JOP Title:

Targetted Campaign #1, WHI, first week 19 t0 25, March 2008:
Linking the Corona to the solar wind (at Ulysses)

Authors:
G. Poletto (Lead), A. Breen, M. Bisi, R. Fallows, P.K. Manoharan, C. Marque',
S. W. McIntosh, S. Plunkett, K. Reeves, A. Sterling, S.T. Suess, M. Tokumaru

Other Correspondents:
L. Abbo, W. Curdt, M. Kojima, G. Maris, M. P. Miralles, K. Munakata.

Update History
First Draft (26 Nov 2007)
Second Draft (18 Mar 2008)

Participating instruments and observatories

Targetted

Space Based:
SOHO/UVCS - campaign contact G. Poletto, Y.-K. Ko
SOHO/LASCO - extra pB maps under consideration
Hinode/XRT/EIS -- campaign contact A. Sterling
Hinode/SOT -- campaign contact S. Mcintosh
TRACE -- campaign contact K. Reeves

Ground based:
EISCAT -- campaign contact A. Breen
Ooty -- campaign contact P. K. Manoharan
IPS 327MHz station, Nagoya -- campaign contact M. Tokumaru
HSO/CoMP -- campaign contact S. McIntosh

Synoptic
Nancay Radioheliograph -- campaign contact C. Marque', A. Kerdraon
SOHO/LASCO-C2/C3 -- S. Plunkett
SOHO/EIT -- TBD
STEREO/SECCHI/EUVI/COR1/COR2/HI -- campaign contact S. Plunkett
Ulysses/SWOOPS/SWICS -- campaign contact S. Suess
Global Muon Detector Monitor -- contact person K. Munakata

Scientific Objectives

**** due to Ulysses' premature retirement, our emphasis during WHI will be on plumes ****

Aim: twofold,

1) infer the outflow wind speed profile vs. altitude in plume/interplume regions,

2) characterize plumes, their morphology/physical properties and evolution.

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(original text)

Our main scientific objective is to derive the solar wind speed profile from coordinated SOHO/UVCS and radio scintillation data, over a wide range of heliocentric distances (2 to 50 R_sun), with the terminal wind speed being given by in situ Ulysses data. The goal of this study is twofold: on one side, we will provide the solar community with a composite wind speed vs. heliocentric distance profile based on measurements which refer to the same plasma parcels measured by different experiments at different distances - thanks to the SOHO-Sun-Ulysses quadrature configuration. While this is "per se" a valid objective, the wind profile we will come up to will serve as a benchmark input for the construction of a reference solar minimum heliosphere, as described later in this document.

A further objective we aim to as a by-product of the campaign observations is to get a better understanding of polar plumes morphology and physical conditions, with special emphasis to their temporal variation, practically unknown so far. The role of plumes in solar wind is still to be ascertained, hence, although we will build a wind profile averaged over the plume/interplume plasma in our main objective, we also plan to contribute to a better understanding of the solar wind by investigating polar plumes. Observations from COMP will provide measurements of alfvenic plasma motions and pos magnetic field diagnostics from the limb to 1.4 solar radii in the 10747 and 10830 lines. These measurements will help characterize the magnetic structures present, their inclination and the multitude of wave motions present - essential to understanding the roots of the fast solar wind.

These goals are based on the following IHY Coordinated Investigation Programs (CIPs):

7: SOHO-Ulysses coordinated studies during the two quadratures and the alignement of 2007-2008
43: SMEI and IPS 3D heliospheric analysis comparison with Ulysses...
69: Rapid solar wind and its impact on the geomagnetic variability

11: Three-dimensional view of the inner heliosphere...
5: State of the LISM at the Heliopsheric Boundary and Inside

Scientific Justification

The interpretation of the solar wind speed profile from its very source to large distances has still to cope with a number of open problems such as fully explaining the transition from fast to slow wind, bringing together observations close to the Sun and observations at distances of several to tens of AU, constructing the wind 3D structure over the whole heliosphere.

In order to start dealing with these issues, it is crucial to get a data set to be used as a baseline to define a reference heliosphere. To this end, years 2007/2008 - the time interval defined as the International Heliophysical Year - offer an ideal situation, because of the presence of a whole fleet of spacecraft at different heliocentric distances. Also, we point out that during the WHI interval we are in a SOHO-Sun-Ulysses quadrature configuration, i.e., in a geometry that allows plasma parcels observed with remote instrumentation to be observed in due time by "in situ" experiments. Coordinated observations can be made by SOHO/HINODE/ACE/WIND/STEREO/Ulysses while the solar wind speed at the
Termination Shock (TS) will be observed by Voyager 2, at present in the pre-shock regions of the TS. These data will be complemented by ENAs (Energetic Neutral Atoms) observations made by IBEX (Interstellar Boundary Explorer, to be launched in 2008) that are directly related to the solar wind which originates in the corona in 2007/2008.

The JOP data are acquired in the framework of this project. A test campaign has been made May 7 to 13, 2007, joining SOHO/UVCS and radio scintillation measurements.

Operational Considerations

The geometry of the Ulysses quadrature dictates where data need to be acquired: east limb, Northern hemisphere, 70 degree latitude.

Detailed Observing Sequences per Instrument (will be revised later, based on input from instrument teams):

Pointing and characteristics of observing program of different experiments:

SOHO UVCS: slit center at South Pole, different altitudes, 1.7, 2.0, 2.4, 3.0 solar radii. Spectra including Lyman alpha line.

SOHO EIT: usual synoptic program.

SOHO LASCO: usual program, 4 pB maps/day

STEREO SECCHI: 2.5 minutes cadence in 17.1 nm, 10 minutes cadence in the other EUVI bandpasses. COR1 will take pB images with a cadence of 10 minutes, COR2 will alternate between B and pB every 15 minutes. HI1 and HI2 will observe B with cadences of 40 and 120 minutes respectively.

TRACE: two FOV mosaics to cover the coronal hole, pointing -60, -930 and 60, -930 respectively. Images in 171, 284, 195, possibly 1216 A.

HINODE SOT: SP: FOV 400 x 100, spectrpolarimetry in FeI, NFI: two sequences to characterize magnetic field and lower chromospheric expansion in FeI and Na I.

HINODE XRT: FOV 512 x 512, Al/poly and Ti/poly, exposure times 16 and 10 s, respectively

HINODE EIS: default plan, on disk plume observations, 100 s exposures
Radio and scintillation experiments: standard synoptic observations.

Radio scintillation data:
Different instrumentation take part in the campaign:

- Ooty Radio Telescope operating at 327 MHz: will make solar wind estimates (using the Interplanetary Scintillation (IPS) technique) for the whole campaign period.

- STELab 327MHz multi-station IPS system: will start observing on April 1st, so it will not take data during the Targetted Campaign Week. Nevertheless, from April 1st data will be acquired daily from 22h and 7h UT. The distribution of the solar wind speed for radial distance between 0.1 and 1 AU will be derived over a Carrington rotation. Hence, if the target coronal hole is a stationary feature STELab will still provide relevant data. The wind map provided by STELab covers the entire range of heliographic longitude and latitude, and the speed estimate is given with a 1 deg by 1 deg pixel resolution.

- EISCAT-MERLIN: unfortunately there are no sources to infer good information with EISCAT-MERLIN baselines during WHI. The situation is somehow analogous to that of STELab, but during the previous Carrington rotation a number of observations will be made at the East limb. More precisely:

20080223

	Dist	Lat	limb	sites

1330	1430	2225-049	18.6	63.1	E	KT
1330	1430	2232+117	78.6	51.9	E	CK
1430	1530	2212+018	44.7	69.9	E	JS

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1330	1430	2232+117	77.1	53.6	E	CK
1345	1445	2225-049	17.3	72.6	E	KT
1430	1530	2212+018	44.4	70.7	E	JS

Observations can be made later with the 0137+331 source, extending from 50 N at 85Rs on 20080415 through to past the end (or beginning earlier, at lower latitudes) - say to 64N at 79Rs on 20080427, East limb, thus "bordering" data taken during the WHI.

Ground based instrumentation

NSO Observing Plan:
If the targetted campaign # 1 will be held in the first week of the WHI, we plan to use the usual SOLIS synoptic maps. Should the campaign be postponed we may search for a more active NSO participation.

Nancay Radioheliograph
Daily observations from 8:30 to 15:30 UT; five requencies between 150 and 450 MHz; spatial resolution ~ 1 arcnmin; FOV: full Sun.

Global Muon Detector Monitor
Observations of high-energy cosmic rays with the Global Muon Detector Network.

HSO/Coronal Multi-channel Polarimeter [CoMP] (NOT AVAILABLE DURING WHI)
- CoMP spectroscopically observes a full-disk FOV out to 1.4 Rsun.
Fe XII 10747 - 10s cadence full corona - wave studies
He I 10830 - 10s cadence full corona - wave studies - detail of near-limb alfvenic motions.
Deep exposure spectropolarimetric POS magnetic field strength, azimuth and line width measurements.