SO/PHI-HRT, second data release. L2 level, first version.

The second data release includes L2 SO/PHI-HRT datasets from RSW 3, 4, and 5 (version 1).

All datasets are corrected for optical aberration, however, reconstruction for diffraction at the entrance pupil is not applied. The quality of the correction is variable, depending on the availability of suitable phase-diversity calibration files (not always available mostly due to off-pointing). In some cases, improvement to processing is to be expected from forthcoming acquisitions of new calibration datasets and updated observational procedures (see Kahil et al., 2023).

For the above reason, at this point in time only part of the data is released to SOAR. The criteria for SOAR upload is that either data are properly calibrated, or it is not expected that the calibration will improve in the near future. Nevertheless, the data are in a state suitable for scientific exploitation. The datasets uploaded to SOAR are part of the following SOOPs:

- RSW 3: Nanoflare, Polar (first instance), AR_Long_Term
- RSW 4: RS_ Bursts (both instances), Connection_Mosaic
- RSW 5: AR_Long_Term

The remaining data, including the whole RSW 6, will be uploaded to SOAR as soon as better calibrations are attained.

In general, all standard observables are released:

- *icnt*: continuum intensity computed by the RTE inversion;
- *vlos*: longitudinal velocity computed by the RTE inversion;
- *bmag*: magnetic field strength computed by the RTE inversion;
- *binc*: magnetic field inclination computed by the RTE inversion;
- *bazi*: ambiguous magnetic field azimuth computed by the RTE inversion;
- *blos*: longitudinal magnetic field computed from *bmag* and *binc (*note that *blos* is typically more robust than either *bmag* or *binc)*;
- *stokes*: full Stokes vector (I, Q, U, V) measured in 5 points within the absorption line and in one point in the near continuum (measured continuum).

Some artefacts may impact significantly in particular on *vlos*. In such cases, *vlos* is not released at this point in time.

If any publications are produced to which SO/PHI data contribute in any way, we would be request you to cite the relevant instrument papers:

Solanki, S. K., del Toro Iniesta, J. C., Woch, J., et al. 2020, A&A, 642, A11, DOI: 10.1051/0004-6361/201935325;

Gandorfer, A. M., Grauf, B., Staub, J., et al. 2018, in Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, Vol. 10698, Space Tele-scopes and Instrumentation 2022: Optical, Infrared, and Millimeter Wave,1403–1415, DOI: 10.1117/12.2311816.

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We would appreciate receiving a copy of any publication you produce that profits from SO/PHI data.

We would be glad if you can report to us about any problem or issue encountered in using SO/PHI data. Please contact sophi_support [at] mps.mpg.de

Further information is given at:
https://www.mps.mpg.de/solar-physics/solar-orbiter-phi