How O+ Becomes a Significant Fraction of the Storm-Time Ring Current

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During storm times, the pressure that creates the storm-time ring current in the inner magnetosphere can be predominantly O+. This is surprising, as the immediate source for the ring current is the nightside plasma sheet, and O+ is usually not the dominant species in the plasma sheet. In this talk we use Van Allen Probes and Cluster data to examine the processes that lead to this heavy ion dominance. The factors that contribute include the different transport paths of O+ and H+ from the cusp region, which brings more energetic O+ than H+ into the near earth plasma sheet, the source spectrum in the near-earth plasma sheet, which tends to be harder for O+ than for H+, and the time dependence of the O+ in the plasma sheet. The plasma sheet O+ tends to be high towards the beginning of the storm, when the convection is largest, bringing it into the inner magnetosphere. All of these processes play a role, and which is most important is a topic which can be addressed by the multi-spacecraft combination of Van Allen Probes and ARASE.