A Study of the Characteristics of ULF Waves Observed at the Geomagnetic Conjugate Stations

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To clarify the effects of ionospheric conditions on ground signature of Pc 3-5 waves, we examined the geomagnetic data recorded at ground-based geomagnetic conjugate pair stations, Kotzebue (KOT) in Alaska and Macquarie island (MCQ) in Australia. As a result, we have found the following north-south asymmetries in the power ratio of the Pc 3-5 waves.

1. In the summer hemisphere, the power of the Pc 3-5 wave becomes weak compared with that in the winter hemisphere. That is, there exists a shielding effect.
2. The 'shielding effect' looks more effective in higher frequency band.
3. The lower frequency band (Pc 4, 5) components have a general tendency that the wave power at KOT is larger than simultaneously observed wave power at MCQ.

To clarify the effects of ionospheric conditions (e.g. Pedersen and Hall conductivity) on ground signature of Pc 3-5 waves, we examined the north-south asymmetry of the Pc 3-5 wave powers recorded at ground-based geomagnetic conjugate pair stations during the interval of November 11, 1993 -September 29 1994. The stations are located at Kotzebue (KOT) in Alaska and at Macquarie island (MCQ) in Australia (L=5.4), in the Circum-pan Pacific Magnetometer Network (CPMN).

In order to concretely investigate the ionospheric effects, we pay attention to the standing field line oscillations. The event selection criterion is that the coherence between the magnetic field H component data at KOT and MCQ is more than 0.7. Power spectrums of thus selected events are calculated by the FFT (fast Fourier transform) method, and the power ratios between the northern and the southern hemispheres are calculated statistically.

As a result, we have found the following north-south asymmetries in the power ratio of the Pc 3-5 waves.

1. In the summer hemisphere, the power of the Pc 3-5 wave becomes weak compared with that in the winter hemisphere. That is, there exists a shielding effect.
2. The higher frequency band (Pc 3) component shows a symmetric seasonal variation.
3. The middle frequency band (Pc 4) component shows a seasonal variation weaker than the Pc 3 component. In addition, it is a general tendency that the wave power at KOT is larger than simultaneously observed wave power at MCQ.
4. The lower frequency band (Pc 5) component doesn't show a seasonal variation. In addition, it is a general tendency that the wave power at KOT is larger than simultaneously observed wave power at MCQ.

The 'shielding effect' especially for Pc 3 in the summer hemisphere can be interpreted in terms of the effect of the divergent Hall current in the inductive ionosphere. And larger Pc 5 power at KOT than at MCQ may be interpreted by the north-south asymmetry of the incident wave field, which caused by the asymmetry of ambient magnetic field intensity at the stations.