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Spatial localization and azimuthal wave numbers of Alfven waves generated by drift-bounce resonance in the magnetosphere

P.N. Mager and D.Yu. Klimushkin

Institute of Solar-Terrestrial Physics, Irkutsk, Russia (p.mager@iszf.irk.ru)

There are two factors that cause the localization of Alfvén wave generated by energetic particles across magnetic shells. First, the instability growth rate is proportional to the distribution function of the energetic particles, hence waves must be predominantly generated on magnetic shells where the particles are. Second, the frequency of the generated poloidal wave must coincide with the poloidal eigenfrequency, which is a function of the radial coordinate. Combined impact of these two factors also determine the azimuthal wave number of the generated oscillations. The beams with energies about $10\,keV$ and $150\,keV$ are considered. As a result, the waves are strongly localized across magnetic shells; for the most often observed second longitudinal harmonic of poloidal Alfvén wave ($N = 2$), the localization region is about one Earth's radius across magnetic shells. It is shown that the drift-bounce resonance condition does not select m value for this harmonic. For $10\,keV$ particles (most often involved for the explanation of poloidal pulsations), the azimuthal wave number was shown to be determined with rather low accuracy, $-100 < m < 0$. $150\,keV$ particles provide for little better but still poor determination of this value, $-90 < m < -70$. For the fundamental harmonic ($N = 1$), the azimuthal wave number is determined with better accuracy, but either these numbers are too small (if the waves are generated by $150\,keV$ particles), or the waves are generated on too distant magnetic shells (in $10\,keV$ case). The calculated values of γ/ω are not enough to overcome the damping on the ionosphere. All these have cast some suspicion on the possibility of drift-bounce instability to generate poloidal pulsations in the magnetosphere.