

## **SOME ASPECTS OF THE CLIMATE WARMING IN BRAILA'S AREA**

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**Mots-clefs:** le réchauffement du climat, des cycles météorologiques, des oscillations et changements du climat.

**Resumé** L'ouvrage ci-dessous se propose de démontrer que le réchauffement du climat relevé sur tous les méridiens de la Terre, surtout les derniers décennies, se fait remarquer aux alentours de Braila, mais doué les caractéristiques propres. Ce phénomène peut être démontré par des variations thermiques positives découvertes au cadre des cycles météorologiques comme suit: le cycle de huit ans, de dix-neuf ans (le cycle de Meton), de vingt-trois ans etc. Les écarts thermiques positifs sont à remarquer, surtout, au parcours quotidien des températures maximum et minimum de l'air en toute saison.

### **Introduction**

During its geologic history, the Earth has met some hot and cold climatic periods. Such climatic oscillations were produced mainly in the extra tropical areas. Generally, it is considered that the factors that determined these modifications are of astronomic nature such as: the orbit and the inclination of the axis of rotation of the earth, the variation of the solar radiation intensity etc.

The climate warming noticed in the last century is often due to the human activities, mainly to those which produce the gas accumulation with greenhouse effect (CO<sub>2</sub>; SO<sub>2</sub>; CH<sub>4</sub>; Nh<sub>3</sub> etc.). The phenomenon of climate warming from the last decades can be emphasized both through the evolution of the monthly and annual average temperatures, and through the daily course of the maximum and minimum temperatures during some meteorological cycles already known.

### **1. Thermic oscillations during the 19 years cycle (Metonian) in the area of Braila**

As it is already known, the Meton cycle (of 19 years) was discovered in astronomy since the 5<sup>th</sup> B.C. This one lasts 19 years, time during which the Moon, in its spinning around the Earth, comes back exactly in the same position it left. To put it differently, the moon phases repeat after 19 years. The calculations show that during 19 years ( $19 \times 365,24 \text{ days} = 6939,56 \text{ days}$ ), take place 234,0003 synodical

revolutions (a synodical revolution of the Moon = 29,53 days take place)

Through the atmospheric tides produced mainly by the Moon attraction and of the Rossby waves (planetary waves), the metonian selenian cycle reflects in the evolution of some meteorological elements, especially in that of daily maximum and minimum temperatures of the air.

Due to the changes, the climacteric factors go through because of physical-geographical causes but especially to the anthropic ones, its metonian meteorological cycle has certain oscillations that can be emphasized in all the seasons. These positive variations are produced differently according to the season, latitude, altitude, geographic area, etc. these positive variations in the maximum and minimum temperature evolution of the air can appear in the area of Braila. For example, during spring, the maximum and minimum daily temperatures are a few degrees higher than 19 years ago (the Meton cycle), although the hot and cold advections are produced approximately at the same dates (periods).

In Picture 1 is presented the daily course of the maximum and minimum temperatures during March 1987 in comparison with that in March 2006. As it can be seen the maximum temperatures in March 2006 were always higher than those in March 1987. For example, the two warming periods in the second half of March 2006 were 5°C more intense than those corresponding to the year 1987. The same phenomenon can be seen with the daily minimum temperatures between the two periods of coldness from the first decade of March of the two years. The same situation was seen in July.

In Picture 2 is presented the daily course of the maximum and minimum temperatures during July for the years 1983 and 2002. As it can be seen the daily maximum temperatures of the first half of July were higher in 2002 (close to 40° C), in comparison with those in 1983 (close to 35°C). The cooling period of the second half of July 2002 was less accentuated (the minimum reached 15° C), in comparison with that in 1983 (the minimum reached 10° C).

For September 1985 and 2004 the thermal differences are almost inexistent especially for the maximum temperatures (Picture 3), meaning that at a first analysis the warming is not so obvious during autumn months.

In Picture 4 it is presented the daily course of the maximum and minimum temperatures in December for 1986 and 2005. As it can be seen, both the daily maximum temperatures and the minimum ones are higher in December 2005 in comparison with the same month in 1986. The last warming period, that from the end of December 2005 was approximately 10° C higher than that in 1987, and it started a few days earlier.

All these examples prove that we assist to a positive variation of the daily maximum and minimum temperatures in the area of Braila. Normally the daily course of the maximum and minimum temperatures in the Metonian

meteorological cycle (of 19 years) is almost identical [5]. For example, March 1987 is almost identical (according to the daily maximum and minimum temperatures) to March 1968. This fact proves that the climate warming in the last 20 years is a reality.

## **2. Thermic oscillations in other meteorological cycles**

In order to understand better the way these oscillations take place other meteorological cycles were analyzed as the 38 years cycle (two Metonian cycles), the 57 years cycle (three Metonian cycles), the 76 years cycle (four Metonian cycles) and the 95 years cycle (five Metonian Cycles).

In Picture 5 it is presented the daily course of the maximum and minimum temperatures during March 1940 and 1978. Analyzing the graphics one can notice that the daily minimum temperatures in March 1940 were lower than those in 1978, except the last pentad (25-31 March), when the situation reversed. The same situation can be seen analyzing the daily maximum temperatures.

In Picture 6 it is presented the daily course of the maximum and minimum temperatures during February (1924 and 1981) three Metonian cycles). Analyzing the graphics in this picture it results that generally both maximum daily temperatures and the minimum ones were higher in February 1981 in comparison with those in February 1924.

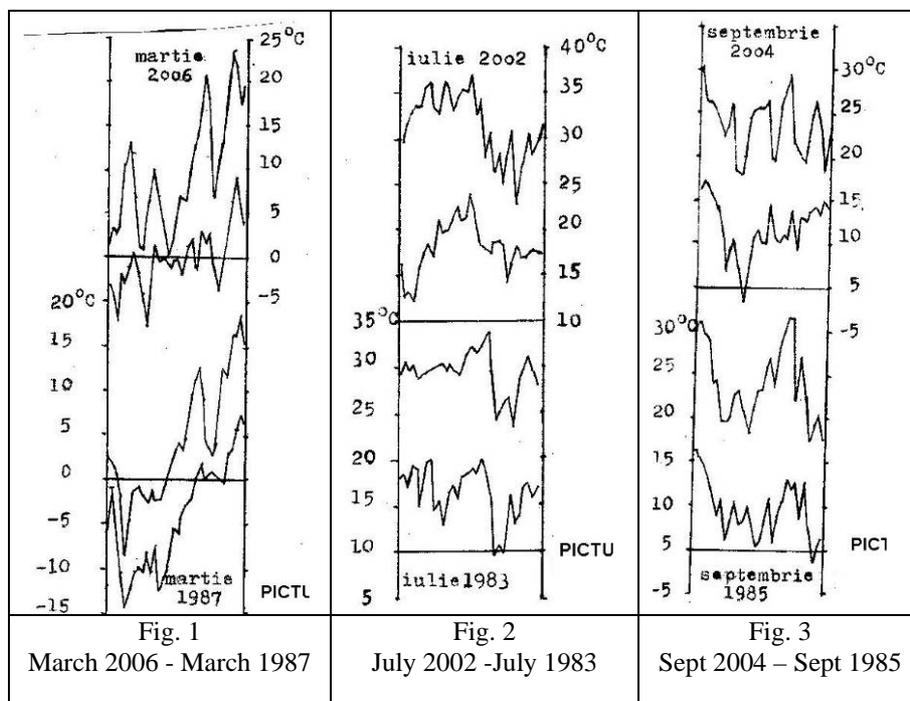
In Picture 7 it is presented the daily course of the maximum and minimum temperatures during May for the years 1911 and 1987 (four Metonian cycles). In this case one can see a different situation, that the daily minimum temperatures in May 1911 were higher than those in May 1987. The same situation can be seen analyzing the daily maximum temperatures.

In the graphics of Picture 8 it is presented the daily course of the maximum and minimum temperatures during October 1911 and 2006 (five Metonian cycles = 95 years). Analyzing the graphics one can notice that the thermal values don't differ too much, that meaning that after a period of 95 years the situation comes back approximately to the normal. This fact is considerable because it permits us to conclude that, in fact, we don't witness a major change of the climate, but only to thermal oscillations specific to this element of the environment.

In order to round off the analysis of the thermal oscillations in the area of Braila, I dealt with the 8 and 23 years cycles [3;4].

In Picture 9 it is presented the daily course of the maximum and minimum temperatures during May for the years 1980, 1988, 1996 and 2004 (the cycle of 8 years and its multiples).

The analysis of the graphics show that these thermal oscillations have some characteristics that prove that we cannot speak about climate changes because the temperature values come back almost to the initial situation. For example, the

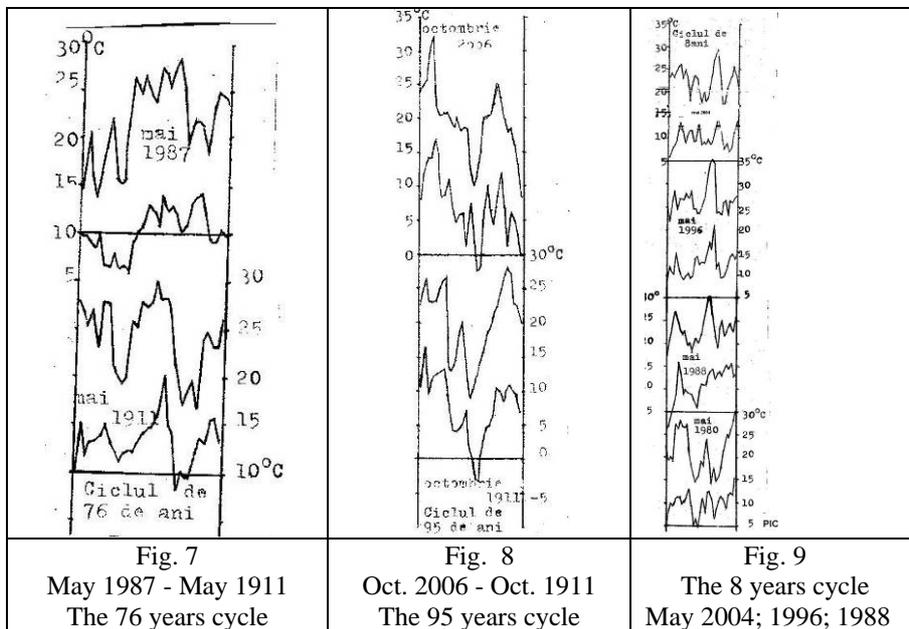
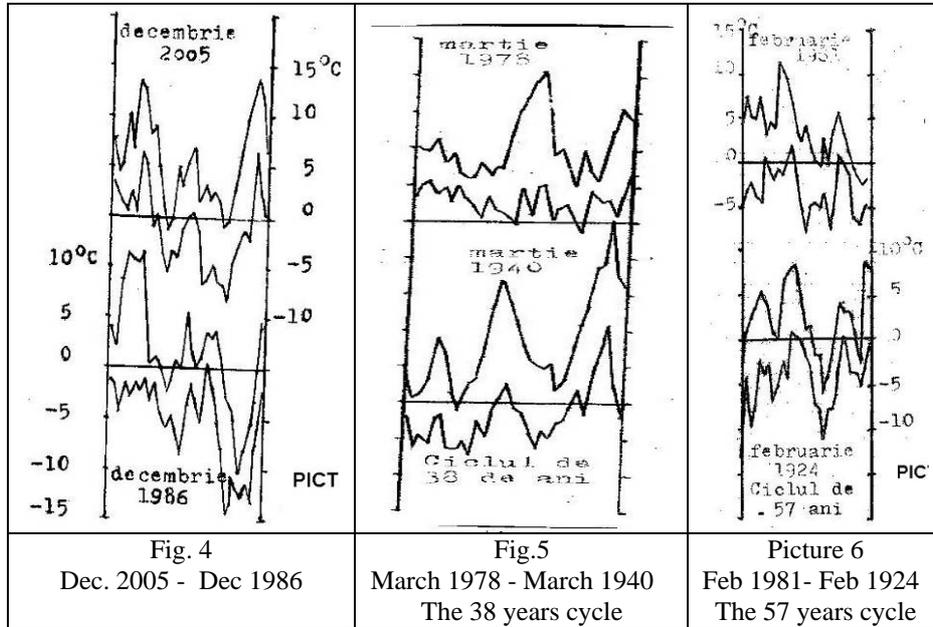


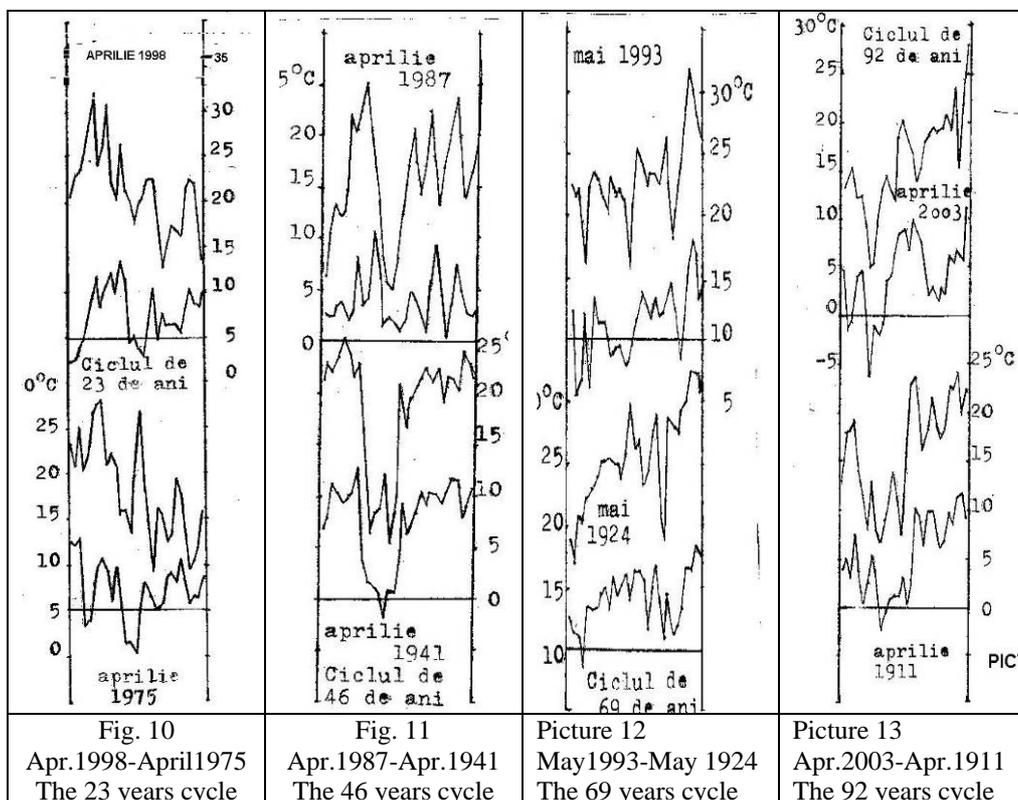
warming from the middle of May 1980 had a lesser amplitude. This one grew in intensity in the following 8 years cycles (1988 and 1996), and after that it decreased. In 1980 the maximum temperature in this warming period almost reached 25°C, in 1988 it reached 30° C, and in 1996 it reached 35° C. In 2004 it decreased to approximately 30° C this meaning that in 2012 it will reach again approximately 25° C as it used to be in 1980.

In the graphics of Picture 10 it is presented the daily course of the maximum and minimum temperatures during April 1975 and 1998 (the 23 years cycle) [4]. As you can see both the maximum and the minimum daily temperatures in 1998 have bigger values in comparison with those in 1975.

In the following lines, we will analyze the evolution of the maximum and minimum daily temperatures in the cycles of 46, 69 and 92 years (multiples of the 23 years cycle).

In Picture 11 we have the graphics with the maximum and minimum daily temperatures in April for the years 1941 and 1987 (the 46 years cycle). Analyzing these graphics we can see that the maximum and minimum daily temperatures in April 1941 have values 5° C higher than those in April 1987, excepting the period from the beginning of the second decade (11-14 April) when a special cold





advection took place. In the case of maximum daily temperatures of the two months the differences are insignificant.

In Picture 12 it is presented the daily course of the maximum and minimum temperatures during May for the years 1924 and 1993 (the 69 years cycle). In this case, we can also notice a similar situation with that in the 46 years cycle. The minimum daily temperatures in 1924 had generally higher values than in 1993. Most of the minimum daily temperatures in May 1924 had values of over 10°C fact that was not seen in 1993.

The graphics in Picture 13 it is presented the daily course of the maximum and minimum temperatures during April for the years 1911 and 2003 (the 92 years cycle). Analyzing the graphics one can notice the same situation met in the 46 and 69 years cycles. The minimum daily temperatures in April 1911 were in most of the cases higher than those corresponding to April 2003 the same situation can be seen in the evolution of the maximum daily temperatures.

### Conclusions

The climate warming in the last two decades noticed in the area of Braila has the same causes evoked by other researchers all over the world.

Taking all these into consideration, because the meteorological station in Braila is situated in a relatively wet area (between the Danube and the Salty Lake), the positive thermal variations are lower in comparison with other meteorological stations in the country, as those from Bucharest, Craiova or Iasi. This phenomenon is due to the fact that water is a thermal moderator.

Although the climate warming of the last decades is a reality we can not affirm exactly that we witness a climate change (transformation) because during the cycles lasting more (46, 69, 92 and 95 years) analyzed in the paper, the initial values of the maximum and minimum daily temperatures are higher or at least equal with those from the end of the cycles. That means that we cannot speak about a climate change. A change (modification) of the climate takes place at very long periods of time (tens of thousands, hundreds of thousands, or even millions of thousands of years).

These positive thermal oscillations (variations) that we notice today cannot be considered thermal modifications of the climate. According to the some relatively recent researches the climate on Terra has started to get colder slowly, 3000 years ago and this process will continue in the following 23.000 years. In this very long period there will be positive and negative temperature variations on Terra of short duration (tens of years, hundreds of years or even thousand of years), but only in the case of a very slow coldness seen only at a very long period of time (26.000 years).

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