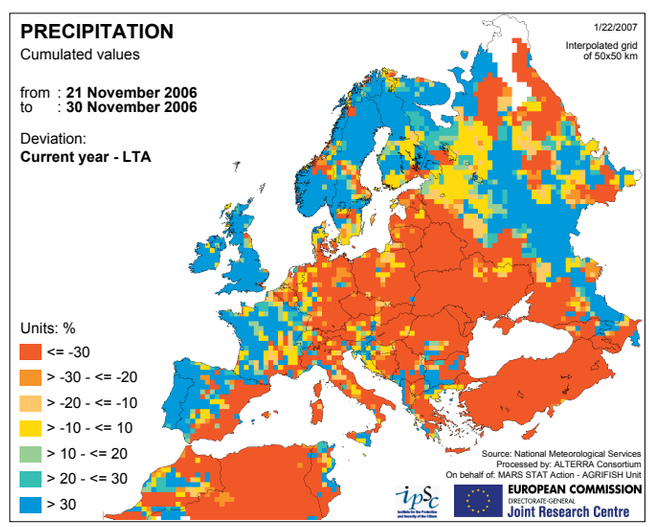




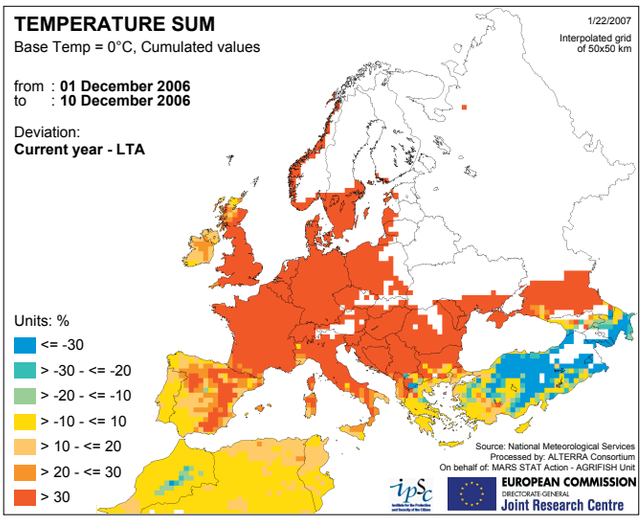


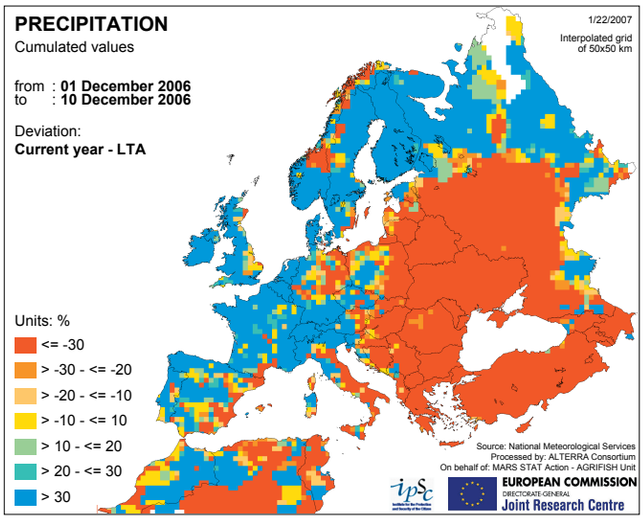


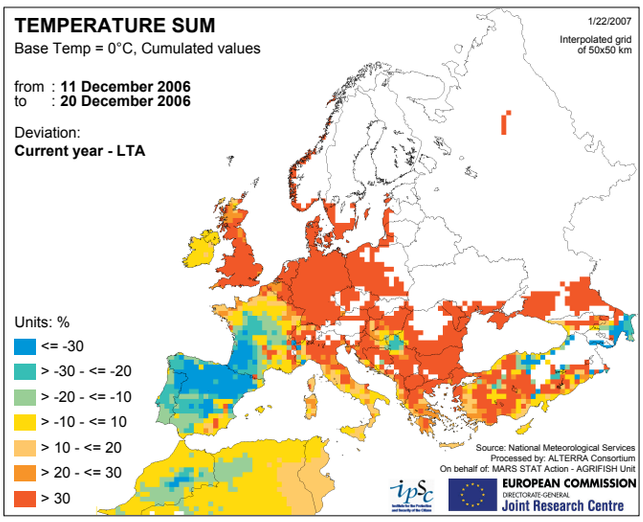


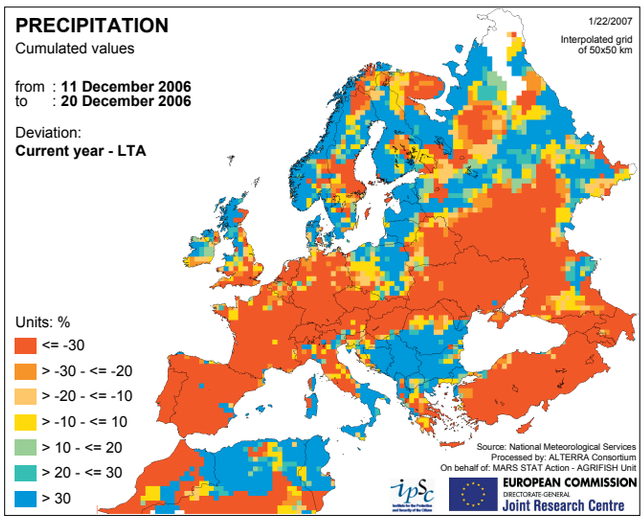


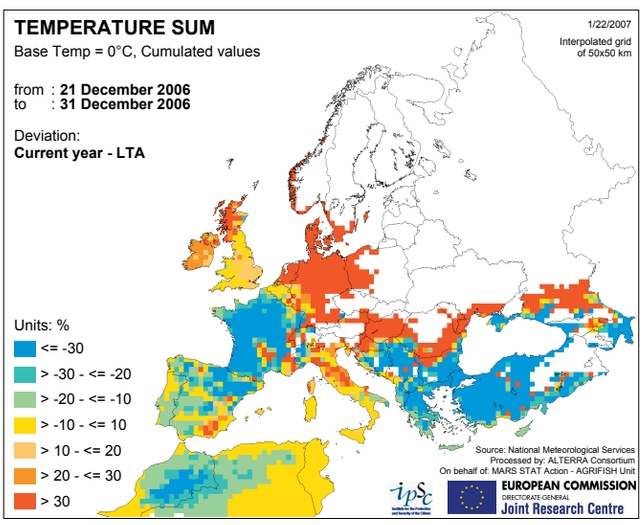
5. Temperature and Precipitation in December 2006

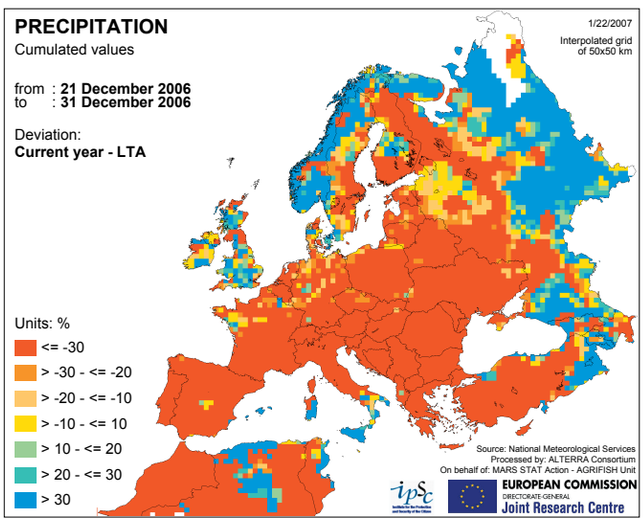




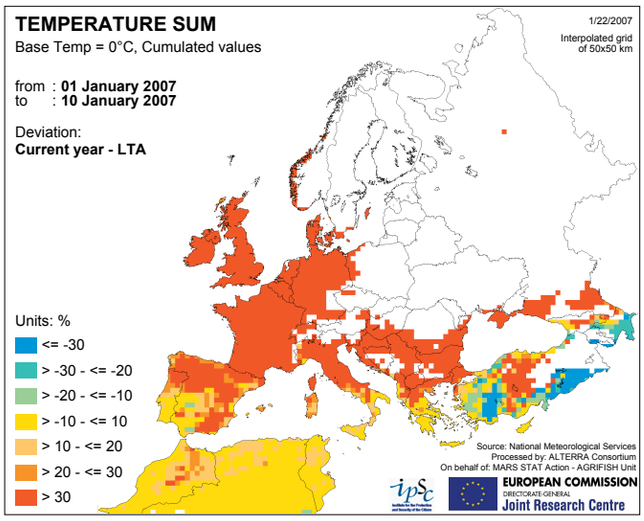


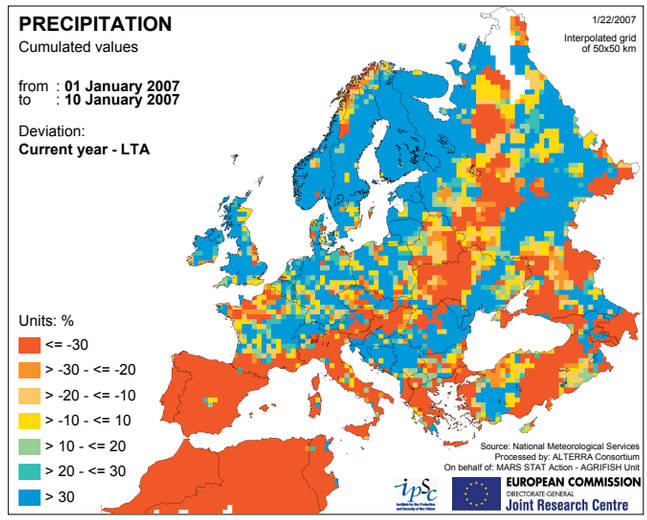


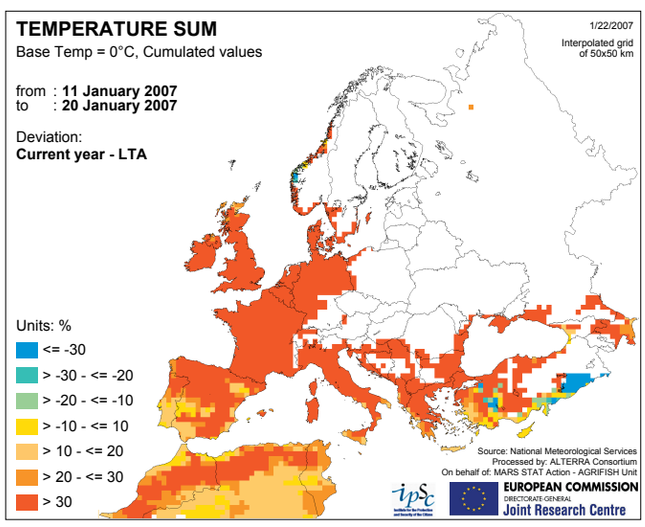


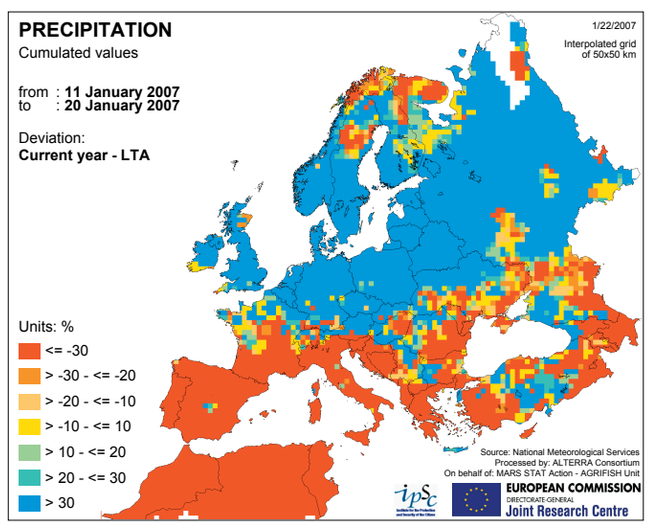


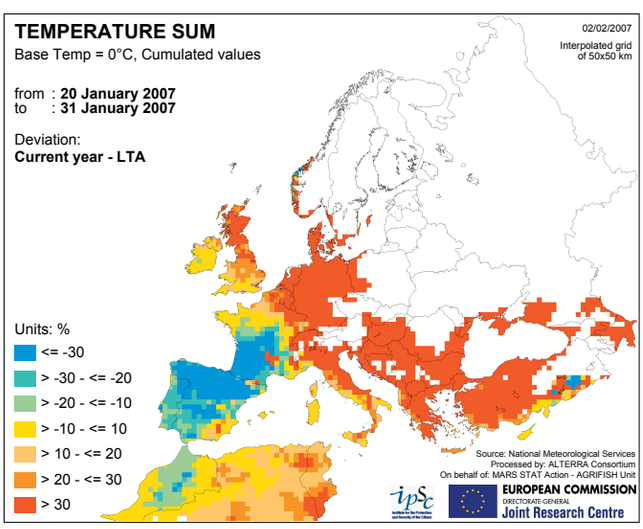
6. Temperature and Precipitation in January 2007

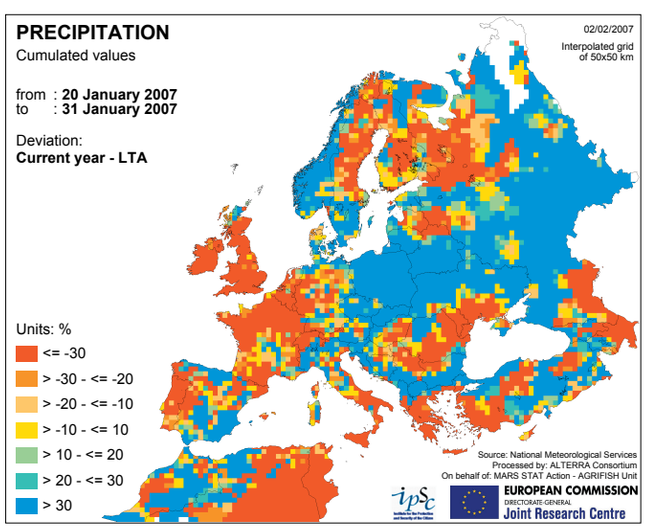






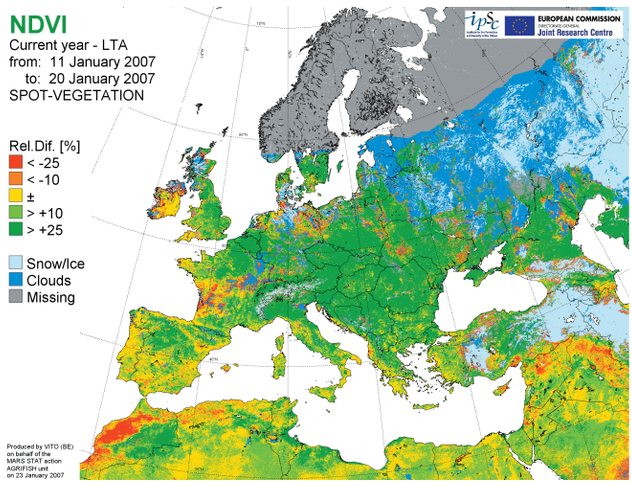






7 . Spot Vegetation satellite analysis

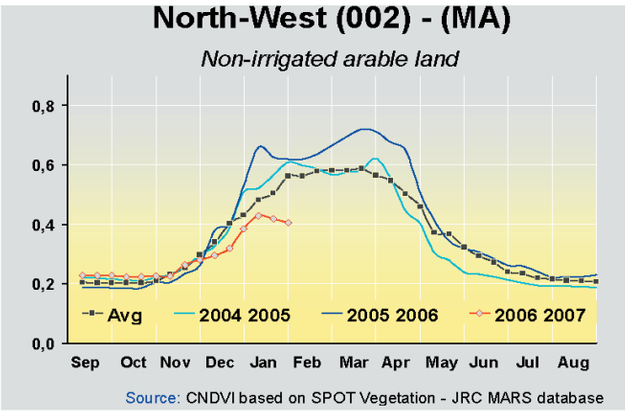
Anomalous mild winter reflected in NDVI maps and profiles

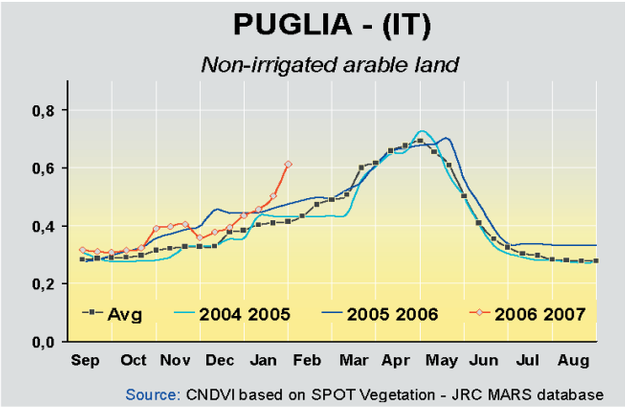


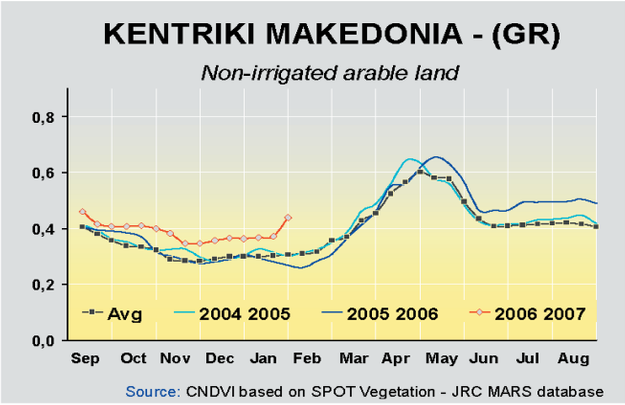
The NDVI map shows the relative differences with the NDVI values of the second dekad of January last year. Most of Europe shows deviations in NDVI values with more than 25 % above the NDVI values that occurred last year. Moreover there is remarkably little snow cover as compared to last year. Lower values are only recorded for the Maghreb, where the growing season was not so favourable.

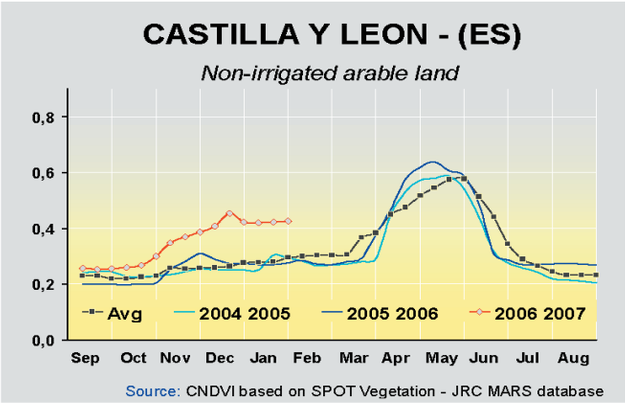
This is documented too in the **NDVI profiles** for the **Maghreb**, when looking at non-irrigated arable land. The profile for the **north-west (Morocco)** is below average and biomass accumulation is also far below the last two seasons, diminishing yield expectations. The same picture is obtained for **Tunisia**.

Other profiles around the **Mediterranean basin** show a more favourable start to the season and profile behaviour. NDVI values in **Puglia** are well above average and a first vegetation boost can be detected since January. The north of Italy experienced dry and warm conditions and is showing a profile well above average as is the one given for **Emilia-Romagna**. Favourable profiles are also found for **Greece**, **Portugal** and **Spain**. For **Castilla y Leon**, in central Spain, we see exceptionally high values, indicating biomass accumulation already, whereas the start of the major vegetation boost is to be expected for early April. A similar situation can be found for central France.









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