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Evolution of ion beams in the low-altitude plasma sheet boundary layer

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From single spacecraft measurement, it appears that Velocity Dispersed Ion Structures (VDIS) are commonly measured at the poleward border of the ion auroral zone and reflect mechanisms acting in the magnetotail. From multipoint Cluster observations, we present a study of spatial and temporal characteristics of ion energy dispersed structures, VDIS, measured in the energy range $\sim$1 to 30 keV in the low-altitude plasma sheet boundary (4-7 R_E). Using the time delays registered onboard three CLUSTER satellites, the lifetime of VDIS is determined. It can reach several tens of minutes. The beam substructures constituting VDIS evolve in shape and size with shorter characteristic time-scale, in the range of tens to hundreds of seconds. Based on these new observations, mechanisms for the formation of ion substructures with direct (increasing with latitude) and inverse (decreasing with latitude) energy dispersions are discussed.