Increase in relativistic electron flux density during an complex interplanetary structure on 09 February 2014

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The particles trapped in the Earth's magnetic field perform three typical movements: gyromotion around the magnetic field line, bouncing along the magnetic field line and drifting across the magnetic field lines. Each movement has a characteristic time and constant of motion called the adiabatic invariant. The solar wind perturbations can interact with the Earth's magnetosphere and generate waves that have frequencies resonant with the characteristic frequencies of the adiabatic motion. With frequencies in the same range as those of the particle drift, ultra-low frequency (ULF) waves are known to cause significant changes in the energetic particle flux in the outer radiation belts. On 09 February 2014, the ACE satellite detected solar wind plasma and Interplanetary Magnetic Field (IMF) perturbations related to an Interplanetary Mass Ejection (ICME) followed by a High Speed Solar Wind Stream (HSS) event. In this work, we analyze the recovery of relativistic outer radiation belt electron flux after the interaction of a complex interplanetary structure with the Earth's magnetosphere. We are interested in the HSS period, around 18:00 UT, when the outer radiation belt electrons flux density exhibited a gradual increase only a few hours after the interplanetary structure arrived. The electron flux density data where obtained by the Relativistic Electron Proton Telescope (REPT) instrument, onboard of the Van Allen Probes. For that period, the Probes where located at MLT 15 and L 5. The north-south solar wind magnetic field is characterized by a predominantly negative Bz and Alfvénic fluctuations. The main focus here is to evaluate the role of each ULF wave frequency range, corresponding to Pc3, Pc4 and Pc5, in accelerating outer radiation belt electrons. Observations show an increase in the ULF wave power spectrum density for the electric and magnetic fields at the Van Allen Probes corresponding to an enhancement of the electron flux density with energies from 1.80 up to 3.40 MeV. This may indicate that ULF waves play a more important role on the acceleration process for this complex event.

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