

SO/PHI data request form

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

Multi-angle view of fast horizontal flows in photospheric granulation

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Science case (stay on one slide):

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

Simulations show supersonic horizontal flows within granules covering 3%–4% of the solar surface at any time (Stein & Nordlund 1998) with shocks forming near intergranular lanes at the deceleration sites of the horizontal flows (Cattaneo + 1990).

In observations horizontal flows can only be detected directly when observing towards the limb as they are seen then as projected line-of-sight velocities. This is at the cost of significant loss of spatial resolution. Therefore other indicators at disk center were taken as proxies to detect fast horizontal flows and associated shocks, such as the excess in line width at intergranular lanes interpreted as a sign of turbulence introduced by the shocks (Nesis+ 1992). Utilizing high spatial resolution Hinode SP observations taken at low μ -angle Bellot Rubio (2009) showed that as a lower limit 0.3% of pixels in the Field of view harbour fast horizontal flows with maximum blueshifts at the border of the granule in the direction to the disk center/towards the observer.

We now have the unique opportunity by combining SO/PHI and EUV data together with satellite (Hinode SP) or ground-based data to observe these features stereoscopically. We will thereby be able to detect the fast horizontal flows, pinpoint their location, study the granulation pattern without foreshortening, and analyze effects on the upper solar atmosphere.

Requirements/data (use additional slide if needed)

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

- Type of solar feature: *quiet Sun*
- HRT or FDT: *HRT*
- Physical parameters needed (available: B_LOS, vector B, v_LOS, I_c, raw data): *preferably raw data (else nominal HRT: B vector, vlos, Ic)*
- Total length of observation: *20 minutes*
- Cadence (maximum 1 dataset/min): *1 dataset/min*
- Pointing needs (disc centre, limb, active region location, particular μ): *disc centre*
- Orbit needs (spatial resolution/co-rotation/angle to Earth/angle to other spacecraft): *high spatial resolution, angle to Earth between 40 degrees and 70 degrees*
- Total number of datasets: *20 data sets*
- Full frame 2k x 2k or partial frame 1kx1k, 0.5kx0.5: *FOV can be reduced to 1k x 1k or even 0.5k x 0.5k in case of telemetry restrictions*
- Full resolution or 2x2, 4x4 binned data: *Full resolution*
- noise level (default 10^{-3}): *default*
- Co-observations with other instruments: *EUI*
- Special requests: *This science case needs to be run with Hinode/SP or comparable spectropolarimeter or spectroscopy instrument with similar spectral resolution .*