Polarization of Pc1/EMIC waves and related aurora observed at Athabasca

Reiko Nomura[1*], Kazuo Shiokawa[1], Kaori Sakaguchi[1], Yuichi Otsuka[1], Martin Connors[2]

[1]Solar-Terrestrial Environment Laboratory, [2]Centre for Science, Athabasca University

Electromagnetic ion cyclotron (EMIC) waves excited at equatorial region of the magnetosphere propagate along the magnetic field line to the ionosphere and are observed as Pc1 geomagnetic pulsations with frequencies 0.2-5 Hz at high latitudes. In this study, we investigated relations between the spectral/polarization parameters of Pc1 pulsations observed by a 64-Hz sampling induction magnetometer and the position of isolated auroral arc observed by an all-sky camera at Athabasca (ATH, 54.7N, 246.7E, magnetic latitude: 61.7N), for the 11 events of one-to-one correspondence of Pc1 and isolated arcs reported by Sakaguchi et al. [2008].
We found that the polarization parameters vary depending on the size of the isolated aurora and the distance from ATH to the aurora. For the major axis direction, we categorized these events into 4 types, the major axis directed toward the isolated aurora (4 events), the major axis was ~90 deg from the direction toward the aurora (3 events), the aurora was just above ATH and the major axis direction became unstable (2 events), and the several isolated auroras appeared and the major axis direction became unstable (2 events). For the sense of polarization, we also categorized these events into 4 types, L mode only (3 events), R mode only (1 event), L (R) mode was observed when the aurora came closer (further) from ATH (2 events), and mixture of L and R modes (5 events). These major axis direction and mode variations are mostly consistent with those predicted by Fujita and Tamao [1988] through model calculations. The polarization parameters of all these events vary depending on both frequency and time in complicated way. In the presentation, we also discuss the frequency dependence in relation with the size and the distance of isolated aurora based on image processing of the all-sky camera data.