SO/PHI data request form

(Cruise phase + first science orbit; SO/PHI-Team internal version)

Mini coronal holes or super-quiet Sun: studying the magnetic field beneath areas in the corona which appear dark in EUV images to determine their nature

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Science case (stay on one slide):

Please also state, why is PHI needed; why is the science unique?

Small areas in the quiet corona appearing dark in EUV images (which we will call mini coronal holes, mini-CHs) can be the result of different magnetic structuring in the photosphere. For one, they could overlie unipolar fields or they could simply be areas of super-quiet Sun, with lower level of magnetic flux than the average QS.

PHI observations will yield information on how strong and how unipolar the magnetic flux is, providing the means to distinguish between the two hypotheses. The sensitivity and stability of PHI allow recording an uninterrupted time series over a longer period and co-observations with high-resolution EUI observations is crucial to understand the coupling of photospheric magnetic fields and the corona, in particular concerning small coronal structures.

The evolution of the magnetic flux in the mini-CHs should be followed over a timescale comparable to the lifetime of a supergranule. This implies an observing sequence of about one day, at moderate cadence. To investigate the possible impact of flux emergence and cancellation one should also include a shorter stretch of data at high cadence of about one minute to capture this process.

Additionally, the obtained data can also be used to extrapolate the magnetic field, determining if locally the field is open or closed. With these a further differentiation between the hypotheses is possible. If a regular coronal hole is available, either at low latitudes or near the poles, these data from mini CHs embedded in the quiet Sun can be compared to the well-studied regular CHs, but through the same instrumentation as the mini CHs. The same applies for EUV-dark CH-like structures adjacent to an active region.

Requirements/data (use additional slide if needed)

Besides best guess requirements, you may also list minimum requirements on the data

- Type of solar feature: mini coronal holes, areas in the corona appearing dark in EUV images
- HRT or FDT: HRT
- Physical parameters needed (available: B_LOS, vector B, v_LOS, I_c, raw data): B_LOS, Inclination
- Total length of observation: 10 min – 1h (1 min cadence), 1 day (30 min cadence), 6h (10 min cadence)
- Cadence (maximum 1 dataset/min): 1 min for 10 min – 1h, 30 min for 1 day, 10 min for 6h
- Pointing needs (disc centre, limb, active region location, particular μ): disc centre or anywhere on disc not too close to limb, possible is also an AR
- Orbit needs (spatial resolution/co-rotation/angle to Earth/angle to other spacecraft): Co-observations with AIA on SDO would be useful to see how the properties (darkness, size, etc.) of the mini CH depends on temperature
- Total number of datasets: > 90
- Full frame 2k x 2k or partial frame 1kx1k, 0.5kx0.5: full frame
- Full resolution or 2x2, 4x4 binned data: full resolution
- noise level (default 10^{-3}): default
- Co-observations with other instruments: EUI, SPICE, AIA
- Special requests: