



Tenth Session of the SOUTH-EAST EUROPE CLIMATE OUTLOOK FORUM

SEECOF-10 MEETING

ANALYSIS AND VERIFICATION OF THE SEECOF-9 CLIMATE OUTLOOK FOR THE 2013 SUMMER SEASON FOR SOUTH-EAST EUROPE (SEE)

CLIMATE OUTLOOK FOR THE 2013 SUMMER SEASON FOR THE SEE REGION

As stated in the SEECOF-9 Consensus Statement for the Seasonal Climate Outlook for the 2013 summer season for South-Eastern Europe (document: <http://www.seevccc.rs/SEECOF/SEECOF-9/STEP%203/Consensus%20Statement%20for%20the%20Climate%20outlook%20for%202013%20summer%20season%20.pdf>), in the whole SEECOF region there is likelihood for the above-average summer season temperature. There is less probability that the value of the average summer season temperature will be exceeded in most of the Balkan Peninsula, eastern and south-eastern part of Turkey and in the western parts of the Caucasus region (zone 2 in Figure 1), while there is a higher probability of such above-average conditions in the Aegean Sea, central and eastern Mediterranean with the belonging coasts, as well as along the western and southern coasts of the Black Sea, in the western part of Turkey and in the eastern part of Caucasus (zone 1 in Figure 1).

Uncertainties in regional predictions are larger for precipitation than for temperature. In the Aegean and Black Sea with hinterland and in the eastern part of Caucasus region summer season precipitation totals are more likely to be below average (zone 1 in Figure 2), while in most of the Balkan Peninsula, Pannonia Plain, Adriatic and Ionian Sea with hinterland, along the southern coasts of Turkey and Cyprus summer season precipitation totals are likely to be near- or below- average (zone 2 in Figure 2). In the mountainous part of the Caucasus region and in the central and eastern part of Turkey (zone 3 in Figure 2), the uncertainty is large: probabilities for below-, near- or above- average conditions are approximately equal. It must be emphasized that it might be possible that some parts, especially mountainous ones, might locally have near- or above- normal

summer season totals, due to the episodes of enhanced convection with high intensity rainfall. Also, it must be noted that due to the dry season masking there is no use forecasting summer season precipitation totals in the Central Mediterranean, as well as in the southern and eastern parts of the Eastern Mediterranean with hinterland.

Climate outlook for the 2013 summer season for the SEE region is presented in Figure 1.

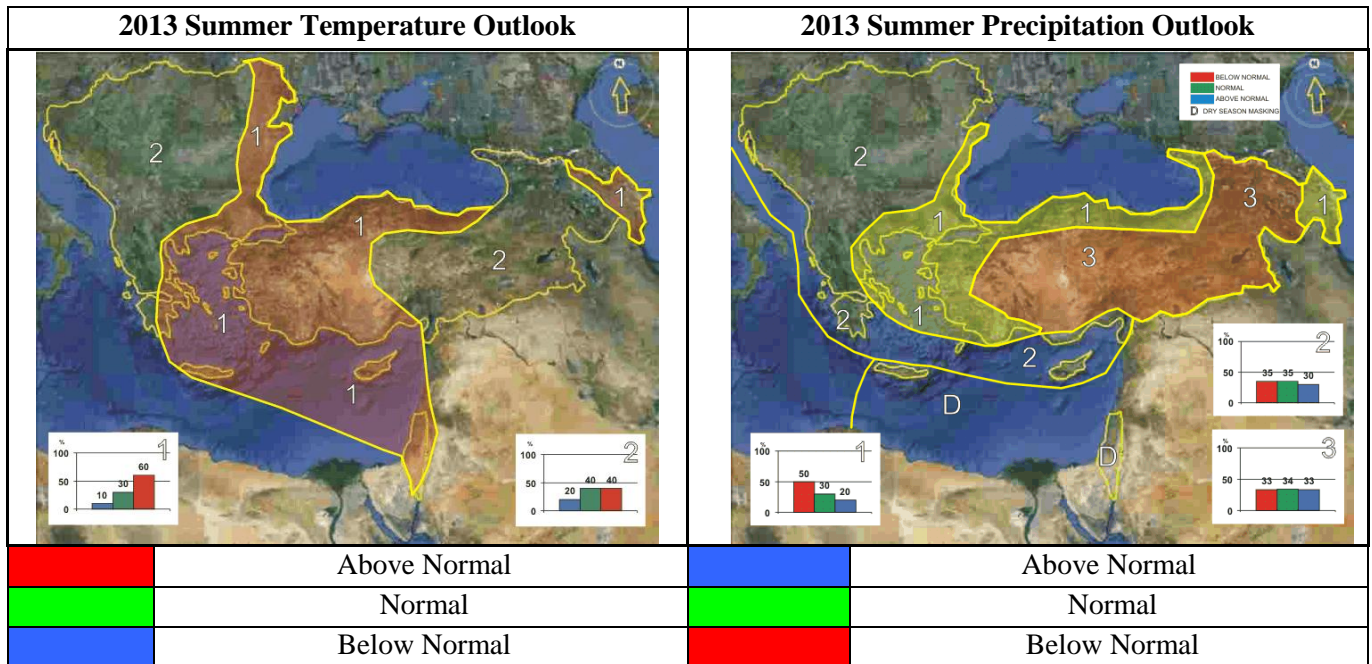


Figure 1. Graphical presentation of the climate outlook for the 2013 summer season for the SEE region

SHORT ANALYSIS OF THE 2013 SUMMER SEASON FOR THE SEE REGION

Analyses of the summer season temperature and precipitation anomalies are based on:

- operational products of the European Climate System Monitoring – ECSM (the ECSM system is a technical platform of the DWD, WMO RA VI RCC Node on Climate Monitoring, <http://www.dwd.de/ecsm>);
- seasonal bulletins on climate in the WMO region VI for the summer of 2013, (ECSM, DWD, WMO RA VI RCC Node on Climate Monitoring, <http://www.seevccc.rs/SEECOF/SEECOF-10/Pre-COF/Climate-Report-summer-season-2013-exp-RCC-CM.pdf>);
- climate monitoring products of the South East European Virtual Climate Change Center - SEEVCCC (member of the WMO RA VI Pilot RCC Node on Climate Monitoring, http://www.seevccc.rs/imgsrc/clim_mon/201308/); and
- national climate monitoring reports of the following SEECOF-10 participating countries: Armenia, Bulgaria, Bosnia and Herzegovina (the Federation of Bosnia and Herzegovina and the Republic of Srpska), Croatia, Cyprus, Georgia, Greece,

Israel, the FYR of Macedonia, the Republic of Moldova, Montenegro, Serbia and Turkey (documents available on:

<http://www.seevccc.rs/SEECOF/SEECOF-10/Pre-COF/>.

In most of the Balkan Peninsula, in Israel and in some parts along the coasts of Turkey with its belonging hinterland, the summer 2013 temperatures were above normal. The exception was the south of Greece, the Eastern Mediterranean, the continental part of Turkey and the Caucasus region with summer season temperatures within normal values.

During summer 2013, entire Serbia was affected by two heat waves, whereas even three heat waves occurred at certain places in the northern and eastern parts of the country. The record-breaking daily air temperature of 39.7°C in relation to the 1961-1990 referent climatological period was registered on July 29th in Veliko Gradiste. On August 8th, the record-breaking daily air temperatures were registered in Bihac where they amounted to 42.0°C, in Drvar 39.3°C and in Livno 38.2°C. The absolute maximum temperature was measured in Radnevo (southeastern Bulgaria) on July 30th (40.5°C).

Summer season temperatures in the lowlands of most of the SEECOF area mostly ranged between 20°C and 25°C; along the coasts of the Mediterranean Sea and Aegean Sea, as well as in the southern parts of the Balkans and Turkey and in Israel temperatures were between 25°C and 28°C, while they were below 13°C at some higher elevations. Summer season temperatures are presented in Figure 2 (left panel).

In most of the SEECOF region anomalies ranged between 1°C and 2°C; in the western part of the Balkan Peninsula, as well as in some parts of the Pannonia Plain and Carpathian region, anomalies were even higher, with the values of up to 3°C above normal. The exception occurred in the Caucasus region, continental part of Turkey, in the south of Greece and in the Eastern Mediterranean, where anomalies ranged between -1°C and 1°C.

The average number of summer days ($T_{max} \geq 25^{\circ}\text{C}$) was exceeded by 10 to 20 days in most of the Balkans, while in the northern and central part of Romania and in northern Montenegro it was exceeded by as much as 30 days. The average number of tropical nights ($T_{min} \geq 20^{\circ}\text{C}$) was surpassed by 20 nights in a part of eastern Bulgaria and in Croatia, while more than 30 nights were registered in a part of northern and southern Turkey, in northeastern Bulgaria and in Israel.

In most of the SEECOF region August was the hottest month during the summer season. In almost the whole Balkan Peninsula and along the coasts of the Eastern Mediterranean the August mean monthly temperature anomalies were between 1°C and 3°C, while in the central parts of the Balkans they were even higher, with mean temperature values between 23°C and 28°C, and up to 30°C along the coasts of the Aegean Sea and Eastern Mediterranean. On the other side, in the Caucasus region and in central and eastern Turkey, August mean monthly temperatures were within normal values.

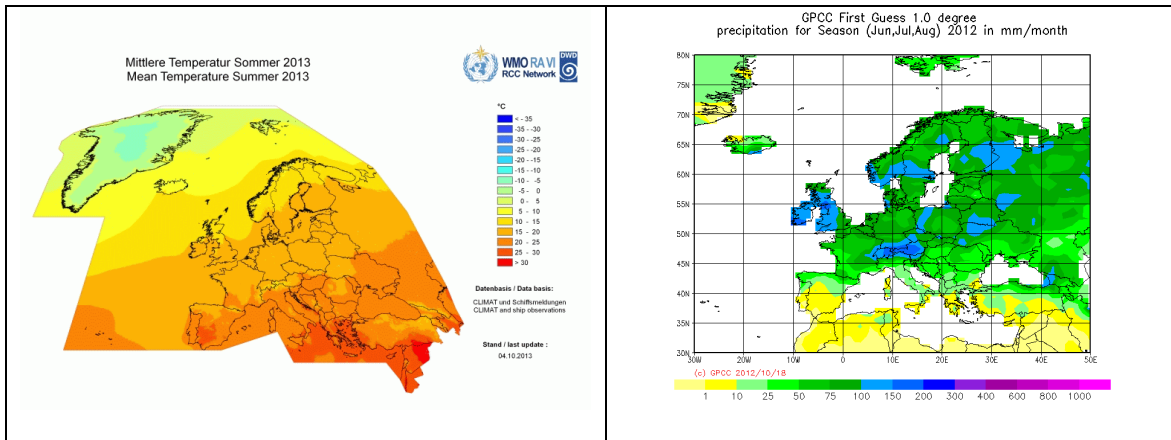


Figure 2. Summer season 2013 observed temperatures (left panel) and summer season observed precipitation in mm per month (right panel). Source: <http://www.dwd.de/ecsm>

The summer precipitation totals over the SEECOF region ranged from less than 10 mm in the south of Greece, in the Eastern Mediterranean, Israel and in the southern and central parts of Turkey, up to 100 mm in some parts of the Carpathian region, in the hinterland of the eastern coasts of the Black Sea, while they were even much higher on the local level. Precipitation anomalies were very diverse within the SEECOF area. It was considerably drier than normal (<75% of the long-term average) in some parts of the western and central Balkans, as well as in some parts of the southern and central parts of Turkey and eastern Mediterranean, while it was drier than normal in most of the Balkans and in the northern and central parts of Turkey. In contrast, in some parts of western Turkey and the southern coasts of the Black Sea, in the eastern Balkans and in the central and western part of the Caucasus region it was wet, while in the rest of the SEECOF region it was normally wet. Summer season precipitation anomalies are presented in Figure 3 (right panel).

In the central parts of Greece, the eastern Balkans, the central part of the Caucasus region and in some parts along the coasts of Turkey, June was considerably wetter than normal, except in some parts of the western Balkans, in the mainland and some parts of southern Turkey, in the eastern part of Caucasus and in the Eastern Mediterranean Sea, where it was considerably drier than normal. In the rest of the SEECOF region June monthly totals were within normal values. In July, the above mentioned precipitation tendency was the same in the south of the Balkans, in the south of Turkey, and in the western part of Caucasus, due to heavy rain events with thunderstorms and hail. In contrast to that, July was dry in the Pannonia Plain, in the western part of the Balkan Peninsula, in some parts along the eastern and western coasts of Turkey and in the eastern part of Caucasus. August was also considerably dry in the southern and southeastern parts of the Balkan Peninsula, in most of Turkey, and in the East Mediterranean and belonging coasts, while due to convective activity the exception to that was the Carpathian region and some parts along the coasts and in the far east of Turkey.

At the beginning of June extremely heavy precipitation in Central Europe caused floods, especially along the Danube River catchment, throughout Hungary. In Moldova, more than 100 mm of precipitation fell within few hours on June 30th, while Bulgaria also received heavy precipitation partly accompanied by large hail. During July and August several parts of Turkey and Georgia were affected by floods.

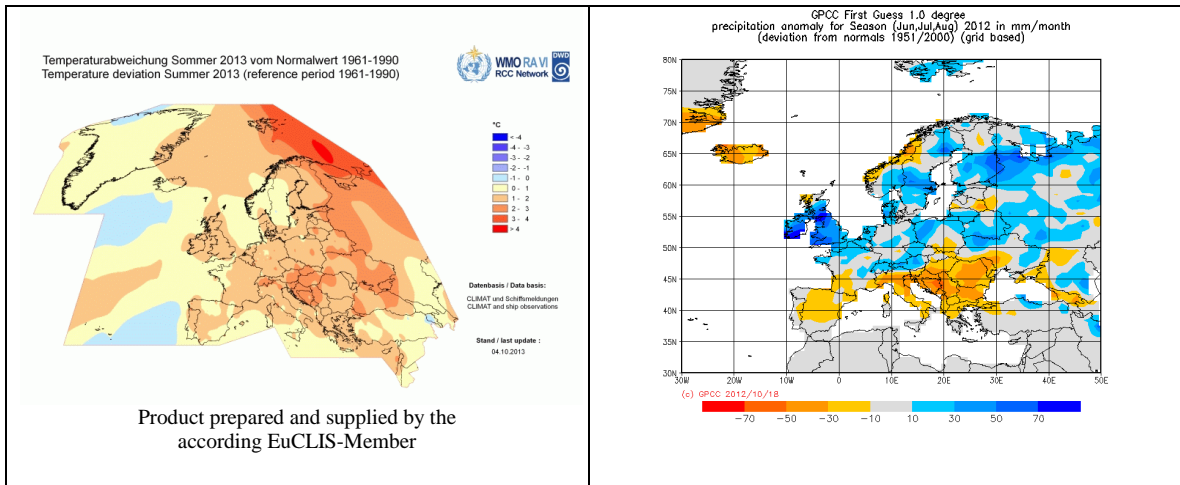


Figure 3. Summer season 2013 observed temperature anomalies (left panel) and summer season observed precipitation anomalies in mm per month (right panel). Source: <http://www.dwd.de/ecsm>

VERIFICATION OF THE CLIMATE OUTLOOK FOR THE 2013 SUMMER SEASON

The SEECOF-9 climate outlook for the 2013 summer season concluded that seasonal temperatures over most of the SEECOF region would be above normal. It was also outlined that the exceeding of the average summer season temperature was predicted with less probability for most of the Balkan Peninsula, the eastern and southeastern part of Turkey and the western parts of the Caucasus region, while for the regions of the Aegean Sea, Central and Eastern Mediterranean with the belonging coasts, as well as along the western and southern coasts of the Black Sea, in the western part of Turkey and in the eastern part of Caucasus it was predicted with a higher probability. On the basis of the aforementioned regional, sub-regional and national climate monitoring products, it appeared that the monitored anomalies of mean summer season air temperatures were above normal in most of the Balkan Peninsula, in Israel, along the western, and partly southern and northern coasts of Turkey, while they were clearly above normal in the western part of the Balkans. This indicates that the climate outlook for the summer season air temperature was more or less correct for most of the SEECOF region.

According to SEECOF-9, it was outlined that the uncertainties in regional predictions would be larger for precipitation than for temperature. In the Pannonia Plain, in the western, central and southern part of the Balkan Peninsula, along the southern coasts of the Black Sea, along the southern coasts of Turkey, in Cyprus and in the eastern part of the Caucasus region, it was predicted that the summer season precipitation totals would be near- or below-average, and that prediction turned out to be quite accurate. Also, it

was emphasized that in Crete, in Israel, in the central parts of Turkey and in the mountainous part of the Caucasus region it was not possible to predict the summer season precipitation totals due to dry season masking, i.e. that there were equal chances for below-, near-, or above-normal conditions. Therefore, the above mentioned regions were not taken into consideration for the verification of the summer season precipitation.

APPENDIX A: Contributors to the pre Pre-COF of SEECOF-10

- World Meteorological Organization
- Deutscher Wetterdienst, the Federal Republic of Germany
- South East European Virtual Climate Change Center hosted by the Republic Hydrometeorological Service of Serbia, the Republic of Serbia
- Royal Netherlands Meteorological Institute, the Netherlands
- Armenian State Hydrometeorological and Monitoring Service, the Republic of Armenia
- National Institute of Meteorology and Hydrology, the Republic of Bulgaria
- Meteorological and Hydrological Service, the Republic of Croatia
- Hellenic National Meteorological Service, the Republic of Greece
- Meteorological Service, the Republic of Cyprus
- Department of Hydrometeorology, the Republic of Georgia
- Israel Meteorological Service, the State of Israel
- Republic Hydrometeorological Institute, the Former Yugoslav Republic of Macedonia
- State Hydrometeorological Service, the Republic of Moldova
- Hydrological and Meteorological Service of Montenegro, the Republic of Montenegro
- Federal Hydrometeorological Service of the Federation of Bosnia and Herzegovina, the Federation of Bosnia and Herzegovina, Bosnia and Herzegovina
- Republic Hydrometeorological Service of the Republic of Srpska, Bosnia and Herzegovina
- Republic Hydrometeorological Service of Serbia, the Republic of Serbia
- Turkish State Meteorological Service, the Republic of Turkey

APPENDIX B: Analysis and verification of the SEECOF-9 climate outlook for the 2013 summer season:

Verification summary based on the national reports and contributions of the participants of Pre-COF of the SEECOF-10 meeting

Country	Seasonal temperature (JJA)		Seasonal precipitation JJA		High Impact Events
	Observed	SEECOF-9 climate outlook for temperature	Observed	SEECOF-9 climate outlook for precipitation	
Armenia (1)	Normal	Above normal to normal	Below normal to normal Above normal (in mountainous parts)	No clear signal	On several days during June and July convective-related severe weather phenomena (thunderstorm, hail with the diameter of max 14 mm, heavy rainfall – 87 mm/2 hour in Sisian, 39 mm/12 hour in Aparan, 36 mm/12 min in Fantan, strong wind with wind gusts of up to 15 – 25 m/s) were observed.
Federation of Bosnia and Herzegovina, Bosnia and Herzegovina (1)	Above normal	Above normal to normal	Below normal in most of the territory Above normal in the southernmost part of the country	Below normal to normal	During summer 2013, record-breaking daily air temperatures were monitored on August 8 th in Bihac (42.0°C), in Drvar (39.3°C) and in Livno (38.2°C).
Republic of Srpska, Bosnia and Herzegovina	Above normal and normal	Above normal to normal	Below normal and normal	Below normal to normal	No comment.

(1)					
Bulgaria (4)	Normal in the central and southernmost parts of the country Above normal in the rest of the country	Above normal in the coastal part of the country Above normal to normal in the rest of the territory	Above normal in some parts of northern and southern territory Normal in the rest of the territory	Above normal in the easternmost parts of the country Below normal to normal in the rest of the territory	In Silistra on July 1 st 24-hour precipitation amounting to 164 mm was measured. The absolute maximum temperature was recorded in Radnevo (southeastern Bulgaria) on July 30 th (40.5°C).
Croatia (1)	Above normal	Above normal to normal	Below normal	Below normal to normal	No comment.
Cyprus (1)	Above normal	Above normal	Below normal	Below normal to normal	No comment.
Georgia (1)	Normal	Above normal to normal	Normal Above normal along the coast of the Black Sea	No clear signal in most of the territory Above normal along the coast of the Black Sea	Heavy rain occurred on August 18 th in Poti – 110 mm precipitation, and in Kobuleti – 118 mm precipitation.
Greece (1)	Above normal in the west and in the plain areas of the country	Above normal in the region of the Aegean Sea and belonging coasts	Above normal in the western and northern part of the country	Above normal in the northern and central parts of the Aegean Sea and	No comment.

	Normal in the rest of the country	Above normal to normal in the rest of the territory	Below normal in the rest of the territory	belonging coasts Below normal to normal in the rest of the territory Dry season masking on Crete	
Israel (5)	Normal	Above normal	No comment	Dry season masking	No comment.
FYR of Macedonia (1)	Above normal	Above normal to normal	Above normal in the eastern part and in a part in the west of the country Below normal in the rest of country	Below normal to normal	No comment.
Republic of Moldova (1,2)	Above normal	Above normal	Near normal in most of the country Below normal in some regions of the central and southern	Below normal to normal	Elemental hydrometeorological phenomena such as torrential rain and hail, causing crop damage, damage and power outages, were reported throughout the season (June, July, August). The highest intensity of rainfall was recorded on June 30 th – July 1 st , when the PH Chisinau and MS Baltata received 140-175 mm of precipitation in 24 hours (200-250% of the monthly norm), and MS Stefan-Voda 126 mm in 12 hours (200% of the monthly norm).

			parts of the country		
Montenegro (1)	Above normal	Above normal to normal	Normal in most of the territory Above normal in the eastern part of the country	Below normal to normal	10 August 2013 – a storm with heavy rainfall in Rozaje (eastern part of Montenegro, i.e. the Polimsko-ibarski Region). Impacts: - the roads were damaged by heavy rainfall and consequential torrential flows, which accumulated sediments of over 1m and destroyed cottages and fences; - over 150 households in the surroundings of Rozaje were cut off from the main town; - around 20 houses were flooded; - estimated material losses amount to 300,000 EUR.
Serbia (1,2,5)	Above Normal	Above normal to normal	Below normal in most of the country Normal in some parts of the central and southwestern Serbia	Below normal to normal	During summer, entire Serbia was affected by two heat waves, whereas even three heat waves occurred at certain locations in the northern and eastern parts of the country. In most of the country, the first heat wave was observed from June 16 th to 22 nd . The second heat wave was registered at 7 primary meteorological stations, and it lasted from July 24 th to 29 th . The third heat wave was observed in entire Serbia at the beginning of August, from August 3 rd to 9 th . The primary meteorological station Zajecar experienced the fourth heat wave with the onset on August 18 th , lasting until August 23 rd . During summer 2013, the record-breaking daily air temperatures were monitored in Veliko Gradiste on July 29 th , amounting to 39.7°C, in relation to the referent climatological period 1961-1990. On August 28 th a thunderstorm with hail the size of an egg, and in some locations even the size of a human fist, hit the central parts of Serbia, damaging cars and trees. There were no casualties.
Turkey	Normal in	Above normal	Below normal	No clear signal	June

(2)	<p>most of the territory</p> <p>Above normal along some parts of the coastal line of the Black Sea</p>	<p>to normal in the eastern and southeastern parts of the country</p> <p>Above normal in the rest of the territory</p>	<p>in most of the territory</p> <p>Above normal in the Aegean region and in the Middle Black Sea region</p>	<p>in most of the territory</p> <p>Above normal along the coast of the Black, Aegean and Western Mediterranean Sea and in the hinterland</p>	<p>Floods, storm and hail affected some parts of Turkey. The most notable event, heavy rain and thunderstorm caused flood in Bursa, Ağrı, Artvin, Rize, Erzurum, Manisa and Denizli. Lightning and hail damaged cars and trees. Also houses and highways were affected by extreme events. There were no casualties.</p> <p>July Heavy rain and thunderstorm caused flood in Afyon, Manisa, Sinop and Uşak. A bridge was destroyed in Sinop by flash flood caused by heavy rain. In Erzurum walnut-sized hail damaged cars, houses and trees.</p> <p>August Floods, storm and hail affected some parts of Turkey. Thunderstorm traced with heavy rain caused flooding in Samsun, Trabzon, Rize and İzmir. Houses, trees and highways were damaged; walnut-sized hail damaged cars.</p> <p>Total mean precipitation in August 2013 was below normal values, but also below values referring to August 2012. Rainfall in August decreased by 42.1% in relation to normal.</p>
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Note:

- 1 - Basic climatological period (1961-1990)
- 2 - Basic climatological period (1971-2000)
- 3 - Basic climatological period (1951-2000)
- 4 – Basic climatological period (1980-2009)
- 5 – Basic climatological period (1981-2010)
- 6 – No information about basic climatological period