

Multi-scale Ion Composition and Plasma Density Irregularities: Swarm-E Observations in the Topside Ionosphere

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We present new simultaneous observations of both ion composition and plasma density variations in the topside ionosphere (325-1500 km altitude) using high sampling-resolution measurements from the Swarm-E (e-POP) ion mass spectrometer in the first 6 years of the mission (2013-2019). A statistical study of these observations reveals the frequent occurrences of multi-scale enhancements of heavy and minor ion composition in the topside auroral ionosphere during magnetic storms and substorms, as well as the corresponding occurrences of small-scale plasma density irregularities down to spatial scales of tens of meters. We compare and correlate the occurrence distributions and morphological characteristics between the two (composition enhancement and irregularities), and discuss the implications of the observed distributions on ionosphere-magnetosphere coupling.

Keywords: ionosphere, ion composition, plasma density irregularities