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Magnetic holes and associated particle energetics inside CIR

Ken Tsubouchi[1*], Hironori Shimazu[1]

[1]NICT

The particle energy in interplanetary space is distributed in a vast range, from tens of eV in a solar wind thermal component up to 10^20 eV ultra-high-energy cosmic rays. Supra-thermal particles are in the range of hundreds of keV - MeV, which fill the gap between the thermal solar wind plasmas and power-law distributed cosmic ray particles. They are the most energetic component in the heliosphere-origin, as well as giving us an observational opportunity to verify the mechanism of particle injection process into the shock acceleration cycle. The corotating interaction regions (CIRs) is one major candidate site for producing such energetic particles, where a shock pair (forward and reverse shock) is formed at its boundaries during the propagation. The CIRs are the consequence of the interaction between fast and slow solar wind. In our previous study, we have investigated the interaction process between the reverse shock and a large-amplitude Alfvenic field fluctuation embedded in the fast solar wind. This process results in the formation of magnetic hole (MH) structures inside the CIRs. The reduction of the field intensity within the MH can be expected to compensate for the additional energy to particles. In the present study, we will verify the particle energetics inside the CIR, where the MH is simultaneously formed, via numerical simulations using one- and two-dimensional hybrid codes. Main attention is paid to the difference of acceleration/heating properties, for the lower and higher energy component, with and without the presence of the MH, through the forward and reverse shock.