

1998 ANNUAL REPORT TO JOSO - ROMANIA

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1. SOLAR RESEARCHES

The solar researches have been continued in the same project as in the previous years, but within a larger extent. This is due both to the many issues that have to be approached in preparing the total solar eclipse of 1999, and to the need of correlating the ground-based observations with those performed from space.

There were continued the investigations about the nonstationary processes in the solar atmosphere and their heliospheric extension. The main topics in this research were:

- acceleration of the suprathermal electrons in the corona;
- numerical modelling of solar flares;
- numerical simulation of prominences formation in a current sheet; MHD of current sheets;
- numerical simulation of coronal streamers and coronal mass ejection;
- thermodynamic study of the prominence-corona transition layer based on EUV observations provided by the Skylab mission (cooperation with Observatoire de Paris-Meudon);
- study of the eruptive prominences observed at Bucharest during the period 1970-1980; a catalogue of such prominences is in preparation (cooperation with the Astronomical Institute of the Bulgarian Academy of Sciences);
- physical conditions in solar plumes as sources of solar wind (cooperation with Brussels Royal Observatory);
- comparative analysis of physical conditions in the coronal sources of solar wind: coronal holes, coronal streams, coronal mass ejections;
- study of the variations of the solar wind depending on the phase of the 11-year solar cycle (on the basis of the data provided by SOHO and Ulysses missions and by the satellites WIND, Helios 1, and Helios 2).

There also were tackled new directions:

- study of solar granulation in quiet and active zones on the basis of Fraunhofer lines spectroscopy;
- study of the Sun's weak magnetic field and of its role in convective motions;
- analysis of the magnetic field of active solar regions based on the data of the MDI (SOHO) experiment;
- study of the acoustic images of an active region (MDI experiment);
- study of the first acoustic image of a solar flare.

Researchers belonging to the Solar Department of the Institute participate in scientific projects connected to the SUMER, EIT and MDI experiments (SOHO).

During June - September 1998, two research assistants (Alina Donea, Elena Moise) participated in the Summer Research Assistantship Program at the National Solar Observatory in Tucson, Arizona (advisors Dr. C. Lindsey and Dr. W. Livingstone, respectively).

Photospheric visual observations, in white light, were carried out along 210 days. After processing, the observational data (as indices and parameters of solar activity) were regularly reported to the world center in Brussels.

Part of the solar researches were made within the contract 193/1996, the grants: 4038 GR/1998 and 4067 GR/1998 financed by the Ministry of Research and Technology.

2. PREPARATIONS FOR THE TOTAL SOLAR ECLIPSE OF AUGUST 11, 1999

The researchers of the Institute continued their studies intended to prepare the eclipse observations, by documentation, papers, ordinary seminars, as well as a National Seminar for different projects related to: shape of corona and its evolution, coronal streamers, coordination of the observations from ground and from space during the eclipse, solar wind recordings correlated with the total eclipse, etc. There were identified the best sites for camps intended to professional observations.

The problems related to the eclipse were approached and discussed in a series of national and international scientific meetings as:

- 4th Yugoslav-Romanian Astronomical Meeting, 5-8 May 1998, Belgrade, Yugoslavia (round table *The Total Solar Eclipse of August 11, 1999*);
- JENAM '98 (7th Conference of the European Astronomical Society and 65th Annual Conference of the Czech Astronomical Society), 9-12 September 1998, Prague, Czech Republic (one-day workshop dedicated to the eclipse);
- Annual Meeting of JOSO, 22-27 September 1998, Potsdam, Germany (meeting of the Working Group 7);
- National Seminar *The Total Solar Eclipse of August 11, 1999 - Interdisciplinary Approach*, 15 October 1998, Bucharest.

The international contest under the aegis of the Working Group "Eclipses" of the IAU, intended to select the best projects for observing the '99 eclipse with the stationary instruments of the Bucharest and Timisoara Observatories, was set up.

3. SOLARRADIOASTRONOMY

The individual research project "*Solar Radio Astronomy in the Decimeter Band*" conducted by Adrian Oncica followed its last evolution in the light of the soon coming total solar eclipse of August 11, 1999. An experiment aimed at detecting small (arcseconds) radio structures in the solar atmosphere was developed. It is based on an idea originating in extragalactic Lunar radio occultation techniques and uses the specific shape and timing of Fresnel diffraction pattern.

The project was originally aimed at covering the 1-12 GHz spectrum with few single frequency wide band receivers and subsequently developed into a full spectrum coverage. At this moment the 1-2 GHz and 10-12 GHz receivers are operational only in the total power mode. Due to the lack of adequate input switches calibration procedures are difficult for the moment. A third receiver for the middle of the range is due for the end of June (if the financing will be in time). Of the three dishes of 1m, 2m, and 3m only the 2m antenna is operational. Nevertheless the step-motor actuators will be postponed and the mounting will rely on a single clock motor.

The data acquisition system built around four ACROSSER AD/DA boards and is almost ready. It will supply when the time will come all the control functions also. A more flexible and user friendly software interface is still needed.

In the field of data analysis important progress was made in using and developing modern approaches such as Joint Time-Frequency Analysis, Joint Time-Scale Analysis (read Wavelet) and Multifractal Analysis of the short term and long term solar radio data. The methods were successfully applied for the detection of underlying physical processes in solar radio bursts. A similar procedure is currently applied in a comprehensive analysis of the long term (four solar cycles) solar radio flux from all the available patrol data.

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