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Energetic ion dynamics of the inner magnetosphere revealed in coordinated Cluster- Double Star observations

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Since early 2004, the Chinese spacecraft Tan Ce 1 (TC 1), first component of the Double Star mission DSP, is on an equatorial elliptical orbit (13.4 Re apogee), allowing the study of the dynamics of the Earth's Magnetosphere, in conjunction with the four European Cluster spacecraft (19.6 Re apogee). The Cluster and Double Star spacecraft orbits are such that the spacecraft are almost in the same meridian, allowing conjugate studies. The 4 Cluster spacecraft highly eccentric polar orbit at 4 Re perigee permits them to sample the ring current, the radiation belts and the outer plasmasphere from south to north, almost following the same magnetic field line (latitudinal profile), whereas TC1, with its very low perigee equatorial orbit, gives the plasma profile across L. Coordinated ion measurements provided by the CIS and HIA instruments onboard Cluster and TC 1 are used to analyse crossings of the plasmasphere and the ring current. Multiple narrow ion energy bands are simultaneously observed by both Cluster and TC 1. These observations reveal the large-scale character of these structures, and pose a challenge for the simulation and modeling of the inner magnetosphere populations.