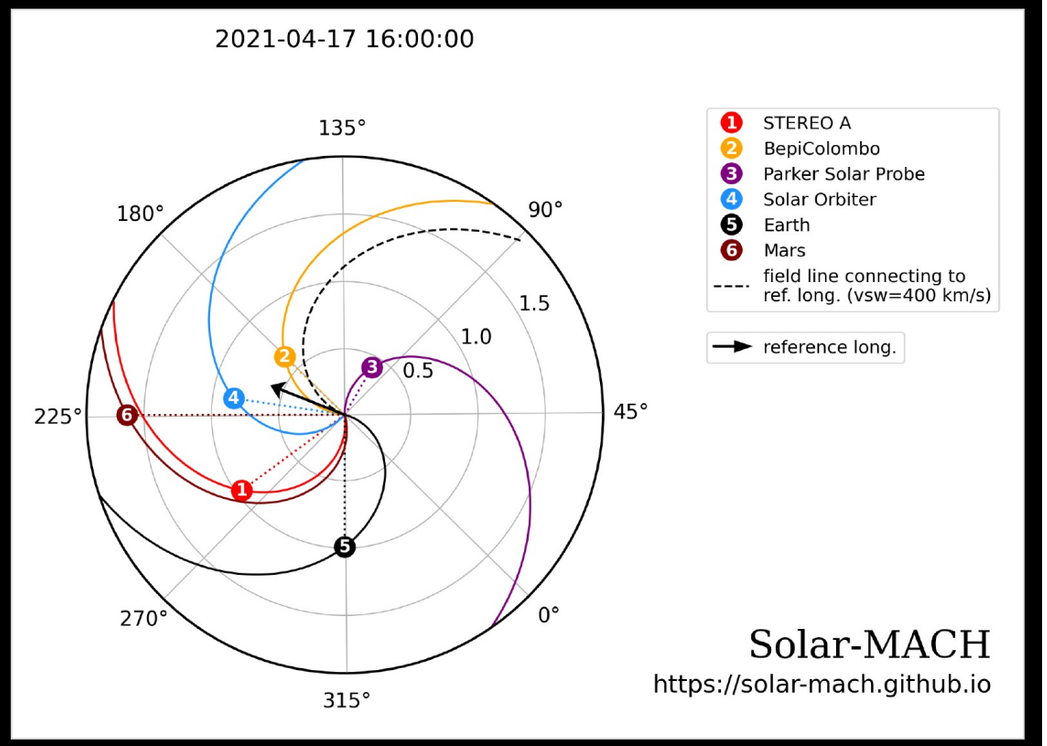
Multipoint Observations Reveal Complex Solar Energetic Particle Event

A complex and long-lasting solar eruption on 17 April 2021 produced a widespread Solar Energetic Particle (SEP) event that was observed by multiple longitudinally well-separated observers in the inner heliosphere: BepiColombo, Parker Solar Probe, Solar Orbiter, STEREO A, Mars orbiting spacecraft and near-Earth spacecraft.

The event was the second widespread SEP event detected in solar cycle 25 and produced relativistic electrons and protons. It was associated with a long-lasting solar hard X-ray flare. The event was further accompanied by a medium fast Coronal Mass Ejection (CME) driving a shock, a coronal wave, as well as long-lasting and complex radio burst activity.

The advanced spacecraft fleet revealed significant differences between the electron and proton SEP event, with a more likely flare association of the electron event and a more likely shock source for the proton event. Combining observations and modeling gives a new insight into the origin of particle events that can have a significant impact on robotic and human spaceflight. Widespread events like this one are especially of concern given their broad impact over more than half of the inner solar system.



The diagram shows the multiple observation points of individual spacecraft in the inner heliosphere. This includes observations by near-Earth spacecraft as well as MAVEN and Mars Express at Mars.

N. Dresing (U. Turku),et al., 2023: “The 17 April 2021 widespread solar energetic particle event,” *Astronomy & Astrophysics*, https://arxiv.org/abs/2303.10969.