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Corotating interaction regions (CIRs) are an important source of energetic particles in the heliosphere. These particles may be accelerated in the high amplitude compression waves bounding CIRs. Alternatively or additionally, CIRs may produce energetic particle populations through stochastic acceleration mechanisms.

In this talk we illustrate how the particle transport model PARADISE (PArTicle Radiation Asset Directed at Interplanetary Space Exploration) can be used to study the transport and acceleration of supra-thermal ions in the vicinity of CIRs. PARADISE models the evolution of energetic particle populations propagating in a solar wind generated by the data-driven three-dimensional magnetohydrodynamic model EUHFORIA (EUropean Heliospheric FORecasting Information Asset). The latter model is used to generate solar wind configurations that contain CIRs, in which we subsequently inject suprathermal ions at a continuous rate. In particular, we discuss the modelling results of a CIR event that was observed by STEREO-A and Parker Solar Probe in 2019 September. For this event, our results indicate that the energetic particles are produced at the compression waves associated with the CIR and that the acceleration process can already commence within Earth's orbit, with an energy dependence on the precise location where particles are accelerated. Moreover, we shown how the three-dimensional configuration of the solar wind stream can strongly modulate the energetic particle distributions, illustrating the necessity of advanced models to understand these particle events.

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