R006-P28 会場: Poster 時間: 11月3日

リングカレント領域へのイオン供給過程におけるプロトンと酸素イオンの違いについて

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Deeper and earlier penetrations of oxygen ions than protons into the inner magnetosphere observed by Van Allen probes.

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It is observationally known that proton and oxygen ions are main components of the ring current during magnetic storms and that the proton and oxygen ions are considered to have different source and supply mechanisms. However, detailed properties of the ion supply and their dependence on ion species is far from well understood. To characterize the ion supply to the ring current during magnetic storms, we report studies of the properties of energetic proton and oxygen ion phase space densities (PSDs) during the April 23-25, 2013, geomagnetic storm observed by the Van Allen Probes mission. We used energetic ion (˜50 - ˜600keV protons, ˜140 - ˜1100keV oxygen) and magnetic field data obtained by the RBSPICE and EMFISIS, respectively, on the Van Allen Probes.

We calculated ion PSDs for the specific first adiabatic invariant, mu (0.3 < mu < 12 keV/nT), and ion pitch angles near 90 degrees as a function of L for each spacecraft orbit. The results show that both proton and oxygen ions penetrated directly to L<5 during the main phase of the magnetic storm. Protons with smaller mu values (mu = 0.3 and 0.5 keV/nT) penetrated earlier than those with larger mu values (mu = 1.0 keV/nT). This result appears consistent with the energy dependence of the Alfven layer. The timing of oxygen ion penetration is approximately the same for all mu values (mu = 0.8, 1.0 and 1.2 keV/nT). The observations also show that oxygen ions penetrated more deeply in L and earlier in time than protons for the same mu value (mu = 1.0keV/nT). These results suggest that the source of the transported oxygen ions is located closer to the Earth than the inner edge of protons. The results imply the importance of the contribution from subauroral oxygen ions to the storm-time ring current. We will also discuss the possibility of non-adiabatic acceleration of oxygen ions in the inner magnetosphere.