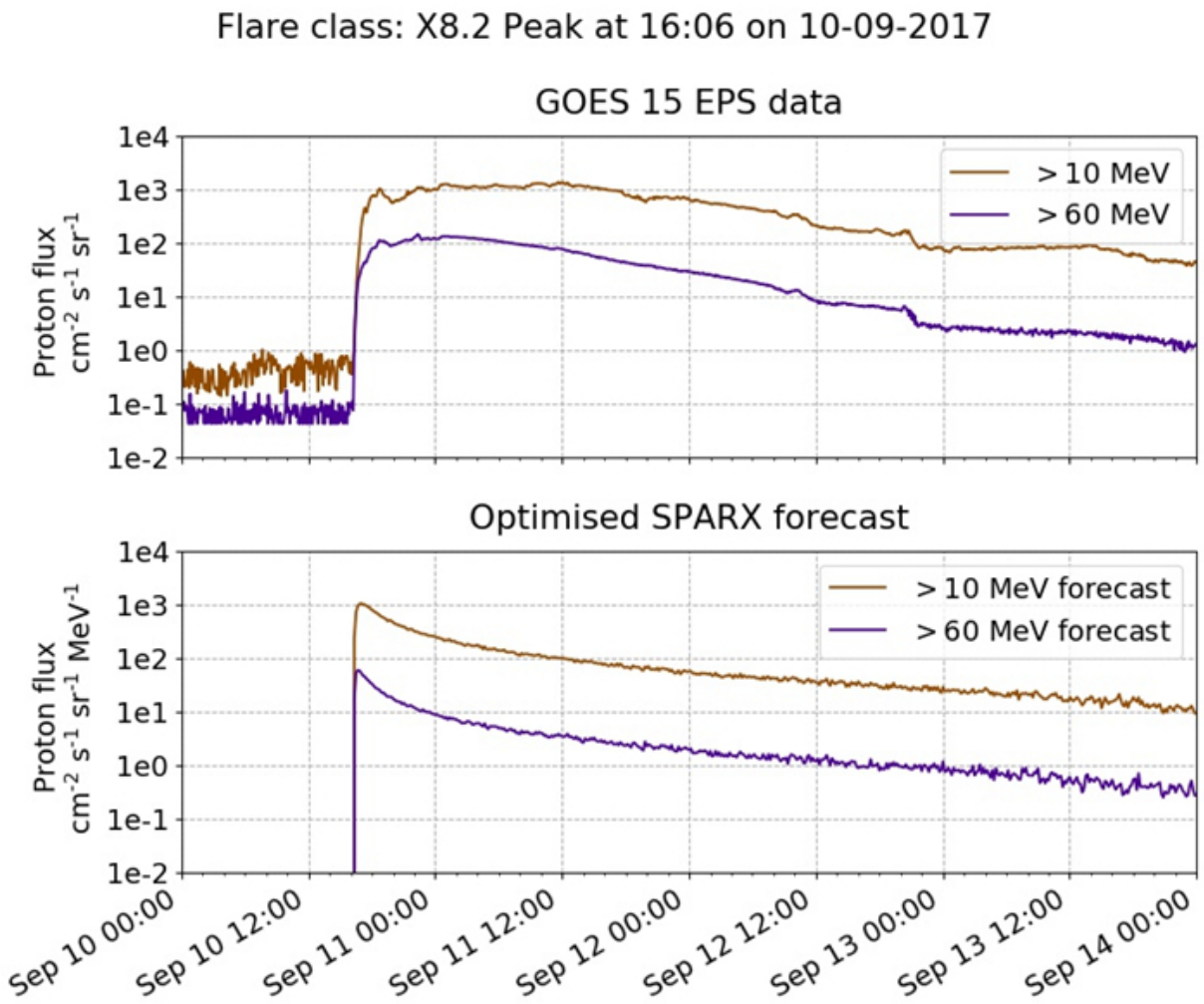
SPARX

- SPARX: Solar PArticle Radiation swX (Marsh et al, *Space Wea.* 2015)
- Based on solution of 3D relativistic full-orbit equations of motion for a set of test particles. No assumption of field line-tied propagation
- Includes scattering, drift, deceleration and corotation of magnetic flux tubes (no perp scattering in current version)
- In v1, operational within COMESEP alert system, particles injected instantaneously only near the Sun
- Outputs: SEP flux profiles for E>10 MeV and E>60 MeV

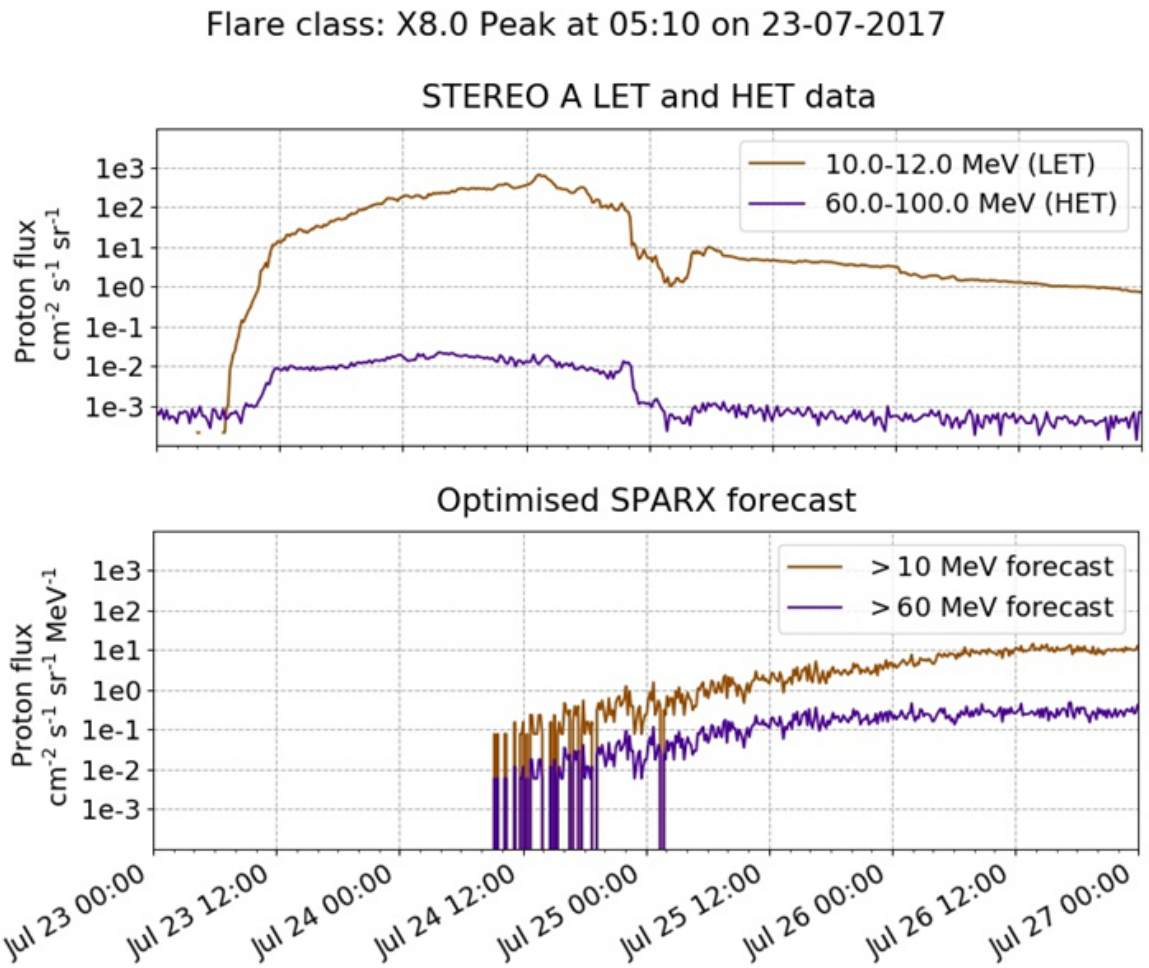
Model results: 10 September 2017



Top plot: GOES 15 EPS data

Bottom plot: output of optimised SPARX run:
solar wind speed 500 km/s
size of injection region 180x180 deg

Model results: 23 July 2017



Assumed flare parameters:
Class: X8.0
Lat: -5 Lon -85 (from STEREO A viewpoint)

Top plot: STEREO A LET and HET data

Bottom plot: output of optimised run:
solar wind speed 500 km/s
size of injection region 180x180 deg

Discussion questions

- How did your optimized run results differ from the initial run?

  The standard run of SPARX has an injection region of size 48x48 degrees: for both events this gave no particles at the spacecraft for vsw=500 km/s. A wider injection region was chosen in the optimised runs (although note: standard run with vsw=300 km/s produces an event for 10 Sep).

- What aspects of the event does your model capture well, and what aspects were more difficult to capture?

  In 10 Sep event the GOES intensities remain constant for about 1 day but this is not captured by the model

  In 23 Jul event the modelled intensities start rising 1 day after STEREO A intensities and peak fluxes are not as high

- What are the next steps for your modeling technique?

  Implementing ensemble techniques, integration with ENLIL, adding perpendicular diffusion and field line meandering