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STATE OF MAGNETOSPHERE AND MICROPULSATION CLASSIFICATION*

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Geomagnetic pulsations are usually classified into pc1−pc5 and pi1−pi2 according to the wave form and the period range. In this paper authors' attempt is to purpose a new classification with reference to the state of magnetosphere and the mechanism of excitation.

Up to the present a variety of mechanisms are possible for the generation of pulsations. They include the following:

1. Magnetosphere oscillation theory

HM oscillations in the magnetosphere consist of toroidal and poloidal types. Transverse oscillations of geomagnetic field lines at particular locations within the magnetosphere are usually recognized to be the generation mechanism of longer period pulsations. The resonance of the magnetosphere is denoted by the symbol "R" in this paper.

2. Excitation sources of the micropulsation

(1) The Kelvin-Helmholtz instability of the plasma near day-side magnetopause produces HM surface wave denoted by "Sf".

(2) HM waves in the magnetosheth are transmittible directly into the day-side magnetosphere, and generates resonance in the apropriate magnetospheric region, symbolized by "T_r".

(3) The expansion and compression of the magnetosphere associated with the solar wind, indicated by "Cp".

(4) Tail dynamics process during substorms, by "Ta".

(5) Cyclotron instability, by "Cy"; Drift instability, by "Dr".

(6) Variations of ionspheric conductivities, by "I".

All excitation mechanisms of HM waves are closely associated with the distribution and the change of the plasma in the magnetosphere, apart from solar wind and IMF. Accordingly, it is appropriate that the magnetosphere is divided into 5 regions.

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* English Detailed Abstract

(1) M region (day-side) is placed between magnetopause and plasmapause, about 4~10 Re. This is a collisionless cold plasma region. Alfven velocity, $V_A = B_0(\mu_0\rho)^{-1/2}$, has maximum at the plasmapause. In the cavity formed by this region longer period pulsations may be excited. At both boundaries of the region excited surface waves are wave sources.

(2) P region is placed between plasmapause and 2000 km above the earth's surface. Alfven velocity has another maximum around 2000 km. This region includes the earth's radiation belt. Here there is higher density and energy flux of the plasma. In this region frequent wave particle interactions favour shorter period pulsation excitation.

(3) The Ionosphere (I) is lower region than 2000 km. Abrupt variations of conductivity in the ionosphere arisen from solar EM emission and FAC would excite MHD wave (Cd).

(4) T region is the magnetospheric tail region. There are plasma sheet, neutral sheet, more currents and electric field. Physical processes in it are very much complicated; during substorms irregular pulsations and long period regular pulsations are frequent.

(5) C region (cusp) is the region, where solar wind particles can directly penetrate into the ionosphere. In the region boundaries, high frequency waves with broad band noise may be produced by Kelvin-Helmholtz instability.

According to the above-mentioned 5 regions with different magnetospheric states, together with different excitation sources, the purposed scheme may be shown in the following table.

State of magnetosphere	Excitation mechanism	Period range (sec)	Berkeley 1963
M	Sf-R Tr-R Cp-R	10—600 10—600 10—600	pc 3—pc 5 pc 3—pc 5 pc 3—pc 5
P	Cy Dr	0.2—10 10—600	pc 1—pc 2 pc 3—pc 5
I	Cd	5—150	pi 1—pi 2
T	Ta-R	0.2—10 150—600	pc 1—pc 2, pi 1—pi 2, pc 5
C	Sf	0.2—5	pc 1, pi 1