

PEM028-P07

Room:Convention Hall

Time:May 27 10:30-13:00

Difference between average AKR spectra on dayside and nightside of the moon observed by the KAGUYA spacecraft

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The KAGUYA spacecraft continuously observed natural plasma waves from a lunar orbit during the mission. One of the strongest waves among them is auroral kilometric radiation (AKR) propagating from the earth. In the present study, in order to derive an average AKR spectrum on the lunar orbit, we statistically constructed two-dimensional histograms of the spectrograms, which were obtained by the waveform capture instrument (WFC) onboard the KAGUYA spacecraft, relative to frequency and power. The average AKR spectrum can be derived by contrasting the histograms which are constructed for the farside and near-side of the moon, respectively.

Comparing the average AKR spectra on dayside and nightside of the moon, we found a difference between them. That is, the wave strength below 250 kHz on the dayside is relatively larger than that on the nightside. This result can be explained by (i) localtime difference of the AKR source on the earth or (ii) frequency dependence of reflection condition of the AKR near the lunar surface.

In the case (ii), the difference of the average AKR spectra can be explained by total reflection of the lower frequency waves due to a plasma layer between observation altitude and the lunar surface. The reflection condition is that peak plasma density on the layer is 800 /cc on the assumption of vertical AKR incidence. In case of oblique incidences, the required density becomes smaller.

In the presentation, we would like to discuss possible explanations for the difference between the average AKR spectra.

Keywords: KAGUYA spacecraft, wave observation, auroral kilometric radiation