Prominences Diagnostics and Dynamics: JOP009*+ THEMIS campaign

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1 Scientific background

The purpose of this project is to understand the structure of prominences from the standpoint of the physics involved in the energy and force balance, processes that make them form, endure and disappear. For this, we need to evaluate the importance, effects, and quantitative description of basic physical processes, and then combine them into a full, consistent, physical picture. These processes involve at least the following items:

- particle transport along and accross the magnetic field, basically mass and energy exchange through the prominence–corona transition region (PCTR)
- optically thin radiative losses, both in the PCTR and in the core of a forming condensation illuminated by solar radiation
- radiative transfer between prominence and solar atmosphere (mainly the chromosphere where the incident radiation forms), and between various parts of the prominence; this involves interactions between prominence threads, Doppler shifts of incident with respect to local profile, and multidimensional radiative transfer (Paletou, Vial & Auer 1993; Paletou 1995, 1997; Fontenla et al. 1996),

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- MHD processes that determine the force balance in both the local and global scale; these involve considering the background magnetic field configuration, the local electric current distribution, and the magnetic interactions between various parts of the prominence.

JOP9 is devoted to the study of solar prominences. It involves the simultaneous use of several experiments on–board SoHO such as the SUMER and CDS spectrometers, the EIT imager and the Michelson Doppler Imager (MDI).

We stress the importance of a reliable diagnostic of the plasma in a very large temperature range since prominences are certainly made of cool (about 7 000 K) and hot coronal material (10^6 K). CDS and SUMER cover such a temperature range. EIT offers a wide enough field of view (FOV) to survey the temporal evolution of the structures. MDI magnetograms in the reduced FOV will allow for the reconstruction of the field.

Valuable data can be obtained with the cooperation of ground–based observatories. In addition THEMIS will provide us with:

- Full–disk (and zoomed) maps of the Sun. Longitudinal magnetic field measurements will complement other data such as those from SoHO/MDI.
- IPM monochromatic images in a 50" diameter FOV. High scanning speed and high spatial resolution will allow for observing the evolution of fine structures together with accurate linear polarization measurements (in the reduced 50"x12" FOV).

When available, spectroscopy modes (e.g. MSDP) will be included in the observing programme.

2 Operations at THEMIS and cooperations

A **2 weeks** observing time has been allocated by the THEMIS time-allocation committee **between 19 and 27 May and between 6 and 24 June** (i.e. before the next SOHO meeting in Oslo, starting on June 17th). FP will take care of THEMIS observations.

- **FD mode:** full–disk maps are required daily during the campaign duration (magnetograms plus dopplergrams and intensitygrams in Na D_1 and Hα). Observations made in a smaller fov are also planned.
- **UBFFP mode:** to perform high resolution images with the IPM in He I D_3 (prominence) and Hα (prominence and filament) wavelengths plus linear polarization analysis.

On SOHO, JOP9 will be run by K. Bocchialini and J.-C. Vial -other scientists involved in JOP9 are: J.M. Fontenla (NCAR/HAO), E. Tandberg–Hanssen (NASA/MSFC) and M. Rovira (IAFE, Argentina).
SUMER and CDS programs have been run in the frame of JOP9 which has been updated in November 96 and January 97.
The EIT contribution will be very valuable in view of the UBFFP high time and spatial resolution in cool lines. The selected fov could be about 8 by 8 arcmin with a time

resolution better than 2 minutes. The line selected is He II 304 A.
MDI will provide magnetograms every 96 minutes.
The UVCS contribution will depend on the nature of the target : if the prominence is high enough, Lyman alpha profiles would be useful at positions as close as possible to the solar limb.

Observing times : 8 to 10 UT for THEMIS
Coordination between EOF and/or MEDOC and Ground-based observatories:
The target is chosen on day D-1. Pointing corrections (i.e. switching from North to South hemisphere) after a flag (telephone or e.mail) is initiated by people observing in Canary Islands around 8 U.T. Some support from the VTT may be possible between May 16 to 31 during the time allocation of E. Wiehr, although his prime targets are spicules.

3 References

The bibliography is limited here to proposers' papers. The latest comprehensive review is to be found in E. Tandberg-Hanssen's book "The nature of solar prominences".

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