# Simulating the transport of high energy solar protons during historic GLE events

Overview:
- Over 15 historic GLE events are modelled with a 3D test particle code - protons are injected with relativistic energies (300<E<1200 MeV) typical of GLE events
- Events are modelled with and without a heliospheric current sheet (HCS) to see how it affects the distribution of energetic particles throughout the heliosphere
- Understanding more about the role the HCS has in particle propagation is important for forecasting energetic events at Earth

Main results:
- HCS plays a significant role in distributing energetic particles throughout the heliosphere
- Particle transport along the HCS is most efficient when the flare is within 15 degrees of the HCS
- The flare was closest to the HCS during the largest GLE's on record (GLE 69, 42 [right], 60, etc) – proximity of the flare to the HCS strongly affects the severity of the event at Earth
- Inclusion of the HCS significantly influences 75% of our simulated historic GLEs
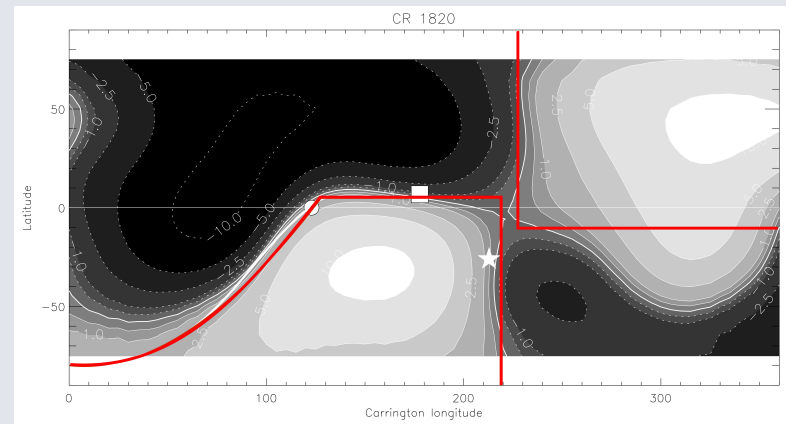
Source surface map for GLE 42 with flare (star) and Earth footpoint (square) locations. Fit to the HCS is shown in red.
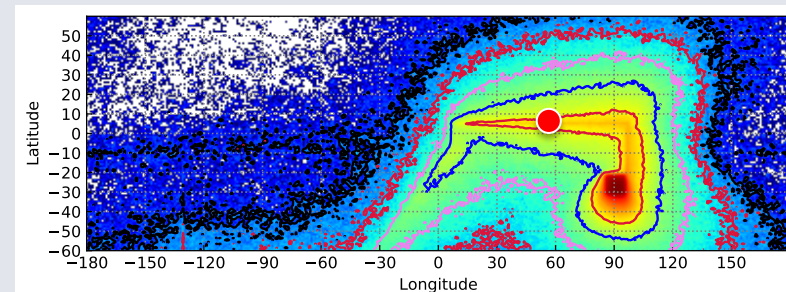
1AU proton crossing map over 72 hours for GLE 42 simulation. 🔴 : Earth's footpoint.

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