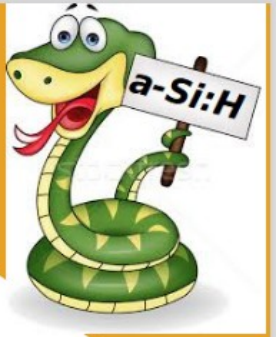


HASPIDE SPACE- WG5 2022-2023

C. Grimani 0.2 FTE

M. Villani 0.3 FTE (AdR LISA – ITT ESA)

F. Sabbatini 0.5 FTE (IT PhD student 1 year)

Tot: 1 FTE

M. Fabi (IT tec. machine-gestione-, Monte Carlo -gestione- geometrie) (Metis Solar Orbiter)

Può essere perso per 75% FTE entro la fine dell'anno

AdR INFN dedicato a HASPIDE

July – December 2022 activity

Monte Carlo simulations of a prototype detector to optimize the active detector geometries and the passive material layers with FLUKA following the work reported in the paper in progress:

1) Build tentative geometries with FLAIR for FLUKA (+Geant4 AdR INFN)→ M. Fabi
2) Optimize sensitive parts and passive material layers for the detector → CG and M.Villani + PG
3) A sample of solar energetic particle events will be considered (SEPPEL) → F. Sabbatini

Papaioannu et al., A&A, 660, L5, 9pp, 2021

Flare X1
Soft X-rays
Radio bursts:
III, II, IV
EUV

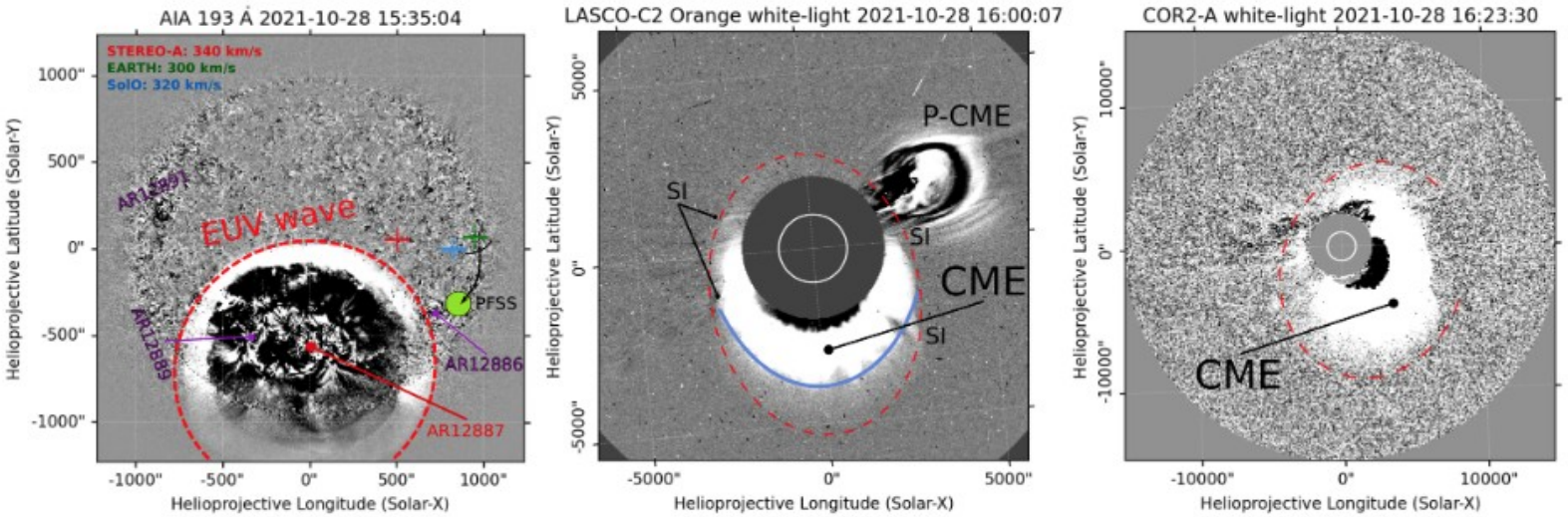


Fig. 2. Selected snapshots of EUV and WL coronagraphic observations before and during the GLE73 event on 28 October 2021. The left panel shows a running-difference image in EUV from SDO/AIA at 193 Å. The EUV wave is encircled to indicate its location. The footpoints of the Parker spirals connected to PSP (purple), STEREO-A (red), SolO (blue), and Earth (green) are shown with the coloured crosses. Most of the footpoints of the magnetic field lines connected to Earth (from PFSS) gather close to the region highlighted with a green circle. We indicate the location of ARs that the pressure/shock wave interacted during its expansion. The middle and right panels show running-difference images from LASCO-C2 and STEREO-A/COR2 coronagraphs, respectively. We outline the location of the shock wave and indicate the CME. We indicate the locations that the pressure/shock wave interacted with coronal streamers (SI) and the previous CME (P-CME).

Papaioannu et al., A&A, 660, L5, 9pp, 2021

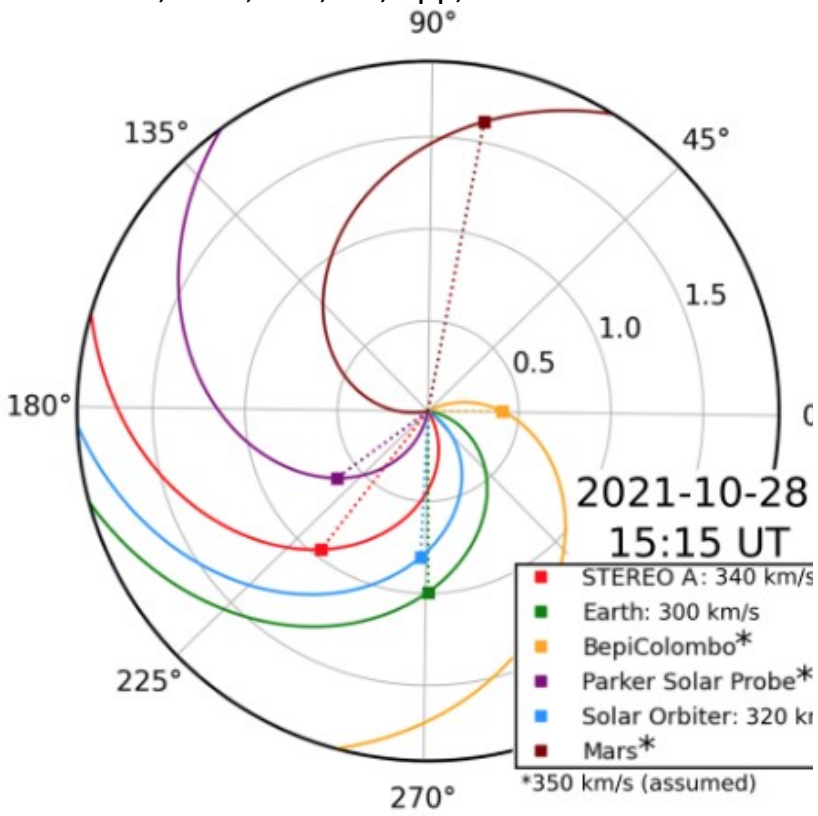


Fig. A.1. A view of the ecliptic plane from solar north show positions of various spacecraft on 28 October 2021 at 15:15 U Parker spirals are shown for each spacecraft. From the Solar M. Connection Haus tool (https://solar-mach.github.io/).

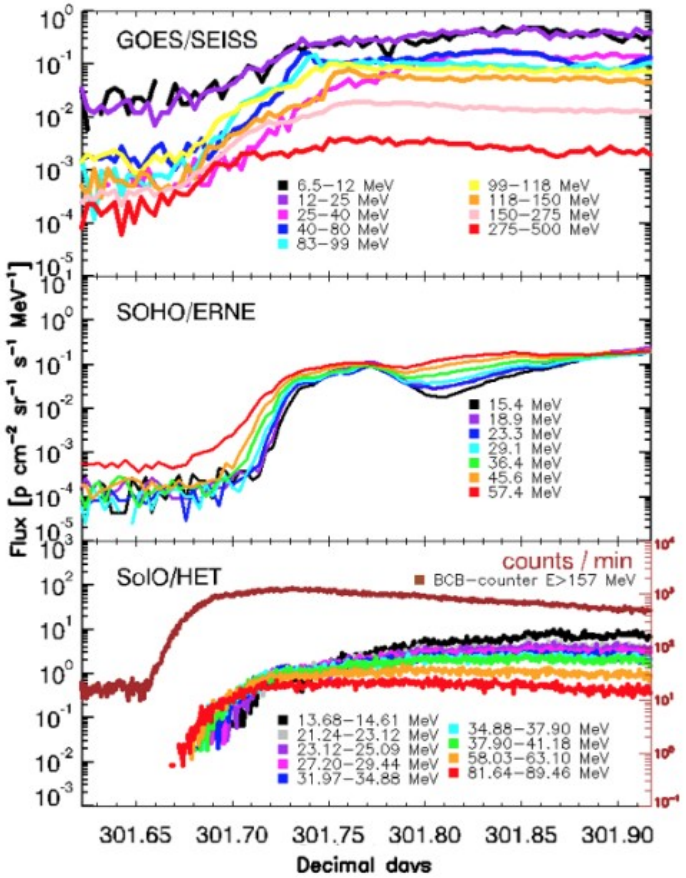
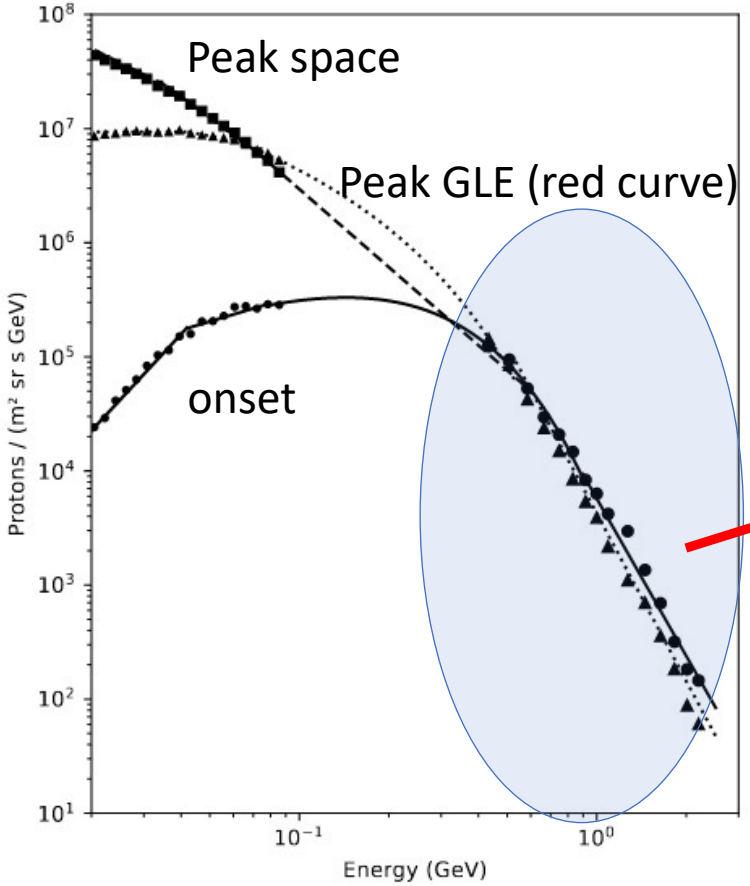


Fig. A.2. Energetic particle recordings of GLE73 in the near Earth space, (from top to bottom) 5-min averaged GOES/SEISS differential fluxes; SOHO/ERNE fluxes and SolO/HET measurements including the recordings of the SolO/HET/BCB-counter.



Papaioannu et al., A&A, 660, L5, 9pp, 2021

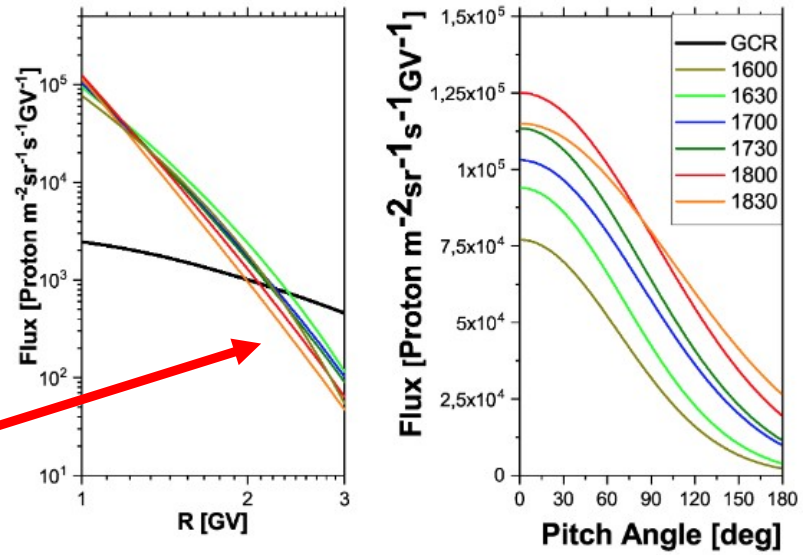


Fig. 4. Derived SEP rigidity spectra (left panel) and PADs (right panel) during GLE73 on 28 October 2021. The solid black line denotes the galactic cosmic ray flux, which corresponds to the time period of the GLE 73 occurrence (see text for details). All time in the legend are in UT and refer to the start of the corresponding five minute interval over which the data are integrated.

Optimization of a a:Si-H detector for long-duration intense solar energetic particle event monitoring

- **a:Si-H active material** and tungsten as passive material
- CSDA proton range in tungsten (Z=74)
- Tungsten density: 19.25 g/cm^3
- Geometrical Factor max for 400 MeV protons 0.6 cm^2 sr for about 1 kg detector

Energia	CSDA range	Range	Massa
300 MeV	99.33 g/cm^2	5.16 cm	2.5x2.5 → 620 g 2.0x2.0 → 397 g 1.5x1.5 → 223 g
350 MeV	127.1 g/cm^2	6.60 cm	2.5x2.5 → 795 g 2.0x2.0 → 508 g 1.5x1.5 → 286 g
400 MeV	156.8 g/cm^2	8.15 cm	2.5x2.5 → 979 g 2.0x2.0 → 627 g 1.5x1.5 → 353 g

SEP event October 28, 2021 GLE 73

Blue dots: data gathered in space up to 100 MeV with Solar Orbiter. Orange squares: Neutron Monitor data.

The blue curve is the best fit with data up to 100 MeV.

The red curve is the best fit with data up to 400 MeV-> SEP monitoring in space, far from Earth should be monitored up to minimum energies of 400 MeV. Only near-Earth detectors cover this energy range.