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# Universal time control of terrestrial auroral kilometric radiation

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#### Abstract

Auroral kilometric radiation (AKR) is emitted from accelerated electrons along the auroral field line. We examine the long-term data for AKR emissions and reveal that the continuous AKR emission frequency changes with universal time as the Earth rotates, indicating that the Earth is a spin-modulated variable radio source. The observed UT variations of AKR frequency means that the acceleration altitude changes periodically with planetary rotation. The results of this study provide insight into the physics of planetary magnetosphere-ionopshere coupling process.

### **1. Introduction**

Nonthermal radio emissions from the polar magnetospheres of the magnetizeid planets into space are universal processes [1]. Auroral kilometric radiation (AKR) from the terrestrial polar region has been observed for a few decades. The frequency spectra of planetary radio waves provide information on the structure and dynamics of radio source regions as well as particle acceleration regions [2]. Spectral studies have shown that planetary particle acceleration regions are commonly located at altitudes of 1-2 planetary radii long auroral field lines, suggesting that there exists as a scaling law in regard to both their generation mechanism and spatial distribution of the planetary auroral acceleration in the M-I coupling regions.

### 2. Results

Figure 1 shows the seasonal variations of AKR spectra obtained from the Geotail satellite. AKR exhibits periodic frequency variation with sinusoidal from synchronized to the Earth's rotation. During the northern winter season, the maximum and minimum center frequencies appear around 05 and 17 UT. On

the other hand, significant phase shifts are found during the northern summer season. The results suggest that the polarity of geomagnetic field inclination with respect to the Sun-Earth direction is essential to determine the form of frequency variations.



Figure 1: Seasonal variation of AKR spectra [4].

## 3. Summary

The present study showed that AKR changes its emission frequency with universal time and suggested that the diurnal wobble of the tilted geomagnetic field in the solar wind flow alters the M-I coupling state in the polar magnetosphere. Magnetized planets; Jupiter, Saturn, Uranus, and Neptune as well as extrasolar planets would be expected to have the same UT variation.

## References

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