

木星オーロラ電波の長期変動特性 - II Long Term Variations of Jupiter's Auroral Radio Emissions - II

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It is known that Jupiter's auroral radio emission (hereafter JAR) shows long term variations with the time scale of about a decade. The variations were first considered to be initiated by the solar activities in 1960's, however, longer term analyses in 1970's showed the variations relate with the Jovicentric declination of the earth (De). So far, their plausible causalities are considered to be brought by 1) De relating to amount of reachable rays to the earth, and 2) the geocentric declination of Jupiter relating to incidence angle of the radio wave to the terrestrial ionosphere. However, considering solar cycle dependence on the terrestrial auroral radio activity (e.g. Kumamoto et al., 2003), the solar activity control may not be negligible for the long term variations. Furthermore, we have not known well long term relationship between JAR and Jupiter's substorm-like process which may be controlled by Io's volcanic activity.

In order to assess the previously proposed causalities and the other effects, we have investigated occurrence features of JAR using the radio wave data observed outside the terrestrial ionosphere; i.e., by the WIND satellite after 1995. We have derived year-scale occurrence probabilities for 0.7 - 14 MHz around Jupiter's occultation periods, where the frequency range includes both Jupiter's decameter and hectometer radio emissions (so-called DAM and HOM, respectively). As the result, the yearly-scale occurrence probabilities show almost monotonous decrease from 1995 to 2005, then gradual increase after 2005, but change to somewhat complex nature with increase and decrease after 2009. The tendency is roughly similar for DAM and HOM, and also quite roughly similar for Io-related and non-Io-related DAMs. On the other hand, the JAR variation features do not seem to correspond to individual variation of De, solar activity and solar wind, but seem to somewhat correlate with those of Iogenic gas luminosity. These results imply that multiple causalities and/or Jupiter's internal process(es) control the long term variations.

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