

JOSO ANNUAL REPORT 2004-2006

ROMANIA

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January 24, 2007

1 Staff

The Romanian solar group (seven members) belongs to the Astrophysics Department of the Astronomical Institute of Romanian Academy. In the last three years this group registered some staff dynamics: many new young researchers joined the team and few of them left us to follow a PhD degree abroad. Marilena Mierla is the first who returned home after she defended her thesis in March 2005, at Lindau, Germany. During this period the group changed also its head: after the retirement of Georgeta Maris, since November 2005, Cristiana Dumitrache is in charge with the solar research theme. At the end of 2006, the team was renewed again.

2 Observational works

The solar atmosphere was investigated under different aspects, from photosphere to corona. Our dome and instruments have been in technical revision, so our work was based only on satellite data. We have purchased a Solar Spectrum H α filter in 2006 and hope to be in work next year.

The analysis of active regions waves were performed in collaboration with a former member of the Bucharest solar group [1,2]. The dynamic properties of the solar corona from SOHO/LASCO observations [15] as well as LASCO-C1 Spectral Data Analysis of the Slow Solar Wind [16] were investigated in international collaboration too, as a continuation of a PhD stage made abroad. Magnetic changes observed in the formation of two filaments in a complex active region [19] have been analyzed in a paper resulted in an international collaboration too, but from our point of view from a bilateral French-Romanian program.

A new method for the investigation of active phenomena in the Sun was proposed by an young researcher [18], in the effort to understand the physics



that stands behind spatial and temporal evolution of prominences, streamers and other coronal structures.

In 2004 we had the opportunity to observe a rare phenomenon: Venus transit on the solar disk. We performed $H\alpha$ observations and registered also the moment of the 3-rd contact. We lived another exceptional astronomical event on 29 March 2006, as participants at the conference "Solar and stellar physics through eclipses", but for memories we took photos.

3 Statistics

Some papers approached statistical studies of solar wind streamers during three solar cycles [14] or other active phenomena behavior during the solar cycle 23 [10,12]. An attempt to forecast of the 24th solar cycle through the artificial neural network method was made [13].

Some common periodicities to the solar activity and to the Earth's rotation, characterized by the length of the day (LOD), were pointed out in paper [11]. The behavior of the LOD time series was analyzed through the "time-frequency distribution" approach. The QBO oscillation (the 26 months period - 0.46 cycles/year) and 10.5 years (0.095 cycles/year) cycles of solar variability are present in the LOD data spectrum, but, due to short (only 42 years) time span of the data, the "11-year" solar feature is to be taken cautiously. In the LOD plot the two maxima between three minima over the 42 years time span may be fitted with a 44-year period of 0.7 ms amplitude and a 20-year period of 0.7 ms amplitude.

Statistical studies of the differential rotation of filaments were performed for

the period 1957-1989 [3]. The differential rotation is found to have a cyclical behavior during the 11-year cycle, while the meridional circulation seems to follow a more complicated pattern. The regular pattern of periodic oscillations of the curves is revealed, in both cases of calculations, by the differential rotation laws or by the total rotation $W(\varphi, k)$ containing differential rotation motion and meridional circulation too. For these reasons we conclude that the differential rotation of the Sun causes distortions of the large-scale circulation pattern and introduces spherical harmonic waves-like. These results agree with similar research, observational or simulations, made during the last years.

4 MHD numerical simulations

Coronal Streamer Formation Post CME - Numerical Simulation [9]: A numerical experiment shows the possibility of a coronal streamer to form after an eruptive process, e.g. after one or more CMEs 'en raffale' [7]. This situation is sustained by some observations existing in the literature. Usually a coronal streamer disrupts in a CME, but the phenomenon of a streamer formation after a CME or an eruptive event is very seldom observed on the Sun. Our simulation describes such a rare phenomenon. In our simulation [7], a prominence structure, formed in a current sheet, evolved in CME disruptions "en raffales". In this numerical experiment the first CMEs are impulsive, but the last one moves slow, proving that the energy storage was exhausted and the sheet will accomplish a new equilibrium state. This new equilibrium permits that a new solar feature forms on this site: a new stage of evolution concerning a coronal streamer. We account that the new feature is possible to form in our simulated case, with two shocks "raffales" and two slow CMEs later, and not in the "cannibal" case, where all the matter and energy is probably exhausted. On the other hand, the slowness is probable due to the second and third CMEs which consist in the legs of a loop or in the matter from lateral side of the sheet.

Starting with a dipole magnetic configuration, 2D-MHD numerical simulations were performed on different solar radii. Our numerical experiments treat locally the formation of the coronal hole. The evolution of the magnetic field and plasma parameters are analyzed and the numerical values obtained by these simulations are in good agreement with those given by the observational works.

5 Other events

In 2006 we celebrated fifty years from the appearance of the first issue of the solar bulletin "Observations Solaires", a yearly publication of the Romanian Academy Publishing House (in French). Fifty years ago, on the occasion of the International Geophysical Year, two research teams started their activity in Romania: the solar group and the artificial Earth satellite group. On this anniversary occasion we organized a conference in Bucharest, between 26 and 30 September 2006. The conference emphasized this jubilee and constituted

itself into an opportunity to bring together scientists from all over the world to exchange ideas and to present their recent results in all fields of astrophysics. The conference was structured on nine sessions, each dedicated to a special topic on which the Romanian researchers worked during the time. Besides the opening and anniversary session, every other session benefited of one or two invited speakers. The proceedings will be published in the AIP Conference Series: "Fifty Years of Romanian Astrophysics", eds. C.Dumitrache, N.A.Popescu, M.D.Suran and V.Mioc.

This event joined the International Heliophysical Year activities for IHY Romania, and was sponsored by the Romanian Ministry of Education and Research, under the national program Research of Excellence, and was organized by the Astronomical Institute of Romanian Academy.

Another event the Second International Symposium on Space Climate: "Long-term Change in the Sun, and its effects in the Heliosphere and Planet Earth" was held at Sinaia, 13-16 September 2006. The scientific contributions presented at the ISSC-2 Symposium will be published in a special issue of the Advances in Space Research journal, with three guest editors (G. Maris, K. Mursula and I. Usoskin) and supervised by the Editor-in-chief M. Shea.

The apparition of two books (one of them in two editions) completed the picture of our activity during these three years: a book was devoted to the history of history of Romanian astrophysics [4,6] and the second [5], devoted to solar prominences, represented the first solar physics monograph in Romanian language.

We prepare for the International Heliophysical Year with educational activities, public outreach and also new scientific topics to be approached the next year.

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