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New Insight into the Inner Magnetosphere Plasma Regimes with the van Allen Probes (RBSP)

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The recent successful launch of the twin van Allen spacecraft (formerly known as RBSP) provides a new and unprecedented window into the structure and dynamics of inner magnetospheric plasma content and dynamics. The equatorially orbiting van Allen spacecraft are returning clean high resolution, very low background ion composition and electron plasma data throughout the radiation belt and ring current region inside geosynchronous orbit. Since both van Allen spacecraft are positioned in near-identical chase orbits, lapping each other continuously throughout the mission, we are able to study both spatial and temporal variability in the inner magnetosphere with unprecedented resolution on a range of time and length scales. In this paper we are presenting initial results from plasma composition measurements in the nightside of Earth's magnetosphere, focussing on plasma fractional plasma composition of H+, He+, and O+ in the plasmasphere through lower ring current energies (< 50 keV). Early results do not only indicate a remarkable spatial and temporal variability in plasma ion composition in the inner magnetosphere, they also show frequent occurrences of multiple peak energy distributions in this energy range. Multi-peaked energy distributions with several peaks occurring in ring current, plasmasphere and (less often) plasma sheet are frequently observed, with distinct differences between the three ion species. Energy spectra with 5-6 peaks for a single species have been observed repeatedly.