

The first experimental confirmation of the existence of a near-equatorial resonator for ion-ion hybrid modes in the magnetosphere

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We show the existence of a near-equatorial resonator for IIH (ion-ion hybrid) modes on the example of Pc1 event observed by Van Allen Probe A on July 14, 2014. Pc1 pearl pulsations with frequencies from 0.9 to 1.3 Hz were registered. The pulsations' frequency was just above the helium gyrofrequency. The waves were located near the outer edge of the plasmapause at the morning sector of the magnetosphere. We found the significant densities of helium and oxygen ions during the event. The helium/proton mass density ratio was about 1, and oxygen/proton mass density ratio was up to 10.

In our previous papers, we considered one of the hypotheses for the formation of the pearl structure. It is the presence of a near-equatorial resonator for ion-ion hybrid modes. According to the hypothesis, because of admixture of heavy ions (helium or oxygen) in the magnetosphere plasma, the resonator at the top of magnetic field line can be formed. We obtained that the calculated eigenfrequencies of the near-equatorial resonator correspond to the observed frequencies. We consider the observed pearl structure of the waves as a result of a superposition of several harmonics with slightly different frequencies inside the resonator.

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