LifeWatch
E-Science European Infrastructure for Biodiversity and Ecosystem Research

Bulletin of Land Surface Dynamics
Second half of 2014

2014 has been the hottest year on record in the World and in Europe. Impacts of this exceptional phenomenon on the land surface dynamics are similar to the ones observed earlier in 2014, including:

- An unusual absence of snow in December over Central Europe
- The Sweden's largest wildfire in 60 years
- A greener vegetation than usual in Mediterranean countries

2014: the warmest year on record

The global temperature of 2014 was 0.68 °C above the long-term average calculated between 1951 and 1980, making 2014 the warmest year on record (NOAA; Figure 1).

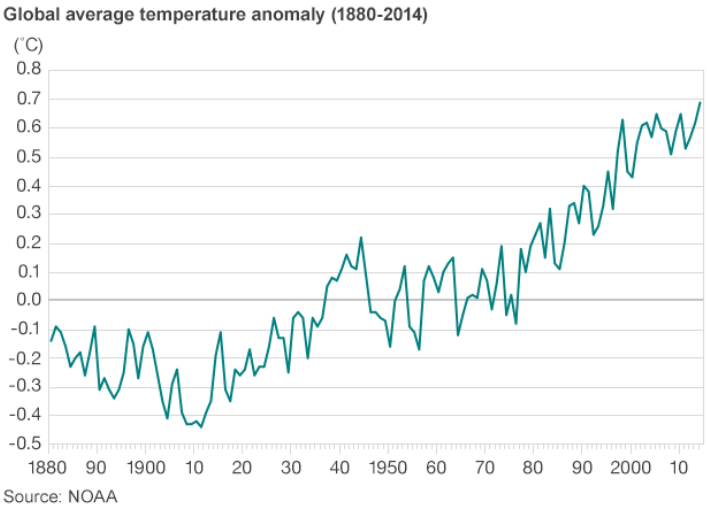

Figure 1: Global average temperature anomaly from 1880 to 2014 based on 1951-1980 climatology.

Not all parts of the globe recorded temperatures above the long-term average, some areas were cooler than average, (e.g. east of the USA and parts of Antarctica). But the greater proportion of warmer land and ocean areas led to this record. Europe has been one of the most affected continent with west of North America and north-east of Asia (Figure 2 & 3).

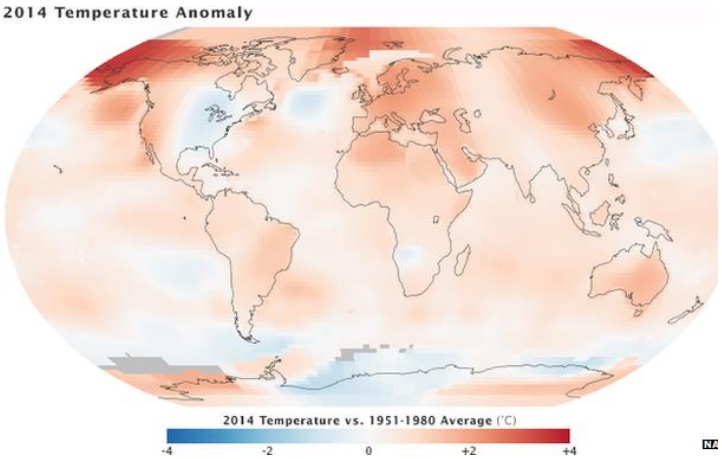

Figure 2: Temperature anomaly for 2014, many parts of the world show a higher temperature than the normal, mainly west of North America, Europe and north-east of Asia.

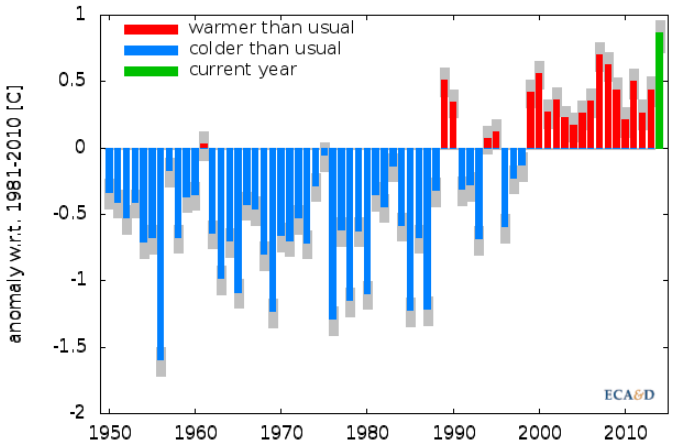

Figure 3: European temperature anomaly from 1950 to 2014 based on 1981-2010 climatology. Figure from ERO4M Climate Indicator Bulletin.

For many European countries, 2014 was the hottest year since meteorological records began (Figure 3 & Table 1). The European temperature anomalies (with respect to the 1981-2010 climatology) show warm winter, spring and autumn whereas summer 2014 was a bit colder with temperatures closer to the average (Figure 4).

Table 1: Some European countries that experienced their hottest year in 2014 compared to the long-term average.

Country	Long-term average	2014		Difference
Sweden	4.7°C	6.9°C	→	+ 2.2°C
Germany	8.2°C	10.3°C	→	+ 2.1°C
Belarus	5.8°C	7.8°C	→	+ 2.0°C
Italy	12.5°C	13.9°C	→	+ 1.4°C
France	12.6°C	13.8°C	→	+ 1.2°C
UK	8.8°C	9.9°C	→	+ 1.1°C

Unusual absence of snow in European Mountains

The unusual hot temperature of autumn 2014 in most of European countries (Figure 4) led to an important delay in the start of snow cover in the north and in the main mountain ranges (Figure 5). It was the second warmest autumn since the start of nationwide measurements in Germany and the third warmest autumn in a UK series from 1910 according to the DWD and the Met Office respectively. Temperatures reported in November across much of Western Europe were exceptionally high and many sites broke their all-time November heat records. On the opposite, parts of Russia and Ukraine saw cold temperature during this period (Figure 4).

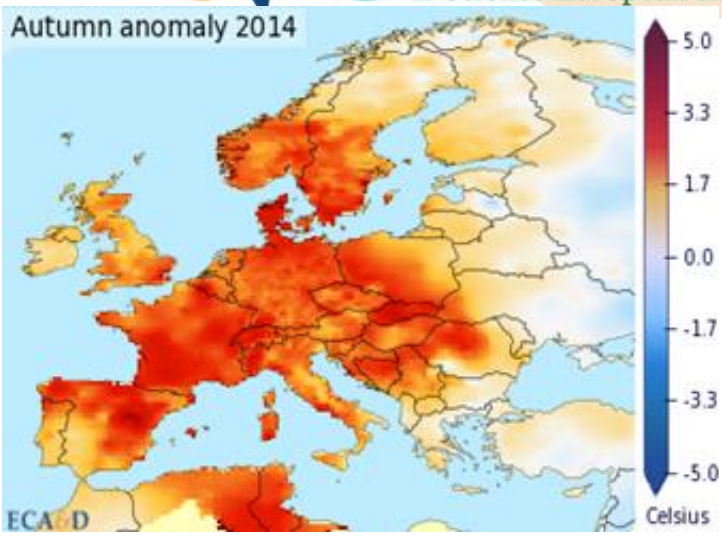

Figure 4: Anomalous autumnal temperatures with respect to the 1981-2010 climatology. This period was marked by high temperatures, only extreme east of Europe shows colder temperature than usual. Figure from the EURO4M Climate Indicator Bulletin.

The snow was absent in major parts of Balkans, Carpathians Mountains and some parts of the Alps until the end of December (Figure 6). At this time of the year, snow has been always observed in these areas since the beginning of observations with the MODIS sensor in 2000. Snow was also absent in some part of western Russia, Ukraine and Belarus in December although it has been observed in November. This lack of snow has forced Alpine ski resorts to postpone the opening of ski slopes. An exceptionally short duration of snow cover has been observed in 2014 over Europe because of the remarkable absence of snow in spring and autumn.

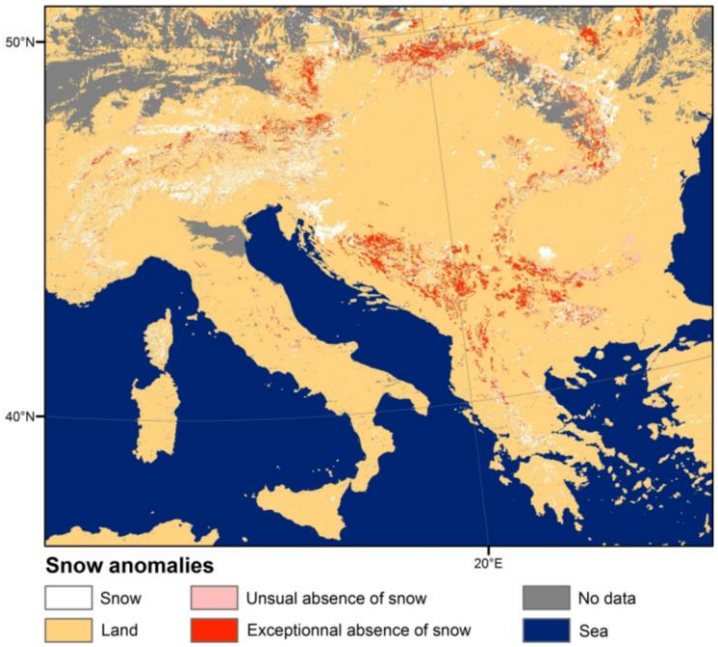

Figure 5: Exceptional absence of snow (red) in the 3rd week of December in the Mountains of Central Europe.

Short but exceptional presence of snow

Two European areas have seen exceptional, but brief, snow cover. The first one occurred in the north-east of the Carpathian Mountains in Ukraine and in Moldavia at the end of October (90 000 km^2). This snow disappeared few days after. The second exceptional snow cover took place in Italy, Tunisia and Algeria early January 2015 (Figure 6). These areas are usually not covered by snow. The city of Pachino (Sicily,Italy) had not recorded snow for 110 years.

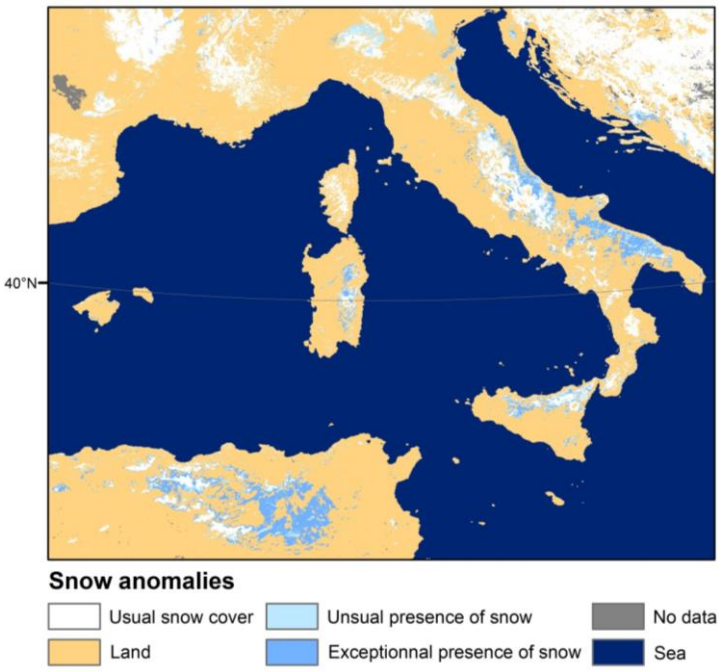

Figure 6: Exceptional presence of snow in Italy, Algeria and Tunisia during the first week of January 2015.

Rodent populations soared

Exceptionally mild winters 2013-2014 and 2014-2015 led to an impressive increase in the rodent populations over Western Europe. Farmers and horticulturists complain about damages in their grasslands and plants nursery. This change in the base of the food web had an impact on populations of other species, for example, more raptors specialized in rodent hunting (boreal owl (*Aegolius funereus*), common kestrel (*Falco tinnunculus*), etc.) have been observed during the winter 2014-2015 in Western Europe because 1) the reproduction in spring 2014 has been more successful than usual and 2) birds moved from the east to the west, where more preys were available. Moreover, in order to take advantage of this larger food availability, birds changed their hunting behaviour: grey heron (*Ardea cinerea*) and great egret (*Ardea alba*) were more present in grassland than near water bodies where we could usually find them fishing.

Birds stay in the north

As observed during the first months of 2014, an unusually high numbers of birds have been spotted at the end of the year in the northern border of their winter range, including chiffchaff (*Phylloscopus collybita*) and stonechat (*Saxicola rubicola*; Figure 8). More and more of these birds cut short their journey to the south because of the mild weather. For example, a third of smew (*Mergellus albellus*) population spent winter 2014 in the north-east of Europe, while only 6% of the birds were there 20 years ago (Figure 9). This change is in accordance with the predictions of global warming. Moreover, in the north-east of Europe, the increase in population is twice as fast within the Natura 2000 sites (Jordán *et al*., 2015, *Divers. Distrib.*).

Figure 8: the stonechat was observed in high number in the northern border of their winter range at the beginning and the end of 2014, © Robin Gailly.

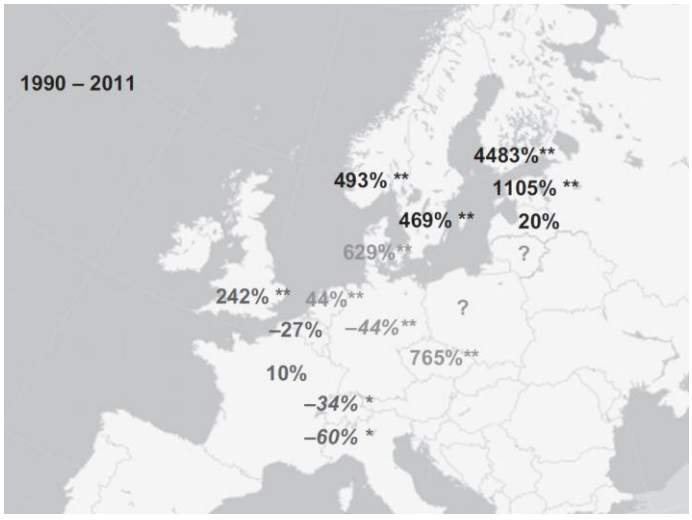

Figure 9: Rate of change (in percentage) in winter abundance of smew during 1990–2011. The Smew wintering distribution shifted north-eastwards in Europe during this period. Figure from Jordán *et al.*, 2015, Divers. Distrib.

Fires occurrence in 2014

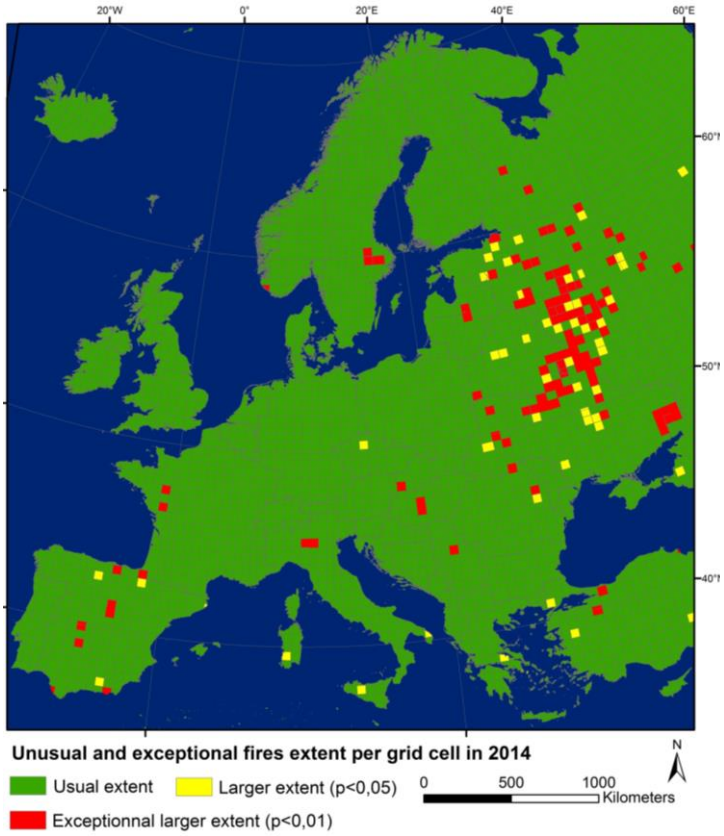

Figure 10: The main 2014 exceptional fires occur in Russia, Ukraine, Sweden and Belarus. They are mainly agricultural fires.

The number of exceptional fires observed in 2014 is similar to the previous years. They mainly occurred in Russia, Ukraine and Belarus (Figure 10). Fires in 2014 burnt 550 square kilometres of Natura 2000 sites, mainly in Spain, Portugal and Greece. In the summer, the unusual warm and dry weather in Sweden led to the Sweden's largest wildfire in 60 years (Figure 11).

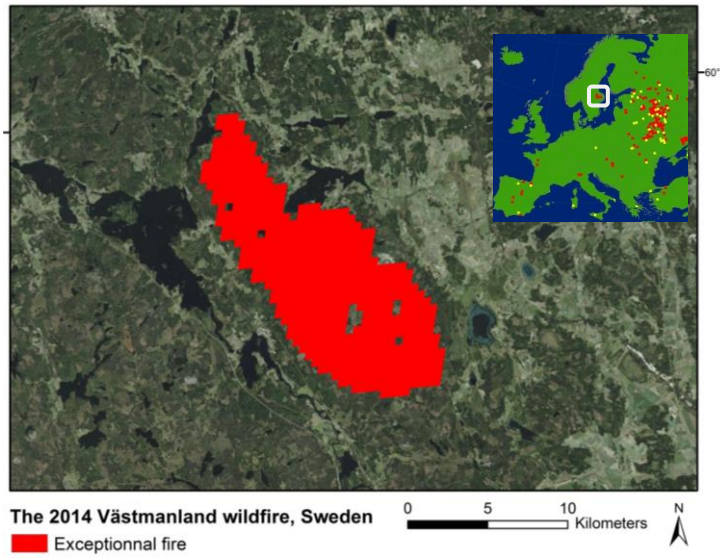

Figure 11: Västmanland wildfire burnt at least 15,000 hectares of boreal forest in August 2014.

Vegetation greenness significantly higher than usual

Some part of Europe had vegetation greenness values significantly higher than usual in summer and autumn 2014. As shown in the previous Bulletin, in the Mediterranean region, precipitation rate is the main factor limiting vegetation growth. The wet (Figure 12) and hot summer and autumn 2014 led to an important development of vegetation which has been detected on satellite images. The three Mediterranean peninsulas showed unusual vegetation greenness, but at different periods: Iberian Peninsula from the end of September to early November, Italy from mid-July to end of August (Figure 13) and the Balkans mainly in August, for some parts in September.

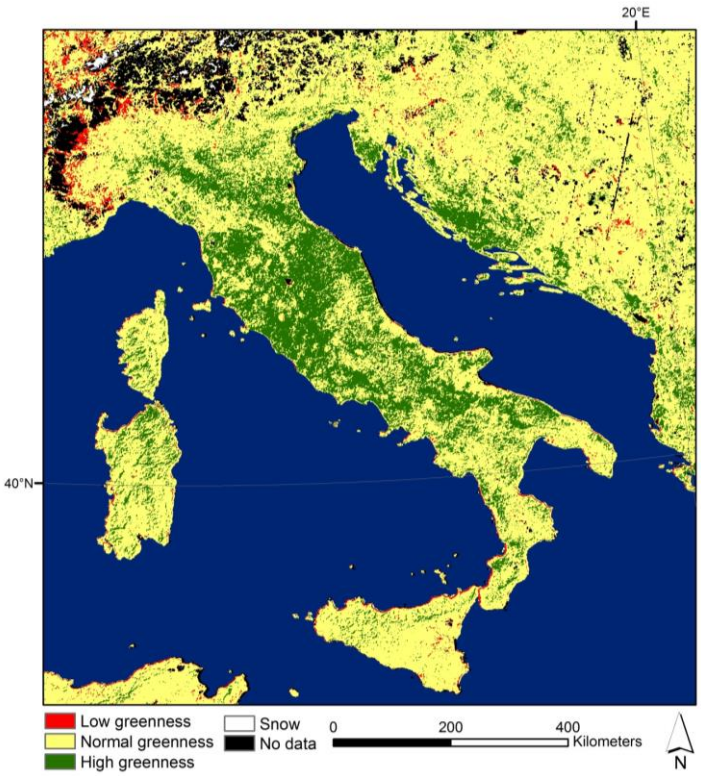

Figure 13: Vegetation greenness anomalies in the second week of August 2014. Significantly higher vegetation greenness values (dark green) occur over major parts of Italy and in Croatia.

The web portal to view and download data

All this information can be visualized from the web portal where a point based extraction tool is also provided.

www.uclouvain.be/lifewatch

All data are available at least from 2001 to present and are regularly updated. Follow us on Twitter to get the latest news @LifeWatch_WB. For comments, suggestions or unusual data request, contact us at *lifewatch@uclouvain.be*

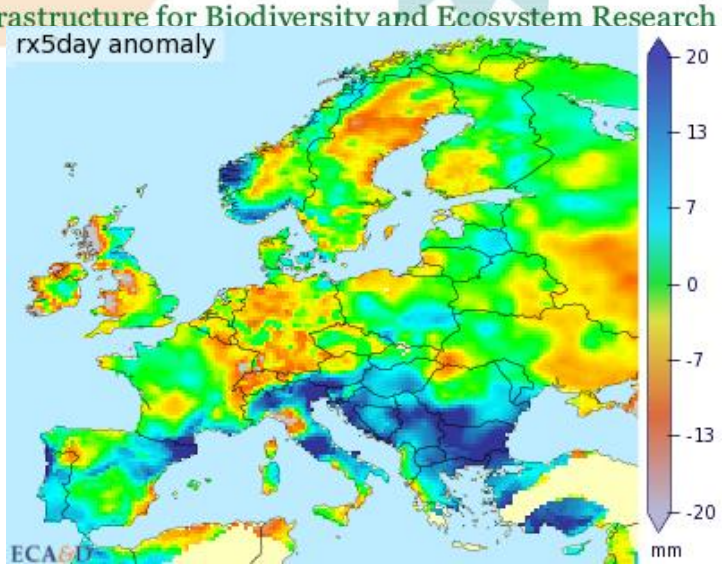

Figure 12: Annual maximum five day (RX5day) precipitation indices show large amounts of above-normal precipitation in 2014 in southern Europe. Figure from the EURO4M Climate Indicator Bulletin.

LifeWatch: Biodiversity and Ecosystem research

LifeWatch Wallonia-Brussels is one of the Belgian contributions to the European Research Infrastructure Consortium for Biodiversity and Ecosystem research (LifeWatch). It is funded by the Fédération Wallonie-Bruxelles. Information about the Belgian contributions to LifeWatch can be found on *www.lifewatch.be*

It is one of the most ambitious European initiatives for the study of biodiversity and ecosystems. LifeWatch is not a research project, but an infrastructure that offers services and tools to the scientific community, the policy makers and the public. In addition, LifeWatch will provide opportunities to construct personalized 'virtual labs', also allowing entering new data and analytical tools. More information about LifeWatch can be found on: *www.lifewatch.eu*

Methods

The summarized land surface dynamics are developed from remote sensing time series of daily global observations by satellites. The times series allow to derive average state of variables at any given time of the year. Data can be compared to this average to highlight anomalies. The average state of variables is produced by LifeWatch-WB team from time series of different remote sensing products developed within the CCI Land Cover project *http://www.esa-landcover-cci.org*. Moreover, data from the Belgian satellite Proba-V are used to continue the vegetation greenness time series after the end of SPOT-VEGETATION.