Characteristics of temporal variation of AKR and Pi 2 observed by ARASE and MAGDAS/CPMN: Initial results

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Auroral breakup occurs at the onset of substorm [*Akasofu*, 1964], and it represents the development of the auroral acceleration region above the auroral ionosphere. Auroral kilometric radiation (AKR) can remotely detect the development of the auroral acceleration region [e.g., *Gurnett et al.*, 1981]. Three-dimensional current system of the substorm, so called substorm current wedge (SCW) [*McPherron et al.*, 1973], is also formed at the onset of the substorm. Duskward part of the SCW corresponds to an intense upward field-aligned current (FAC) [e.g., *Samson and Rostoker*, 1983], and it is collocated with the auroral acceleration region [e.g., *Kamide and Rostoker*, 1977]. It has been widely accepted that Pi 2 occurs at the onset of substorm and each auroral breakup [*Sakurai and Saito*, 1979], and global high-correlation Pi 2 pulsation manifests the fluctuation of the FACs of the SCW [*Uozumi et al.*, 2009, 2016]. AKR and Pi 2 are recognized as elementary components of the substorm [*Morioka et al.*, 2005], and there exist many conjunctional studies between the two phenomena [e.g., *Liou et al.*, 2000; *Morioka et al.*, 2008]. Past studies presented the timing relation between the occurrence of AKR breakup and Pi 2 onsets. However, few studies investigated the relation between the temporal variation of AKR and Pi 2, except *Uozumi et al.* [2011]. In this study, we made a comparative study concerning temporal variation between AKR modulation and ground Pi 2 pulsation with data sets obtained by the High Frequency Analyzer (HFA) of the Plasma Wave Experiment (PWE) on board the Arase (ERG) satellite [*Kasahara et al.*, 2018; *Kumamoto et al.*, 2018] and the MAGDAS/CPMN equatorial ground magnetometer [*Yumoto et al.*, 2006]. We will report some initial results of the present study in our talk.

AKR events were searched for during the interval from April to October 2017, and 40 AKR events were selected. Time series data of AKR power were derived by integrating the power spectrum data of the PWE/HFA with respect to frequency of AKR (mostly 50-300kHz, but depended on each event) at every time step of 8s. It is found that the dominant period of the modulation of AKR power was distributed within the Pi 2 period range (40-150s) for 35 out of 40 events. The temporal variation of the AKR modulation was compared to the waveform of the equatorial ground Pi 2 pulsations that were observed at Huancayo in Peru. It is found that 34 out of 40 events exhibited high correlation coefficient of $|R| >= 0.70$ ($|R| >= 0.85$ for 15 out of 40 events). Those results are consistent with the results reported by *Uozumi et al.* [2011]. It implies that the modulation of AKR power is closely related to global Pi 2 oscillations. It suggests that the modulation of AKR power could be controlled by global Pi 2 pulsation through a wave-wave interaction. It also suggests that the temporal variation of the auroral acceleration could be connected to the global Pi 2 as well.