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Extended ^3He -rich time periods observed by Solar Orbiter

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Solar energetic particle (SEP) observations from Suprathermal Ion Spectrograph (SIS) which is part of the Energetic Particle Detector (EPD) suite on board the Solar Orbiter (SolO) mission, provide an unprecedented opportunity to study the composition and evolution of SEPs close at the Sun and to understand where SEPs are accelerated at the Sun and when released from their sources to interplanetary space. In this study, we examine ^3He -rich time periods that last for many days. These extended ^3He -rich periods that observed by SIS are particularly interesting because this rare isotope of He is not abundant in the solar corona and events rich of ^3He are usually associated with transient and small "impulsive" SEP events. First, we compile a catalogue of extended ^3He -rich time periods that were observed during the first three years of SolO mission and we determined and registered their characteristics (duration, composition, etc.). We also examined the spacecraft's magnetic connectivity during these time periods and the characteristics of the connected regions. We find that, during the extended ^3He -rich time periods, SolO is stably magnetically connected to an active region(s) for most cases. The connectivity usually changes near the boundaries of the time periods so the connectivity to the source region is an important element for the observation of these ^3He -rich time periods. The active region(s) where SolO is magnetically connected during the time periods are typically very productive of solar events (flares, jets, CMEs).