SoHO JOP 078 – VARIABILITY AND PROPERTIES OF THE QUIET SUN SUPERGRANULAR NETWORK AND INTERNETWORK

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Abstract. Study of the variability of the quiet solar atmosphere covering as large as possible range of the temperatures using both the 2D imaging and 1D spectra was the aim of SoHO JOP 78 observations. Supergranular cells were the objects of our main interest. This programme is based on the cooperation of several SoHO instruments (SUMER, CDS, MDI, EIT) and TRACE. Justification of the JOP, cooperation of instruments and specially arranged measurements for the post-facto coalignment of data from different instruments are described in this paper.

1. Introduction

Our JOP078 proposed simultaneous solar spectral line measurements in the chromosphere (SUMER), the transition region (SUMER,CDS) and in the corona (CDS). The aim was to trace the variability and dynamics of the solar quiet atmosphere in both the supergranular network and internetwork focusing on the particular phenomena. The inevitable MDI and TRACE photospheric information and UV imaging of TRACE and EIT were requested to be acquired at the same time with the highest possible spatial and temporal resolution.

Previous observations performed with the CDS and SUMER instruments have revealed that the upper chromosphere and the transition region as well are not static, but display significant changes and variability even in case of the quiet solar atmosphere (see e.g. review Judge, 1997). Our previous observations of the chromosphere and the transition region made only with the SUMER spectrometer (Curdt et al., 1997a) have confirmed those results. They have shown additionally, that the temporal variabilities of the spectral lines originated in those layers are significantly different in the supergranular boundaries and internetwork (Curdt et al., 1997b, Kučera et al., 1998).

MDI magnetograms taken simultaneously with the 2D CDS rasters of the coronal line intensities have shown that the occasional merging of the opposite magnetic polarities in the supergranular boundaries correlate with the coronal emission brightening above these quiet solar atmosphere regions. The concept of 'magnetic carpet' was proposed as the explanation of this phenomenon (Judge, 1997, Schrijver, 1997). The behaviour of such phenomena in the chromosphere and the transition region has not been revealed by observations till now. Our team, lead by W.Curdt, therefore proposed the presented JOP in order to trace such behaviour.

2. Joint operation of instruments

The full spectral line profile measurements of the SUMER and CDS NIS spectrometers are the core of the JOP078 observations. We have proposed simultaneous measurements of these spectrometers for an interval of a few hours and for several days in order to acquire sufficiently large amount of data. The inevitable 'second core' is the information on the photospheric magnetic field provided by the MDI instrument, importance of which should be essential for the understanding of events taking place in the higher atmospheric layers. The third part of this complex JOP is the 2D chromospheric, transition region and coronal imaging in several lines by TRACE and EIT.

The SUMER spectrometer should use a fixed 1D slit position, which is only available. The CDS should mostly provide information from a 2D field-of-view (FOV) pointed at the SUMER position. This combination should provide a possibility to overlap SUMER and CDS data post-facto. A fine coalignment of the SUMER and CDS slits directly onboard is unrealistic as the precision of their practical positioning goes up to 5". Therefore the special measurements were proposed to reach a more precise determination of the SUMER slit position in the CDS 2D FOVs.

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The photospheric physical quantities are proposed to be measured with the MDI instrument simultaneously on a more extended FOV than in the case of SUMER and CDS instruments. The proposed TRACE operation includes also the collection of photospheric continuum images. The extended SUMER RSC measurements are scheduled for the coalignment of the SUMER slit position with the photospheric images taken by MDI and TRACE.

3. Measurements for the post-facto coalignment

The careful planning of the data acquisition for the post-facto alignment has been performed in order to reach the highest possible adjustment of the SUMER slit position within the field of view of the other instruments.

SUMER & **CDS :** The most favorite common spectral line observable with both the SUMER and CDS instruments is the bright He I 584.33 Å (2.0x10^4 K). It was selected for the simultaneous measurements within the presented JOP for the post-facto coalignment of the SUMER slit position within the CDS rasters. The SUMER slit position should be fixed at the disk center at the beginning of these measurements, with the rotation compensation included through the whole SUMER & CDS coalignment mode, scheduled for 82 minutes. In the case of the CDS NIS spectrometer the He I 584 Å line was included in all modes of the CDS operation within the JOP078 run. The CDS would be programmed to perform the large and small movie modes as well as 2D sequential rasters.

SUMER & **MDI and SUMER** & **TRACE :** In order to align measurements from the SUMER and CDS spectrometers and the FOVs of MDI and TRACE we plan to use the photospheric white light images. The MDI and TRACE instruments should provide such data from the beginning of the JOP078. They will cover only a limited FOVs around the disk center. The special long-term SUMER rear slit camera (RSC) measurements should be carried out before the simultaneous observations. The SUMER RSC 'image' will be later aligned with the MDI and TRACE continuum images taken at least a few seconds after the end of SUMER RSC data acquisition. We expect to identify some pores which could help us to improve specification of the SUMER slit position in the MDI and TRACE continuum images better than expected intrinsic ± 5".

SUMER & **EIT :** This alignment could be made in two steps. The described SUMER & CDS alignment has to be used to specify the SUMER slit in the CDS 2D FOVs, and then the CDS & EIT alignment can be performed in order to obtain the required SUMER & EIT alignment. The actual CDS & EIT coalignment can be done in two ways. The first one is based on the comparison of the acquired CDS He I 584 Å 2D movies and rasters and the simultaneously taken EIT He II 304 Å images. The second one is to exploit the CDS 2D rasters in which the He II 304 Å line is included. These CDS rasters should be acquired simultaneously with the EIT in the same line.

4. 'Scientific' measurements

The measurements, proposed to be done for the determination of the variability and properties of the quiet sun supergranular network and internetwork, consist of different observing sequence parts for the SUMER and CDS spectrometers and one or two observing modes for the EIT, MDI and TRACE instruments. Operation of all instruments would be phased according to our aim. Detailed information on the proposed 'scientific measurements' can be found in the list of SoHO JOPs (http://sohowww.nascom.nasa.gov/soc/JOPs/).

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