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Time sequence of ring current ion-flux enhancements and ion injections around outer radiation belt during a major storm on 15 May, 2005

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A complete record is available in ENA data of ring current activity recorded by the NUADU instrument aboard TC-2 on 15 May, 2005 during a major magnetic storm (including a substorm that occurred in the recovery phase). Comparisons of the ion fluxes in 4-minute temporal resolution derived from ENA data in the energy ranges 50-81 keV and 81-158 keV with in situ particle fluxes measured by the LANL-SOPA instruments aboard LANL-01, LANL-02, LANL-97 and LANL-84 (a series of geosynchronous satellites that encircle the equatorial plane at $\sim$ 6.6 RE near the outer radiation belt) are presented. It is the first we found that the ring current ion flux increasing began before ion injections from magnetotail. When the convection electric field was restrained and convection flows were anti-Earthward at the very beginning of the substorm onset, ring current ion fluxes, observed and derived from ENA data globally, began enhanced in the dusk-night sector. If only the ring current ion-flux attained its maximum the diagnostic signature of the ion injection, observed by the LANL-SOPA instruments, was occurred with convection flows turned Earthward. So that the ion injections from the magnetotail can not be identified as the reason of causing ring current ion-flux enhancements, but rather the result of the ring current decaying, which challenge the traditional ion injection concept and still need further investigations.

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