2001年8月17日の磁気嵐中におけるFASTとClusterの酸素イオンの準同時観測

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Near-conjugate observations of O+ ions by Cluster and FAST during the magnetic storm of August 17, 2001

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It is well known that O+ population is enhanced in the plasma sheet and the ring current during magnetic storm times. However, the mechanism of O+ transport/filling in the ring current from the ionosphere is less known, or not well investigated. One aim of the GEMSIS (Geospace Environment Modelling System for Integrated Studies) project conducted by STELab at Nagoya University is to elucidate the mechanism of O+ filling (enrichment) in the ring current in particular during magnetic storm period. During the magnetic storm on August 17, 2001, the FAST satellite traversed at least 4 times over the dawn-side auroral oval. The ion population observed by FAST can be splitted into two regions: one region is high-latitude auroral oval where low energy component is absent, and the other is low-latitude auroral oval where the ion population is well thermalized. During the main phase of magnetic storm, the energy distribution of H+ was broad and the characteristic energy was more than 1 keV, while the energy of O+ was monochromatic (a dispersion can be seen, and the energy ranges from ˜10 keV to 1 keV with decreasing latitude) in the high-altitude auroral oval. Owing to the low-altitude orbit, we can investigate the time evolution of ring current, i.e. wedge-like distribution of O+ during this magnetic storm. The number flux of O+ appears to increase gradually as the storm developed. By the end of magnetic storm main phase, multi(-dispersed) bands of O+ can be seen to be merged to the inner region. On the other hand, the Cluster satellites traversed near in the neutral sheet on the dawn side. In this observation, we saw temporal distributions of monoenergetic (i.e., a several keV and ˜700 eV) O+ band. The pitch angle distribution of O+ band is bi-directional, indicating that O+ ions are on closed field lines and bouncing between Northern and Southern hemispheres. Characteristics of the H+ and O+ distributions are similar to those observed by FAST in the high-latitude portion of the auroral oval. We infer that FAST and Cluster were located near the conjugate point. We study this near-conjugated event in terms of E (energy)-f (phase density) distributions to investigate that how newly accelerated and escaping O+ from the polar ionosphere is transported toward the ring current as losing its energy and with pitch angle being scattered.