SOHO Joint Observing Programme 35

Coronal Hole Structure and Evolution

Author(s): R.A. Harrison (CDS), J. Insley (CDS), V. Moore (CDS), J. Gurman (EIT), C. St. Cyr (LASCO), J. Saba (MDI), U. Schuehle (SUMER), B.J.I. Bromage (CDS)

Addresses:

harrison@solg2.bnsc.rl.ac.uk
gurman@uvsp.nascom.nasa.gov
schuehle@sumop1.nascom.nasa.gov
mdi@mdisas.nascom.nasa.gov
igse@lasco.nascom.nasa.gov

Progress:

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Objective: To study the structure and evolution of coronal holes, with special emphasis on the structure and activites in the boundaries

Conditions Necessary to Run: Identification of a well defined coronal hole and involvement, at a minimum, of CDS and EIT.

Scientific Case:
This JOP is designed to study the structure and development of coronal holes. In particular the processes that occur in the boundary regions are examined. The JOP is supported by the on-going CDS synoptic scans and two dedicated Studies (BOUND and CHSTR). These are complementary to the SUMER POP 21. The target coronal hole is mapped and a boundary region is chosen for special attention. Supporting data from the more "global" views afforded by LASCO, EIT and Yohkoh are sought.

Pointing and Target Selection: Coronal hole, preferably with well defined boundary, with minimum of line of sight contamination from overlying structures.

Operating Details:

- **CDS**

This scheme involves three CDS Studies:
- BOUND - Coronal Hole Boundary Study (Blue Book Page 14-17)
- CHSTR - Coronal Hole Structure (Blue Book Page 14-28)
- SYNOP - Synoptic Study (Blue Book Page 14-91)

The scheme calls for selecting a boundary region and running BOUND followed by CHSTR which maps the hole and looks for dynamic events etc... SYNOP is run on a daily basis as part of the CDS synoptic programme and will be used to provide global information.

(1) BOUND:
Spectrometer: Normal incidence

Phase 1:- Viewfinder Phase
4 x 240 slit
60x240 arcsec field of view - i.e. 15 location raster. Perform once.
20 Sec exposure at each location
Line Selection - Good temperature range (logT = 4.3 to 6.2), with one density sensitive pair, and a good boundary/structure identifier (Mg IX): He I 584Å, O V 629Å, Mg IX 368Å, Si IX 342/349Å, Fe XVI 360Å, Si XII 520Å.
16 to 12 bit Compression. 11 bins across each line.

Phase 2:- 'Fast Raster Phase
2 x 240- arcsec slit
60x60 arcsec field of view - i.e. 30 location raster
20 Sec exposure at each location. Raster duration = 5 min.
20 rasters. Total duration = 250 min.
Line Selection - Few lines, i.e. for speedy telemetry. Select bright lines from very different temperatures: He I 584Å, O III 599Å, Mg IX 368Å, Ne VI 562Å, Fe XIII 320Å and Fe XVI 335Å.
16 to 12 bit Compression. 11 bins across each line.
Repeat raster 20 times.

Phase 3:- repeat phase 1

Total duration of BOUND = 4 hr 20 m.

(2) CHSTR:
Spectrometer: Normal incidence
Slit: 2x240 arcsecond
240x240 arcsec field of view - i.e. 120 location raster
60 Sec exposure at each location
Line Selection - Coronal Hole Line Selection 1 [NIS] (i.e. Blue Book page 15-4, 13 lines, Fe VIII to Fe XVI plus Si IX and X, and Mg IX, including several density sensitive line ratios, a good T range and a good boundary identifier.
16 to 12 bit Compression. 11 bins across each line. Telemetry = 13 lines x 120 x 11 pixels x 12 bits / 10000 = 20.6 Sec.

Total duration = 2 hr 8 min.

(3) SYNOP:
See Blue Book. JOP 35 will make use of the latest SYNOP data without a requirement for special runs.

- **SUMER**

SUMER POP 21 - "Coronal Hole Study" (Red Book 8.1.2.1). The first phase should be run four times, in phase with the CDS BOUND Study. This phase is designed to identify the hole boundary and any macrospicule or bright point activity etc... The second phase is timed to coincide with the CDS CHSTR Study and contains cooler lines as well as some overlap with CDS lines for alignment etc...

Slit: 1x300 arcsec slit
Raster area: 300x300 arcsec - centred on CDS field.
Phase 1 - Run simultaneously with CDS BOUND
0.76 arcsec steps - 14 second integration time - 400 steps. Run 4 times.
Total duration = 380 minutes

Line Selection - Band centred on He I 584.334Å 2nd order.

Phase 2 - Run simultaneously with CDS CHSTR
0.76 arcsec steps - 44 second integration time - 394 steps. Run once.
Total duration = 293 minutes
Line selection - Band centred on 1240Å - including N V, Fe XII, C III, Mg X, O V.

- **EIT**

EIT will provide full Sun images in He II 304Å and Fe IX 171Å at the beginning and end of the campaign, plus occasional images during the campaign. These will provide a view of full Sun coronal structure. The EIT/LASCO synoptic programme is sufficient for the needs of this JOP.

- **LASCO**

Coronagraph images will provide information on the plane of the sky dimension when targets are located near the limb. The LASCO synoptic operation should be sufficient to cover the needs of this JOP.

- **MDI**

MDI will provide magnetogram support during the operation. The MDI synoptic magnetogram operation should be sufficient for the needs of this JOP.

- **Ground Based Instrumentation and Other Spacecraft**

1. Yohkoh - SXT full-Sun images would be useful. Their cadence can be much faster than that of EIT so any coronal changes which may influence the study can be identified.

2. He 10830Å - These images can be obtained from Sac Peak or elsewhere.

3. In addition, H-alpha (Big Bear, SOON) and magnetogram (Marshall, SOON) data from ground based observatories.