First Observations with THEMIS

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Abstract. Among the different observing modes of the French-Italian THEMIS telescope in Tenerife some have been already tested quite successfully since April 1997. We will present high resolution images in H\(_\alpha\) and in the photospheric line 557.6 nm of Fe I, obtained with the Italian Panoramic Monochromator (IPM), full disk H\(_\alpha\) images, Na D1 images and Dopplergrams, high spectral resolution spectra.

1. Introduction

THEMIS (Télescope Héliographique pour l’Etude du Magnétisme et des Instabilités Solaires) is built by INSU-CNRS (France) and CNR (Italy). The main aim of THEMIS and details of its instrumentation can be found in earlier publications (Mein & Rayrole 1989, Rayrole & Mein 1993).

THEMIS is still in the phase of adjustments and waits for commissioning. Nevertheless it has been opened for observations 2 hours per day since April 1997. Every 3 months a scientific committee allocates the time to specific programs after approval of the proposals. Already some groups got observing time during campaigns with SOHO, e.g. the campaign of May-June 1997 on filaments and prominences. Some data obtained with the Italian Panoramic Monochromator (IPM) and in the spectral mode are accessible on the WWW (http://www.obsnice.fr/themis/). THEMIS is characterized by a wide set of possible observing modes (Mein 1997).

2. Instrument

Themis is a Ritchey-Chrétien telescope with azimuthal mounting. The diameter of the telescope primary mirror is 90 cm. It is designed to be polarization free. The telescope is filled with helium which permits to avoid constrains and birefringences on the entrance window.

The spectrographs are hanging vertically. The pre-disperser has 3 exchangeable gratings, one of them is an echelle grating which is used within the Multichannel subtractive Double Pass (MSDP) mode (Mein & Rayrole 1993). The second spectrograph has also an echelle grating with a blaze angle of 63.26° and a focal length of 8 meter. In the focus are placed CCD cameras 288 x 384 pixels each (Mein & Rayrole 1989).
The polarization analyzer is performed by the use of a quarter wave plate followed by a polarizing beam splitter. It will work in the 4500-10000 Å range. It will be installed in summer 1998.

3. Observing Modes

The present mirror does not fit the requirements and should be replaced in early 1998. Nevertheless the spatial resolution of it is around 0.8" and could reach 0.5" when the local turbulence near the entrance window will be reduced by adjustments of the junction between the telescope tube and the dome. Different modes of observations are proposed (Schmieder & Mein 1994). They have been already tested in 1997.

- Full disk Hα images, Na D1 images and Dopplergrams
  The full disk is covered by 10 to 15 overlapping strips in 25 to 40 minutes. The scanning is obtained by diurnal motion (telescope stopped). Hα and sodium images and Dopplergrams can be obtained (Figure 1).

![Full disk images obtained on July 1, 1997: (a) Hα image, (b) Na D1 image and (c) Dopplergram in Na D1.](image)

- Spectral Mode
  High spectral and spatial resolution spectra can be obtained (see Figure 2). The exposure time is 300 ms and each frame is 0.2 nm x 90". Velocity structures of 0.5 arcsec are clearly visible.

- The Italian Panoramic Monochromator (IPM)
  First images from the Italian Panoramic Monochromator are available at Arcetri's THEMIS page (WWW). This instrument is described in Cavallini (1998), it has been used for different observing programmes in 1997, e.g.:

  - Observations of granulation in the continuum (557.8 nm) have been analysed by means of skeletonizing and wavelet algorithms in order to study the pattern and spatial properties of granulation (Berrilli et al. 1998a, Berrilli et al. 1998b).
Figure 2. High spectral resolution spectra at 522.5 nm, 525.0 nm and 610.3 nm before the astigmatism of the telescope was corrected.

- Partial frame images of prominences have been obtained during SOHO campaigns (see the movie on the web site of THEMIS).
- A set of data concerning chromospheric fine structures, mottles and the corresponding photosphere has been obtained in different wavelengths. In Figure 3 is presented a partial sequence of monochromatic images in the 5576 Fe i and in the Hα lines obtained by the IPM/THEMIS on July 7 1997 inside the observing program of Meunier and Ceppatelli. All these images have been treated for dark current and flat-field: the total field is 34″ × 34″. The quality of the images is considerably improved after the tube was filled with helium.

- The MSDP spectrograph

The MSDP system has been tested partially and will be operational in 1998. The software is developing.

4. Operation Plans

The time schedule of the technical operations on the telescope for 1998 foresees the replacement of the primary mirror, the integration of the polarization analyzer and the installation of the image stabilizer (Molodij 1996).

5. Conclusions

The first results of THEMIS are very promising. The technical team is still working on the site. The knowledge transfer will be achieved by a new team lead by G. Lelièvre.

More informations about THEMIS developments can be found on the Web site: http://www.obs-nice.fr/themis/
Figure 3. Images obtained with the Italian Panoramic Monochromator (IPM) in the photospheric Iron line \(\lambda 557.6 \text{ nm}\) (a) and in the chromospheric Hydrogen H\(\alpha\) (b).
References

Mein P. 1997, ASP Conf. Series, 118, 320
Rayrole J., & Mein P. 1993, IAU Colloquium 141, 170
Schmieder B., & Mein P. 1994, Third SOHO Workshop, Estes Park, ESA SP 373, 393