



Characteristics of plasmaspheric hiss

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The plasmaspheric hiss is regularly observed in the inner magnetosphere, particularly in the plasmasphere and in the related high-density regions such as in the plumes. Even the phenomenon is well known for long time, the generation mechanism of hiss has remained open. Neither its characteristics are well known. The hiss is important because it is believed to cause loss of radiation belt particles. We have investigated the hiss emission during the Cluster perigee passes and found enhanced emission to occur both in the plasmaspheric plumes and in the plasmasphere. However, their wave characteristics differ significantly. Due to the polar orbits of the four Cluster spacecraft, each spacecraft provides two snapshots of hiss, separated by a few hours, on the two opposing hemispheres, so differences in wave characteristics between two hemispheres can be discerned. Furthermore the four spacecraft follow each other within an hour, so the temporal variation of hiss over the same hemisphere can be observed as well. Occasionally the spacecraft are simultaneously located in the same flux tube in the both hemispheres. Most of the time hiss does not vary much within an hour (except for some spatial variations) even if the geomagnetic conditions vary. However, hemispheric differences are significant: all observations in the plumes show that the wave vector is parallel with the local magnetic field vector and the waves propagate away from the equatorial region of the plumes. In the plasmasphere at lower L shells the hiss is observed as well but here over both hemispheres the waves propagate towards the equator and the wave vector has a larger angle with the magnetic field. We conclude that the equatorial plume region is a source region of plasmaspheric hiss and the waves propagate towards the polar regions where they are refracted and reflected towards lower L shells and into the plasmasphere.