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Outer radiation belt dynamics following the arrival of an interplanetary shock : What the Cluster-CIS and Double Star-HIA data can tell us

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Following the launch by NASA of the Radiation Belt Storm Probes (RBSP) twin spacecraft, now named the Van Allen Probes, the discovery of a storage ring was announced: Baker et al., Science, 2013. This transient feature was observed during September 2012, following the arrival of an interplanetary shock, was located between L=3.0 and L=3.5 and consisted of about 4 to 6 MeV electrons. During that period the Cluster spacecraft had a high-inclination orbit, with a perigee just above 2 Re. The CIS experiment onboard Cluster is sensitive to penetrating energetic electrons (E > 2 MeV), which produce background counts and thus allow to localise the boundaries of the outer and inner radiation belts (Ganushkina et al., JGR, 2011). A search was undertaken in the September 2012 CIS data for eventual signatures of the storage ring, and indeed a small increase of the instrument background was observed between L=3.0 and L=3.5. This is clearly separated from the main outer radiation belt, which presents a much stronger background due to higher fluxes of relativistic electrons. A mono-energetic ion drift band was also observed by CIS inside the storage ring, at about 5 keV for He+ and O+ ions. This result provides an independent confirmation for the storage ring. In addition, it allows also to examine Cluster and Double Star data from earlier years, covering a solar cycle, for other such signatures of a transient storage ring. It results that this 3-belt structure is seen several times, following the arrival of an interplanetary shock and if the orbital configuration is suitable.