Brief Description of the Model:

SEPMOD was developed under CISM in the mid-2000s to provide a WSA-ENLIL-cone simulation-based SEP model

What it is:

- A *generalized** test particle code that uses the time-dependent fields and shock information from MHD heliospheric CME/ICME simulations for ***FORWARD MODELING*** *SEP event time profiles*

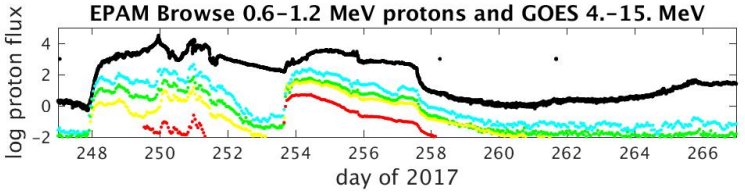
  (* can actually use any MHD model results)

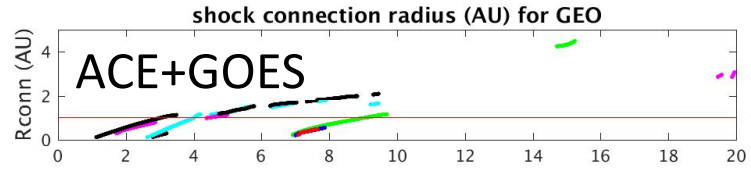
- Approach:

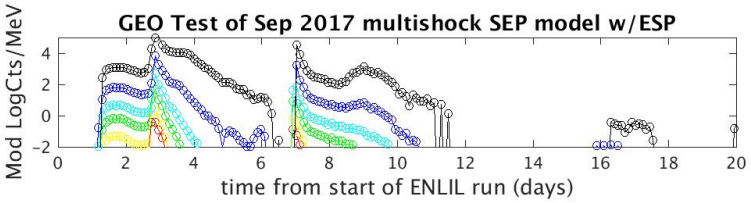
  Transport : A field-line tracer adapted for time-integrating guiding-center particle trajectories of ~1-100 MeV protons.

  Source: Uses an MHD shock parameter-based source description that is the same for all events. An ESP enhancement with a softer spectrum is assumed to travel with the shock.

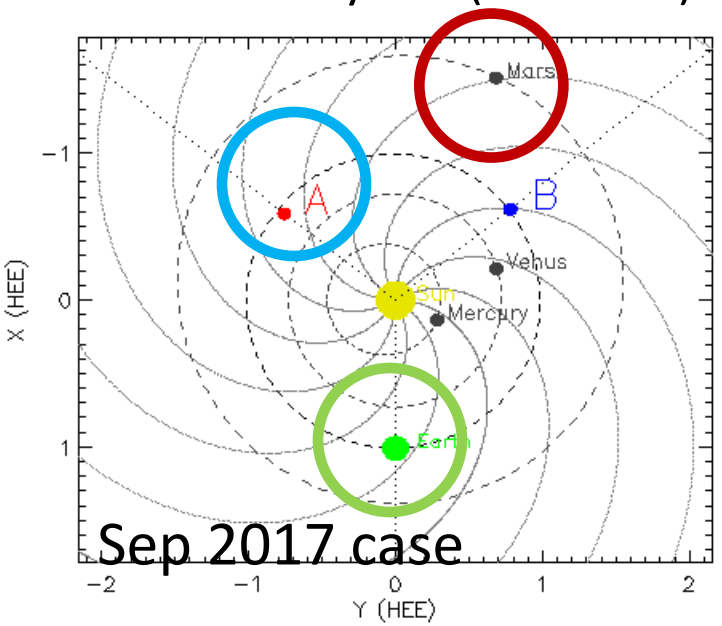
  Results include: Time series of SEP fluxes at user-specified energies for any observer(s) in the ENLIL domain , pitch angle distribution (anisotropy) information, option to add flare SEPs.

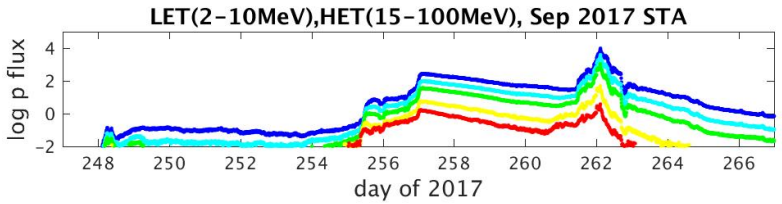


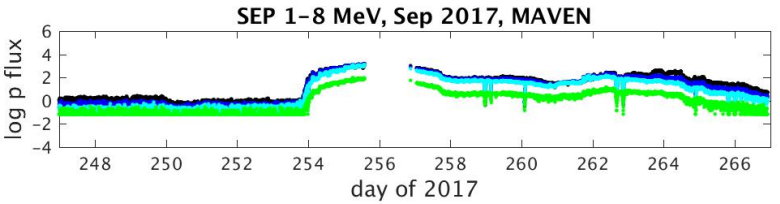


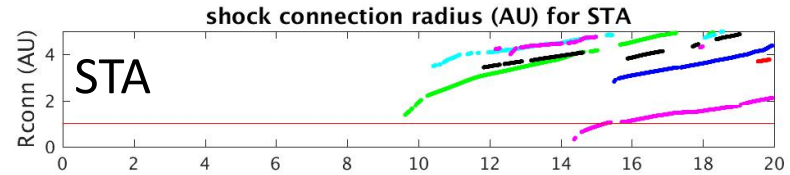


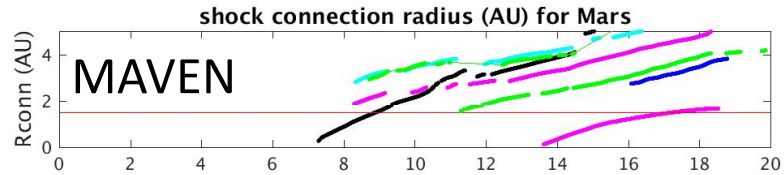
Observer 'layout' (from SSC)

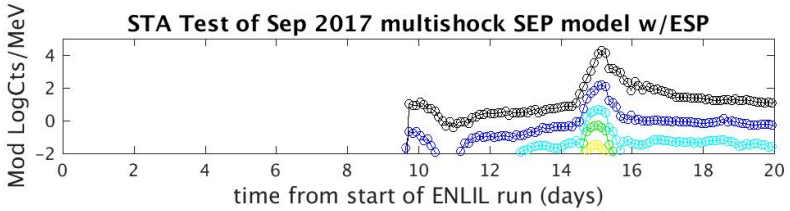


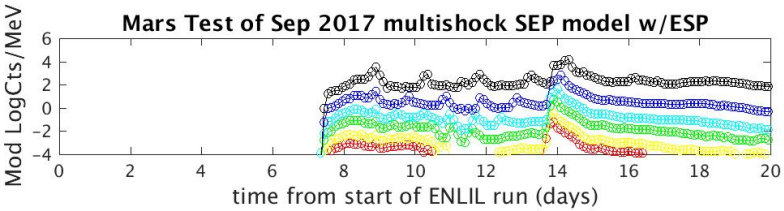




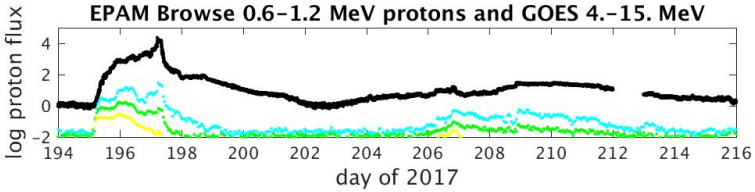


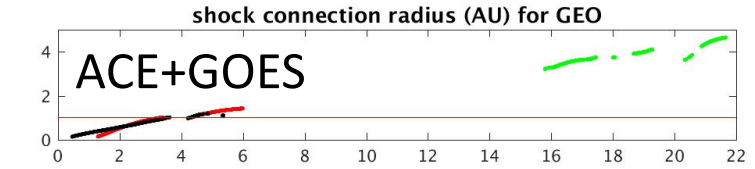


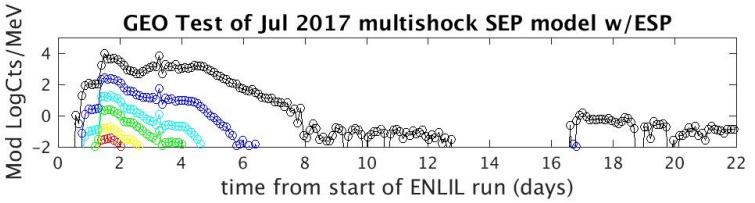




Model Results: September 2107







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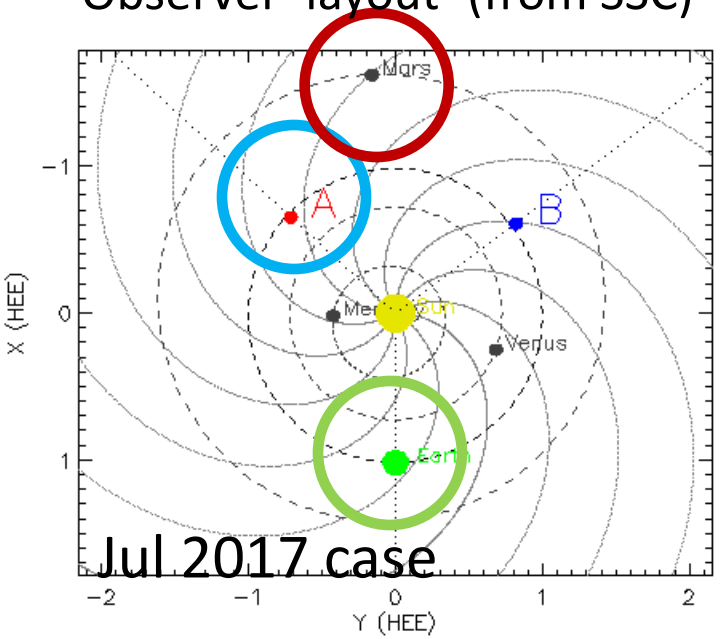

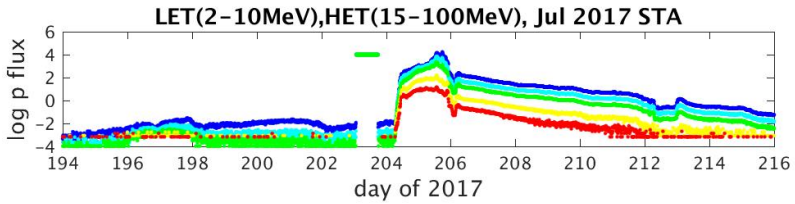

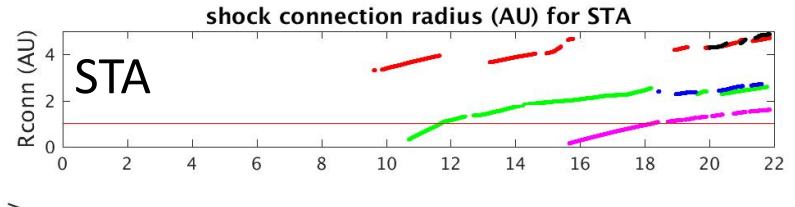

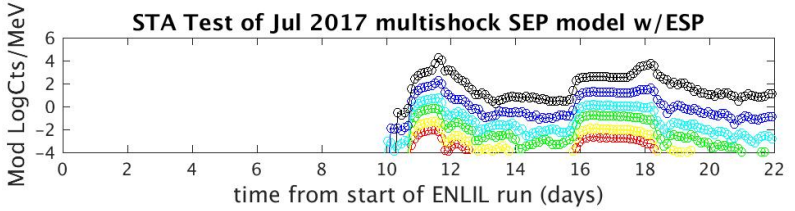

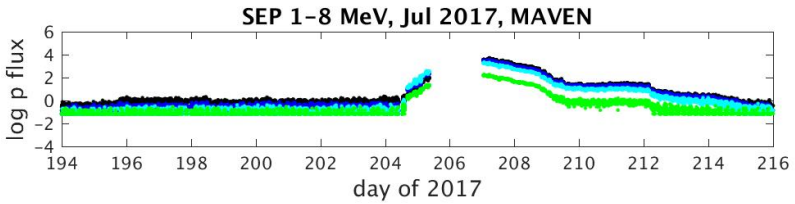

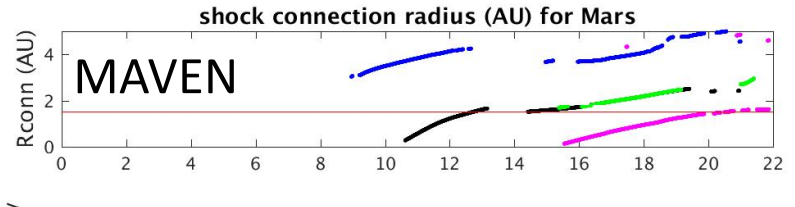

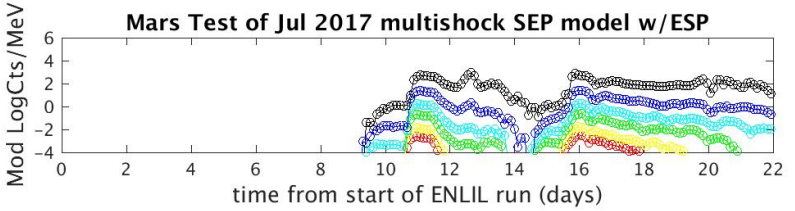

Model Results: July 2017

Discussion questions

- How did your optimized run results differ from the initial run? *Initial comparisons with multipoint data suggested our ENLIL time span on the September case was too short, and the later farside cone CMEs too narrow to capture the observed overlapping STA and Mars event(s). The effects of these later eruptions influenced the ongoing SEP event activity at Earth.*

- What aspects of the event does your model capture well, and what aspects were more difficult to capture? *Event onset timing at three observers (Earth, STA and Mars) was captured pretty well in both cases but the cone characterization of the farside CMEs was not as good as for the Earth-directed event.*

- What are the next steps for your modeling technique? *Too many to list here. Continuing applications to real multipoint events will be used to improve shock source description needed to improve results, but remains extremely dependent on ENLIL success/improvements as well. A priority is also finding a compatible way to include the <21.5 Rs domain.*