SO/PHI data request form

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

Understanding the 3D velocity structure of sunspot penumbrae

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Science case (stay on one slide):
Please also state, why is PHI needed; why is the science unique?

We propose to perform stereoscopic observations of a sunspot from two different vantage points using PHI and instruments from Earth. Stereoscopic observations provide two components of the velocity vector, allowing tighter constraints on the geometry of flows within the penumbra. Such data will help improving our understanding of the Evershed flow and potentially allow distinguishing between the two models for the origin of this flow (siphon flow or magnetoconvection). Similarly, the flow geometry within individual penumbral filaments could be derived. A similar kind of analysis can also be applied to orphan penumbrae. This science case is unique to PHI, since stereoscopic observations are not possible with current instrumentation. Ideally, both PHI and the instrument on Earth will utilize the same spectral line and observe the sunspot at a similar heliocentric angle in order to achieve a similar formation height.

Requirements/data (use additional slide if needed)

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

- Type of solar feature: Sunspot / orphan penumbra
- HRT or FDT: HRT
- Physical parameters needed (available: B_LOS, vector B, v_LOS, I_c, raw data): inverted parameters
- Total length of observation: 120 min
- Cadence (maximum 1 dataset/min): 1 min
- Pointing needs (disc centre, limb, active region location, particular μ): Active region location
- Orbit needs (spatial resolution/co-rotation/angle to Earth/angle to other spacecraft): If possible, PHI should be looking at the sunspot from a similar angle as from Earth in order to sample similar heights with PHI and CRISP instruments, but from a different point in order to have stereoscopy.
- Total number of datasets: 120
- 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 : CRISP at SST (Fe 6173 A and other spectral lines to get information from higher layers), Hinode SOT/NFI, Hinode SOT/SP, SDO/AIA, SDO/HMI, and SO/EUI HRI observations in Ly-alpha and 174 nm as context on the overall topology of the active region in the high layers, e.g., presence of pre-exisiting magnetic fields above the penumbra blocking the rising of new emerged flux.

- Special requests: