



Behavior of Flare-associated Suprathermal Ions at Coronal Mass Ejections observed with Solar Orbiter at 0.5 AU

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Flare-associated particles from so-called impulsive events might be efficiently reaccelerated in gradual Solar Energetic Particle (SEP) events which are typically related to coronal mass ejections (CMEs). The existence and characteristics of such a flare-associated seed population might play a key role for understanding the high variability in particle intensity under comparable CME speeds and solar wind conditions. Understanding this variability will improve predictions of large gradual SEP events that cause a severe risk for satellite and even ground-based infrastructure. We analyze a sequence of impulsive and subsequent gradual events that occurred between 5 and 11 March 2022 and were measured in-situ with Solar Orbiter at a close distance of 0.5 AU to the Sun. We study in detail the behavior of suprathermal ions during the events and relate it to the ambient solar wind plasma properties and remote-sensing observations of the respective flares and CMEs observed from SOHO, SDO, and Solar Orbiter. We find in particular a strong local enhancement of suprathermal flare-associated ions that are trapped for several hours between two ICME structures and provide therefore a natural reservoir of seed particles that can be efficiently further accelerated in ambient compression regions or occurring shocks on their way out to 1 AU.