

## The hockey stick and the Sun

In these days of the climate conference in Copenhagen is many discussion and are many skeptic disputes mainly about the problem of the actual current global warming: The climate all over the Earth should not have become warmer in the last years, since 1998 in spite of sharp increase of the CO<sub>2</sub> emissions. These messages did urge me somehow to study the data of the global averaged temperatures and so I did make curves from the tables given by the US government [Litt 1], [ftp://ftp.ncdc.noaa.gov/pub/data/anomalies/monthly.land\\_ocean.90S.90N.df\\_1901-2000mean.dat](ftp://ftp.ncdc.noaa.gov/pub/data/anomalies/monthly.land_ocean.90S.90N.df_1901-2000mean.dat) Especially in making the monthly curves of the Global Temperature index of the land and ocean combined anomalies I got the impression that the course in the recent global warming since 1900 was not smooth and steady, but passed step by step. It is generally known that in the last century two periods of warming did exist with some 30 year of relative constant temperature in between. It is, I think, much less known that also within these 2 periods of warming actually exists a step by step framework with discernable short periods with sharp temperature increase, followed by some 10 to 12 year of a relative constant temperature, fluctuating around an average. The intermittent characteristic of the global warming is easily to be seen on the monthly curves as drawn in **FIG 15 part I and II**. The temperature is ever fluctuating, but there are some upwards jumps, moments with maintaining temperature increase. Over the longer period of **FIG 16** seem to be also 2 downward jumps in periods with temperature decline. After these up or down ward jumps the maximum, minimum and average temperatures of the former period all are exceeded. These jumps are drawn in **FIG 15** and **16** as vertical lines with an encircled + or -. In this way nearly all the temperature changes were step by step (discontinue) with the exception of the temperature increase in the period 1934-1944. In that cycle the temperature increase was more steady throughout the cycle, but in the 5 other cycles with temperature increase and the 2 with temperature decrease the temperature changed more suddenly as a jump. The periods with nearly constant temperature, as are in **FIG 16** from 1880 to October 1902 and from September 1944 to December 1976, do not have step

by step changes. These nearly constant periods do have fluctuations that can be classified in time in this periods, but also in other periods that do not show periodic changes in temperature. **FIG 15** gives furthermore in detail the probable, or possible relation of the monthly temperature and the monthly sunspot numbers (SN) [Litt 2]. It is obvious that no correlation exists between the plain variation in the SN and the temperature in the longer as well in the shorter timescale. Between the 2<sup>nd</sup> derivative of the SN curve, thus the acceleration of the increase of the SN, and the temperature however may be anyway a good relation. That is because in the 8 cycles here with temperature change in 7 cases this temperature change for the total period did occur in a jump that always falls at the same point in the solar cycle: at the end of the minimum, when the magnetic field of the Sun begins to increase. If the temperature increases the relation with the SN is positive (+) and if the temperature decreases this relation is negative (-). At the pictures of **FIG 15** about the now current temperature increase since 32 year this connection ever is positive during the small term of the temperature jump. Further increase in the SN and the solar magnetic field within the about 11 year solar cycle is not connected with further temperature rise, suggesting that increase of solar magnetic activity is not a cause of this warming. Following these curves other causes as the greenhouse gases must be looked for as the determining factor of this global warming. The indication nevertheless here is that the fluctuating solar activity should modulate this increase of the temperature. The question than raises how can the sun modulate this temperature rise by the internal factors of the Earth's climate systems, the greenhouse gases. If you try to find the answer to this on **FIG 15**: An indication may be that in the declining phases of the solar cycles the diminishing solar magnetic field may slow down or stop the global warming temporary. Only when the sun just has passed its minimum the increasing greenhouse gases may generate the temperature rise and that than occurs mostly all at once and is only followed by some fluctuations in the temperature by the internal terrestrial factors. The problem of this hypothesis is that it

seems unconceivable that following **FIG 16** the Sun will modulate the temperature decline as well as the incline. If this concept is realistic the changing magnetic fields of the Sun anyway must stabilize the

temperature on Earth, so that the zero points in these fields are gates for temperature change.

**FIG 15 part I**

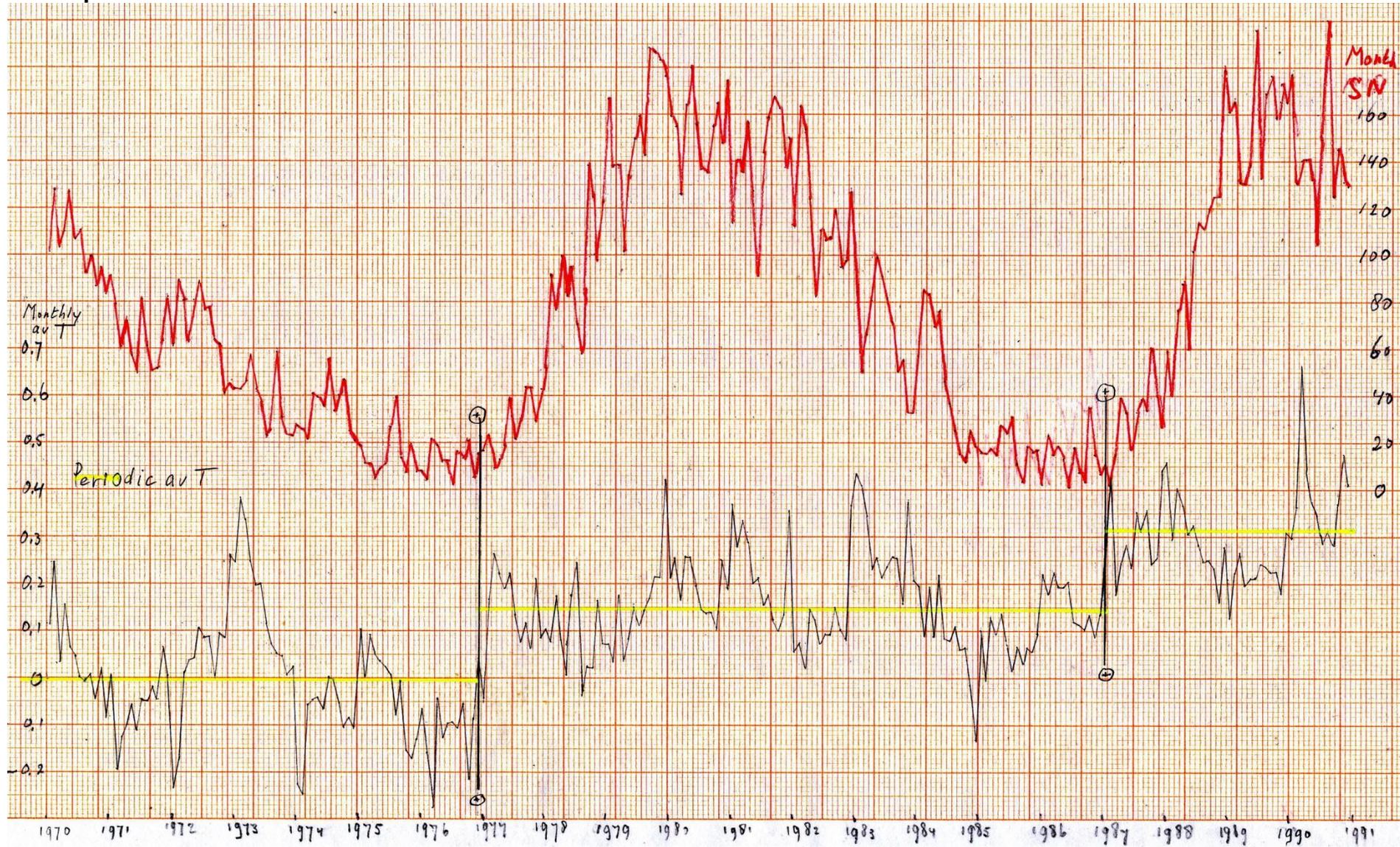


FIG 15 part II

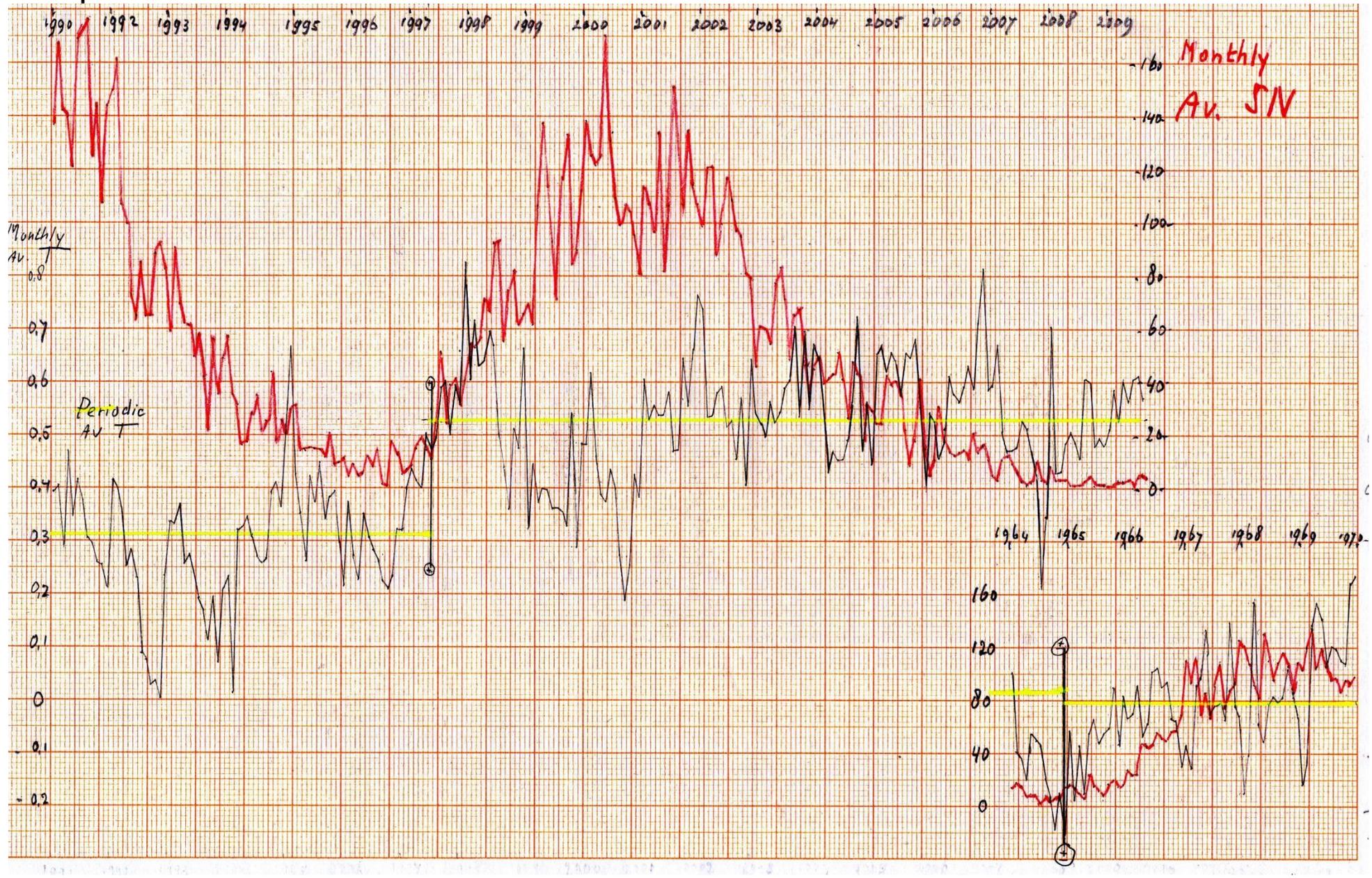
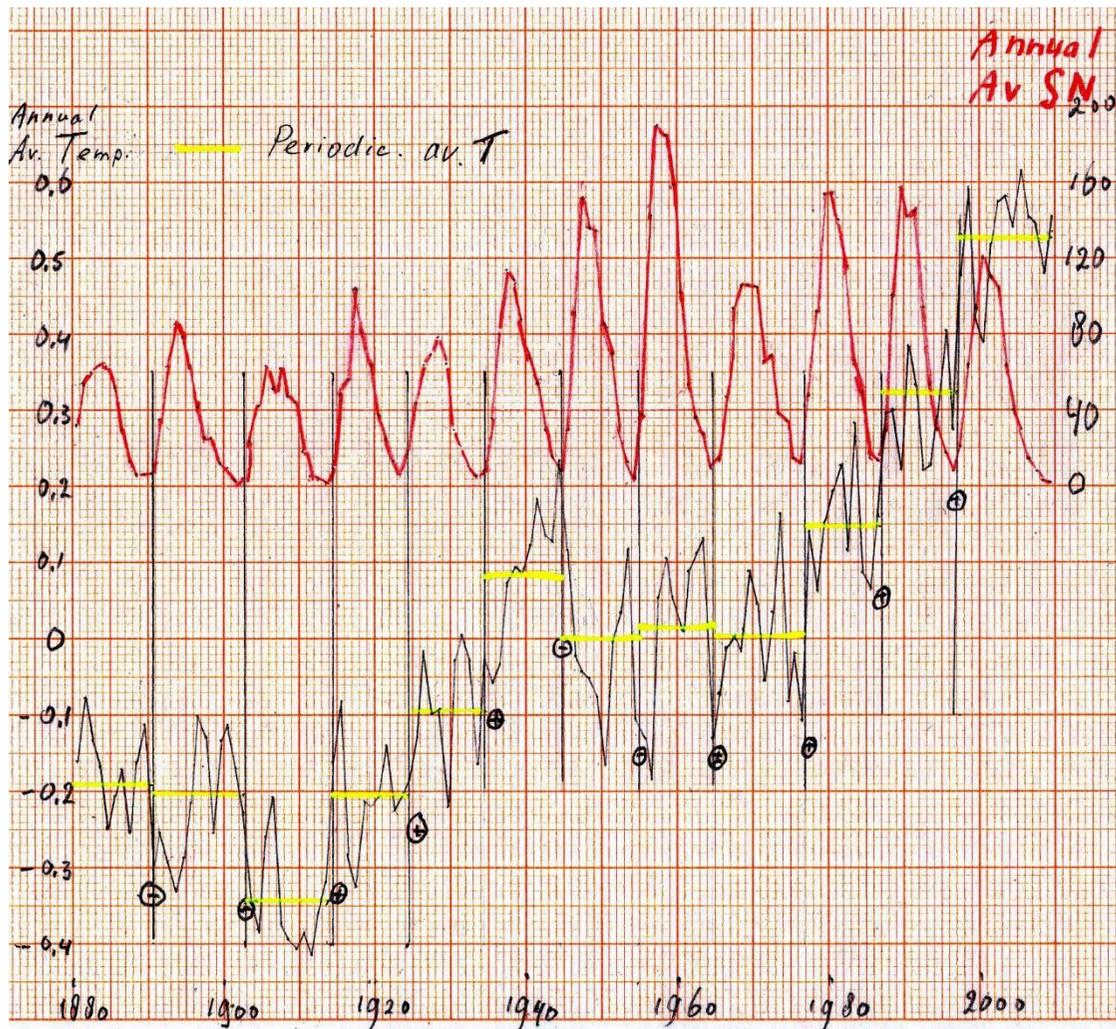


FIG 16



The most important conclusion of **FIG 15** and **16** is that by accurate measurements it comes true that temperature changes in timescale of 1 year or less mostly occur in steps of 10 to 12 year, so that a nearly constant average temperature as in the last decennium is no ways an

indication for a stop in the global warming on a longer term. This step by step temperature changes may be modulated by solar activity, but no physical base is to be found for this.

## Literature:

- 1 National Oceanic and Atmospheric Administration: Global surface temperature anomalies, <http://www.ncdc.noaa.gov/cmb-faq/anomalies.php>
- 2 Voor de zonvlek aantallen : NOAA site <http://www.ngdc.noaa.gov/stp/solar/ssndata.html> of Brussel: <http://sidc.oma.be/sunspot-data>