# サブオーロラ帯緯度における PWING の複数地上観測点を用いた磁気圏 ELF/VLF 波動の経度広がりに関する研究

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# Study of longitudinal extent of magnetospheric ELF/VLF waves using multipoint PWING ground stations at subauroral latitudes

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ELF/VLF waves are generated by electron temperature anisotropy in the equatorial plane of the magnetosphere, and propagate to the ground along geomagnetic field lines. The waves interact with electrons which drift longitudinally in the inner magnetosphere, and help to accelerate them to relativistic energies. However the instantaneous longitudinal distribution of these waves has not been well understood. In this study, we investigated the longitudinal extent of magnetospheric ELF/VLF waves by using simultaneous observations at six stations at subauroral latitudes at Athabasca (ATH; 54.7N, 246.4E, MLAT: 61.3N), and Kapuskasing (KAP; 49.4N, 277.8E, MLAT: 58.7N) in Canada, Gakona (GAK; 62.4N, 214.8E, MLAT: 63.6N) in Alaska, Maimaga (MAM: 63.1N, 129.6E, MLAT: 58.0N), and Istok (IST:70.0N, 88.0E, MLAT: 66.1N) in Russia, and Kannuslehto (KAN: 67.7N, 26.3E, MLAT: 64.5N) in Finland. These stations are located encircling the earth at ˜60 MLAT. We conducted simultaneous observation of ELF/VLF waves from Nov. 1, 2017 to Dec. 31, 2017 (a total of 61 days) with a sampling rate of 40 kHz (78.125 kHz at KAN). We counted appearance of magnetospheric ELF/VLF waves every 10 minutes in the wave spectra at 0-10 kHz. The occurrence rates of ELF/VLF waves were KAN (32.4%), MAM (24.3%), IST (23.8%), GAK (18.5%), ATH (15.3%) and KAP (9.7%), showing longitudinal variations though they are located at same subauroral latitudes. We suggest that this longitudinal variation was possibly caused by longitudinal difference of geomagnetic field strength at the ionospheric altitudes where the high-energy electrons that are the energy source of these waves precipitate and lost in the atmosphere. The longitudinal extent of ELF/VLF waves was estimated by using these occurrence rates with an exponential decay function $\exp(- q/q_0)$, where q is the longitudes difference. The longitudinal extent $q_0$ was estimated to be 48.6 degree by fitting this function to the observed occurrence rates. We also divided the occurrence rate to those at geomagnetically active time (SYM-H<=-7.8 nT) and quiet time (SYM-H>-7.8 nT) with equal number of observations, and found that the longitudinal extents become 36.1 degree and 56.6 degree during active and quiet times, respectively.