Ionospheric Aflvén resonator observed at low-latitude ground station

*能勢 正仁[1]、上嶋 誠[2]、河合 淳[3]、長谷 英彰[4]
*Masahito Nose[1], Makoto Uyeshima[2], Jun Kawai[3], Hideaki Hase[4]

1. 京都大学大学院理学研究科、2. 東京大学地震研究所、3. 金沢工業大学 先端電子技術応用研究所、4. 地熱技術開発株式会社
1. Graduate School of Science, Kyoto University, 2. Earthquake Prediction Research Center, The University of Tokyo, 3. Applied Electronics Laboratory, Kanazawa Institute of Technology, 4. Geothermal Energy Research & Development Co., Ltd.

The ionospheric Alfvén resonator (IAR) is found in dynamic power spectrum of the geomagnetic field variations as spectral resonance structures in the frequency range 0.1–10 Hz. The first observations of IAR were reported by Belyaev et al. [1989, 1990] by using induction magnetometers installed at a mid-latitude station, Gorkii (L~2.65). Since then, studies of IAR have been focused on events at mid and high latitudes. To date, observations of IAR at low latitude are only made at Crete by Bösinger et al. [2002, 2004] and not sufficient enough to reveal its general characteristics. We therefore installed an induction magnetometer at Muroto, Japan (24.40° geomagnetic latitude, −155.56° geomagnetic longitude), in December 2013 to investigate low latitude IAR in greater detail. Its dipole L value is 1.206 and smaller than that of Crete (L~1.3). Cadence of observations is 64 Hz. We analyze data from the induction magnetometer for the period from 28 December 2013 to 13 August 2016. From the statistical analysis of IAR observed at Muroto, we find that its occurrence probability is (1) dominant during nighttime with a gradual increase from the dusk sector to midnight and a broad maximum at 00–05 LT followed by a sudden decrease at the dawn sector, (2) slightly higher during May through September (in summer and fall), and (3) independent to the Kp index. We also find that (4) IAR at Muroto has frequency separation between the harmonics (Δf) of 0.1–0.5 Hz with a peak at 0.200–0.275 Hz. It has been considered that IAR is caused by Alfvén waves trapped in the ionospheric cavity bounded by the conductive E layer and a steep gradient of Alfvén velocity above the F2 layer. We calculate the resonant frequency and the Q factor of the ionospheric cavity, using analytical equations proposed by Polyakov and Rapoport [1981] with the IRI-2012 and IGRF-12 models. Results of comparison between the observations and the model calculation will be discussed.

