# EXPERIMENTAL CONFIRMATION OF THE EXISTENCE OF A NEAR-EQUATORIAL RESONATOR FOR MAGNETOSPHERIC ION-ION HYBRID MODES

**Olga Mikhailova, Pavel Mager**

*Institute of Solar-Terrestrial Physics SB RAS, Irkutsk, Russia,*
o_mikhailova@iszf.irk.ru

Ultra-low frequency waves or geomagnetic pulsations are regularly observed in the Earth's magnetosphere. The highest frequency among them are the Pc1 pulsations (0.2–5 Hz). A specific shape of beats characterizes Pc1 pulsations, for which they are called "pearls". Some of them are called ion-ion hybrid modes. The process of forming a "pearl" structure is not well understood. In addition, none of the existing models allowed us to answer the question about the frequency of oscillations before.

In our previous works [Klimushkin et al., 2010; Mikhailova et al., 2020], we considered one of the hypotheses explaining the formation of the pearl structure of Pc1 ion-ion hybrid waves. The hypothesis is that in the case of an admixture of heavy ions (helium or oxygen) in the magnetosphere plasma, a resonator for ion-ion hybrid waves can form at the equatorial part of the magnetic field line. The eigenfrequencies of the resonator determine the frequency of an excited wave. Since the frequency spectrum in the resonator is dense, there is a beat. To test this hypothesis, we selected a Pc1 range event, which was observed on July 14, 2014 by the Van Allen Probe A.

The Pc1 wave frequency changed from 1.3 to 0.9 Hz and was just above the gyrofrequency of helium ions. During the event, high densities of helium and oxygen ions were observed. The ratio of helium mass density to proton mass density was approximately 1 and the ratio of oxygen mass density to proton mass density exceeded 10.

We have found that the calculated eigenfrequencies of the near-equatorial resonator correspond to the frequency of the observed wave. We consider the observed wave structure as a result of the superposition of several harmonics with slightly different frequencies inside the resonator. This observation confirms the existence of a near-equatorial resonator for ion-ion hybrid modes.

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## REFERENCES

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