CHARACTERISTIC CHANGES IN THE TEMPERATURE OF THE ATMOSPHERE FOR DIFFERENT PERIODS OF TIME IN THE REGION OF STARA ZAGORA

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Abstract

To monitor atmospheric temperature changes, the data obtained from the sensors of the Vantage Pro 2 Plus meteorological station are used. The temperature of the atmosphere is determined by the difference of the amount of heat which heats the air and the amount of heat which cools the air. In this development is examined the thermal dynamics without taking into account the contributions of the individual factors. The data collected from the sensors are processed, averaged and ranked by hours, days, months and years. The results obtained are shaped in graphical form. The purpose of the study is to trace how big is a repetition in different periods. Monitoring is performed in the region of Stara Zagora.

Introduction

When the amount of heat that heats up the air is greater than the amount of heat that cooled the air, the temperature of the atmosphere goes up and vice versa. The heat that heats up the air depends on the temperature of the Earth's surface and from the absorbed solar radiation. The heat, which cools the air depends on the adiabatic cooling, heat radiation and heat transfer in contact with a cold surface. Modern methods for measuring temperature require that reporting be done in as short as possible periods. Then, these measurements are averaged for longer periods. For this reason, measurements are carried out on every 15 minutes. [1] The accumulated and processed data for 6 years is about 210,000 entries .

Theory and research of the temperature dynamics.

It is known that the solar radiation and the temperature of the Earth's surface are higher in the summer months than in the winter. This is also the case for the daily periods.[2] Solar radiation and temperature of the Earth's surface are higher during the daytime period than in during the night. [4]. It is reasonable to expect that these factors will determine the dynamics of the temperature during the respective periods. In this sense the temperature changes are tracked in daily, monthly and annual cycles.

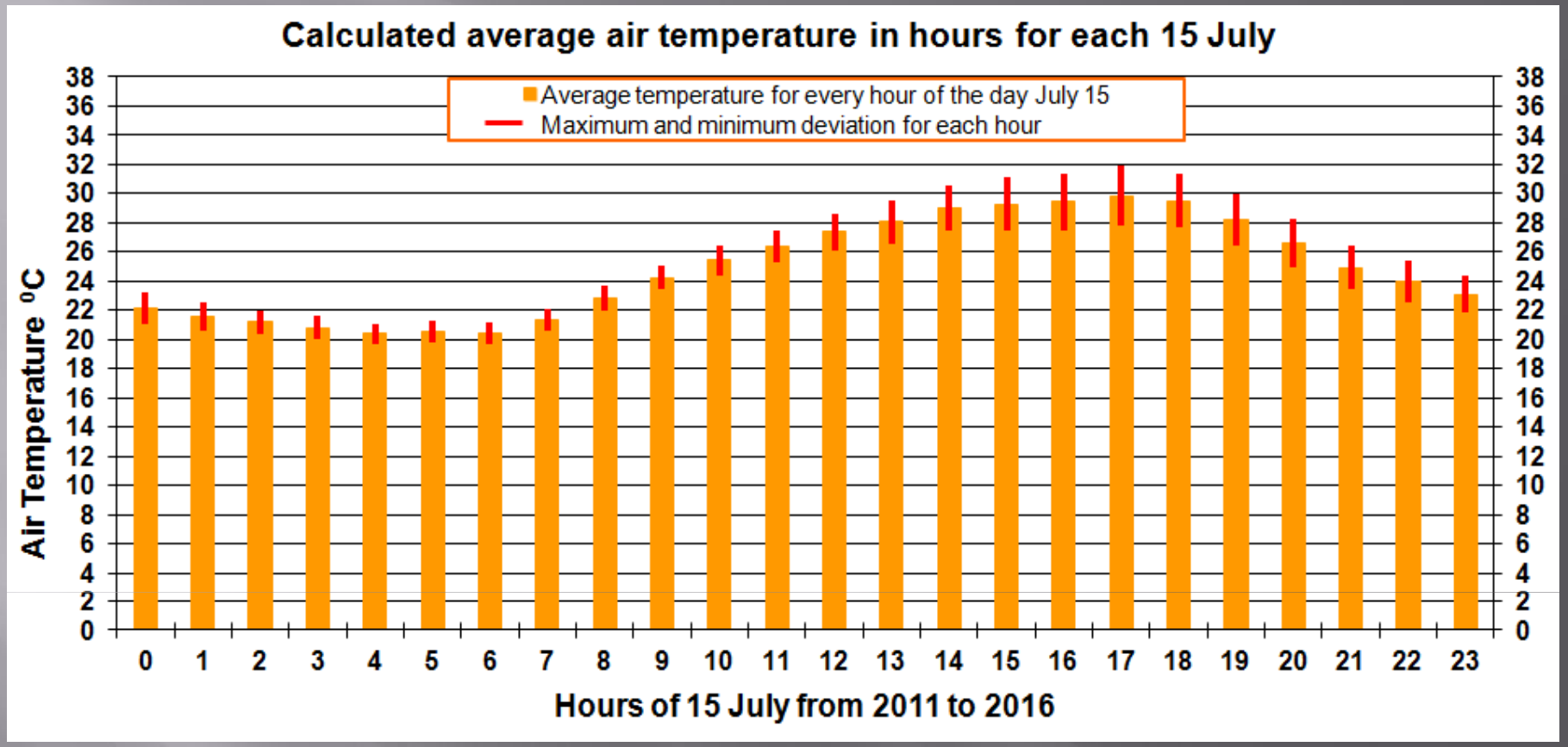

Fig. 1 Average temperature measured for each hour on July 15, years 2011 to 2016

In Fig.1, the average values of atmospheric temperature are shown with orange strips. They are measured for each hour on July 15 in a period of 6 years. The temperature deviations from the midpoint are marked with red lines. It clearly appears that the average temperatures are the highest and with a maximum dynamic from 3 to 6 p.m., and the lowest, with a minimum dynamic from 4 to 6 a.m. The solar radiation is the highest from 11 to 2 p.m. [2], while at night it is practically zero. This phase shift, between the two maxima with 4-5 hours, depends on the time it takes the sun to warm the earth.

Thus, the theory that the earth is the main factor for heating the atmosphere, while the solar radiation is secondary event is confirmed. It is generally accepted, however, that the heat is from 12 to 3 p.m. This opinion is wrong and the people with health problems should acknowledge the scientific investigations.

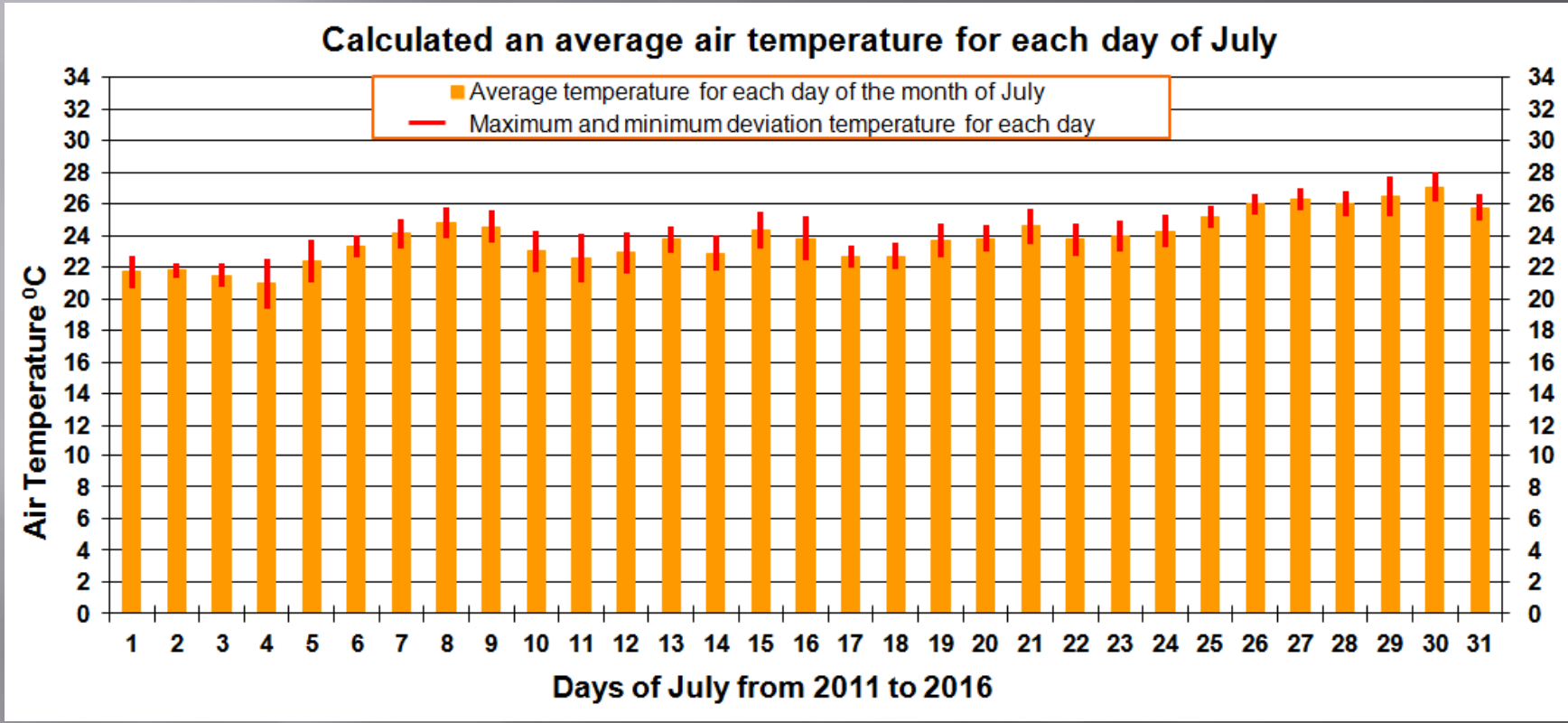

Fig. 2 Average temperature measured for each day on July, years 2011 to 2016.

In Fig. 2, the average temperatures for each day of July in a period of 5 years are shown with orange strips. The temperature deviations from the midpoint are marked with red lines. It is clearly seen, that the dynamic variations are much smaller than the one for every part, due to the obtained arithmetic mean for every day. Moreover, we observe that the maximum and minimum of the average temperatures are statistical.

This is due both to the direct and the indirect influence of the solar radiation, which in turn depends on the presence of dust, moisture, gaseous and other contaminants in the atmosphere. [3]

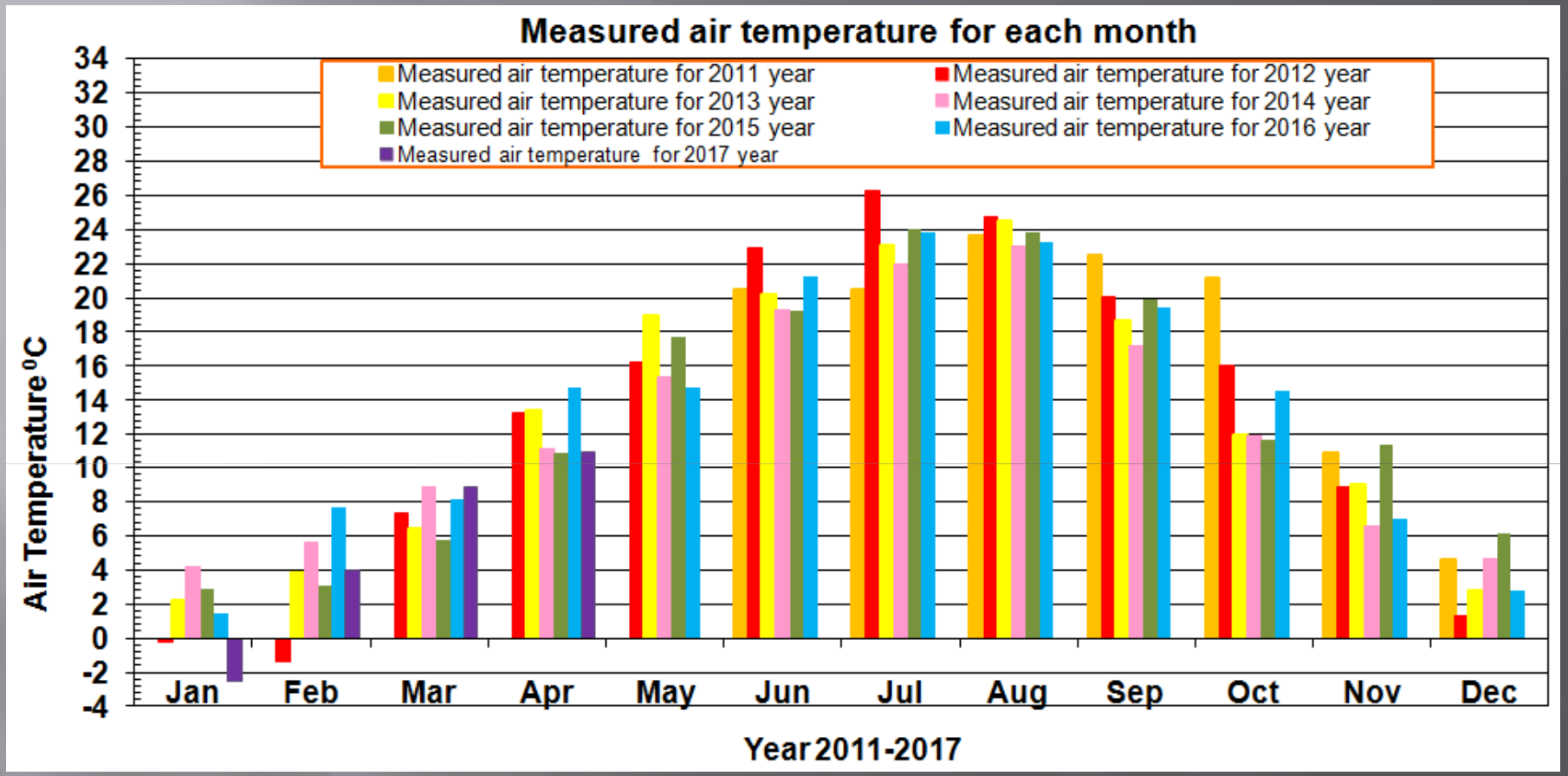

Fig. 3 Temperature measured for each month from 2011 to 2017 .

In Fig. 3, the measured temperatures for each month from 2011 up to 2017 are presented. The different years are marked with a variety of color strips. It is shown that the highest temperatures are in July and August while the lowest are in January and February. In this case, the amount of solar radiation encompass major effect on the temperature, while the earth surface heat has secondary effect.

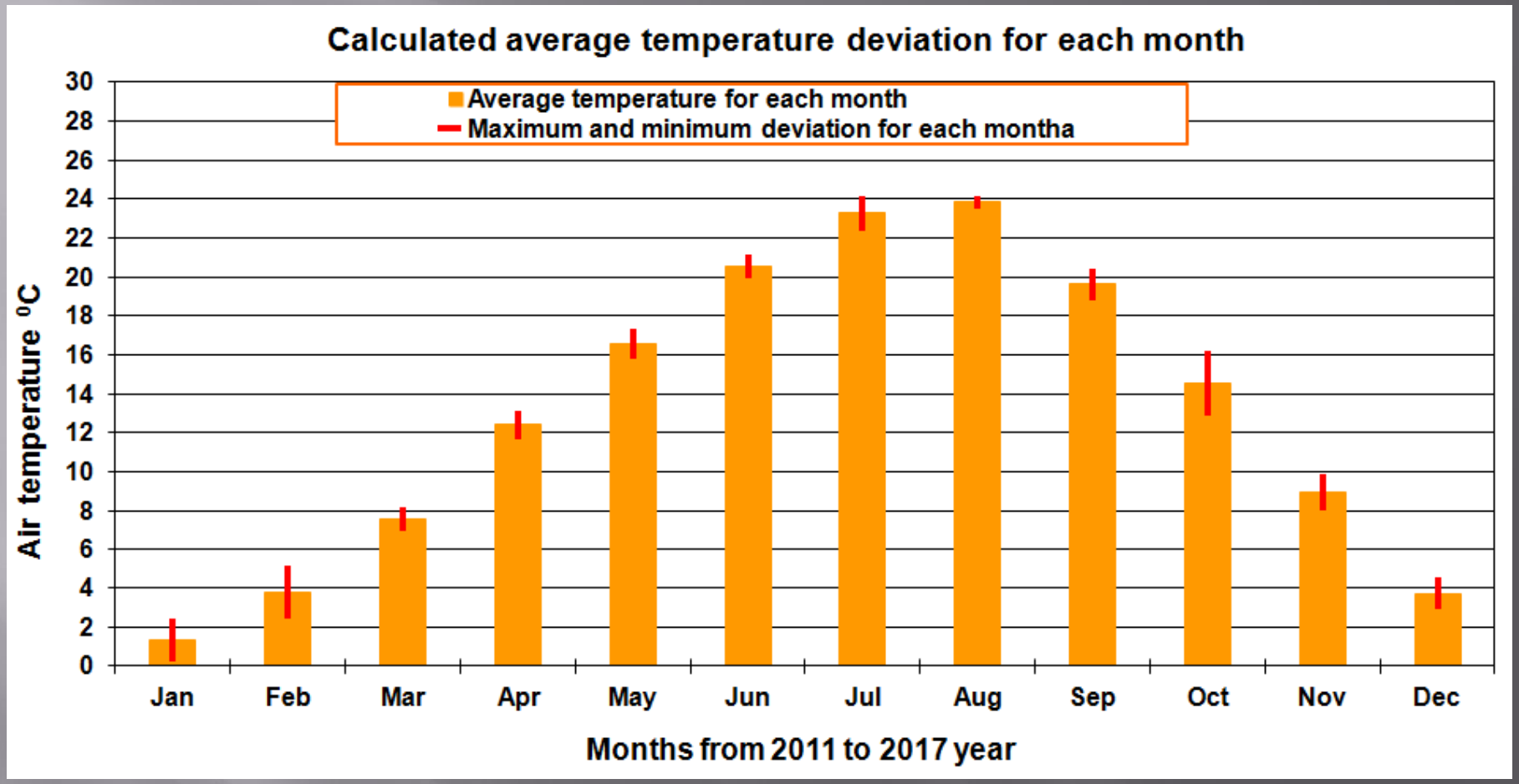

Fig. 4 Average measured temperature for each month.

In Fig. 4, the average temperature for each month in a period of 6 years is shown with orange strips. The temperature deviations from the midpoint are marked with red lines. The temperature dynamics for an astronomic year is clearly distinguished. Most deviations are small in August and the highest in February and October. The data on solar radiation show that here are the smallest deviations for the month of Agust, however, the data for maximum dynamics do not match. [3] Therefore, there are other factors that influence temperature.

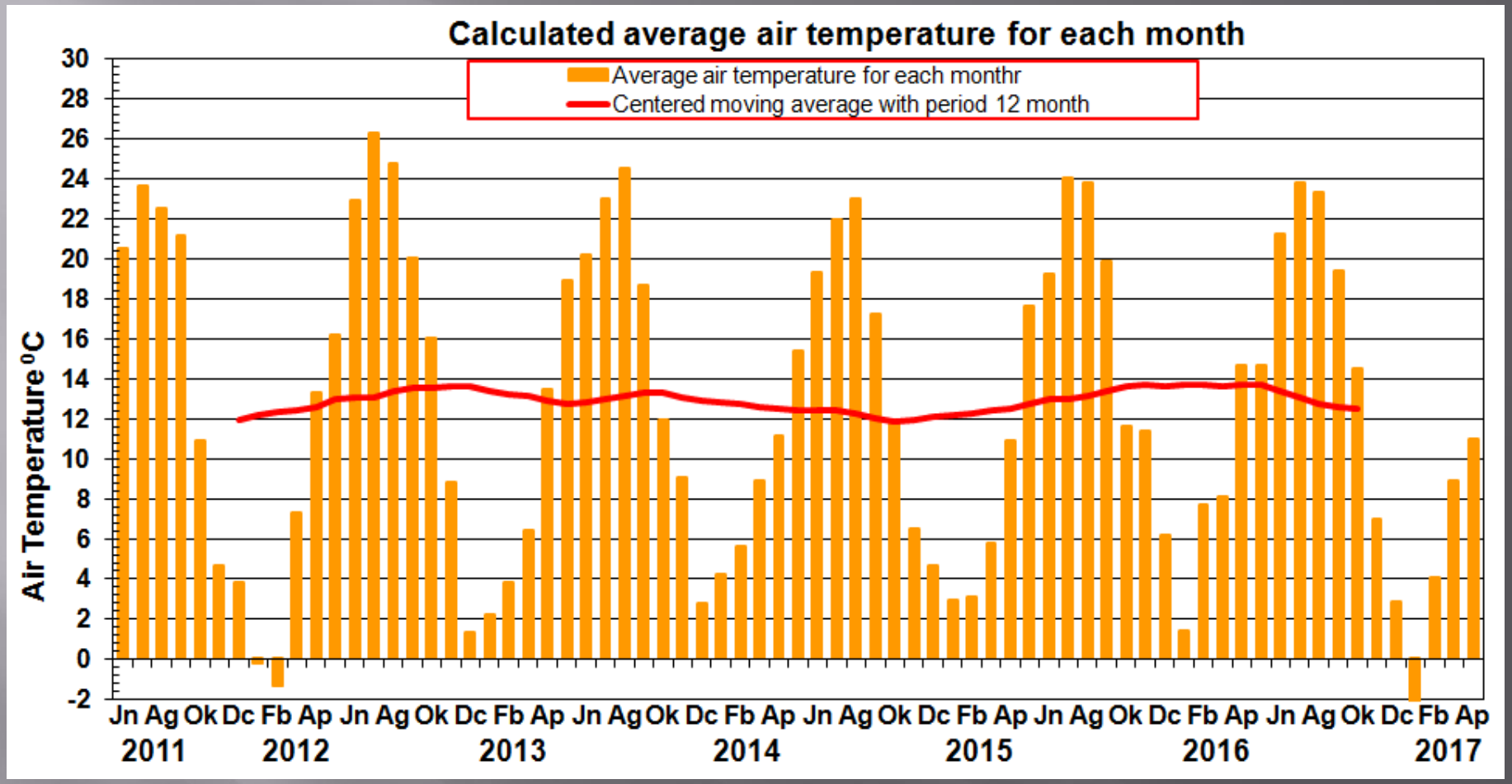

Fig . 5 Centered moving average with a period of 12 months for five years.

In In Fig. 5, a centered moving average temperature is shown. The event is with 12 months period for 6 years and is marked with a red line. The month temperature values are shown with orange bands. It is seen from the graph, the value of the centered moving average temperature is nearly constant and is less than 20C. The dynamic of the annual average value or of the moving average value is much less than the monthly value and no clear tendency for an increase or a decrease of the temperature are observed. See Fig. 3, Fig. 4 and Fig. 5.

Conclusion

The presented investigation revealed that the average atmospheric temperatures for short-term periods (hours and days), depend mainly on the earth's temperature than on solar radiation. In the case of long-term periods (months and years), the average atmospheric temperature is strongly influenced by the solar radiation. This is due to the relatively small inactivity of the earth's temperature. Another important assumption is that the average annual temperature is changed gradually and no tendency for stable increase or decrease is forecast.

References

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