Long term variation of Jupiter's auroral radio emission: Occurrence characteristics observed by the WIND satellite

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It is well known that Jupiter's auroral radio emission in the decameter wave length shows a long-term occurrence variations at the time scale of 11 to 12 years. At early periods in 1960's when the long term variation was first identified, the variation had been considered to be initiated by the solar and/or solar wind activities since the long term variation seemed to inversely correlate with the solar activitiy. After 1970's, precise correlation analyses show that the variation correlates with the Jovicentric declination of the earth (De) rather than the solar and/or solar wind activitiies. Now, plausible causalities of the variation are considered to be geometrical effects; i.e., the De value which directly relates to amount of reachable rays to the earth from the soure regions and the geocentric declination of Jupiter which relates to incidence angle of the radio wave to the terrestrial ionosphere (i.e., the ionospheric shielding effect) (see Oya et al., 1984; Kawauchi, 2002). However, when we think the solar cycle dependence on the terrestrial radio activitiy, such as auroral kilometric radiation (see Kumamoto et al., 2003), the solar and/or solar wind control on the planetary radio emissions is not negligible for the long term variations.

The activity variation of the latest solar cycle showed the maximum around 2000-2001. It is coincidence that the De variation showed the maximum also around 2001. This suggests that it is quite good oppotunity to assess causalities of the long term variations. That is to say, if the solar and/or solar wind activity largely affects the occurrence, the occurrence probability would decrease, on the other hand if the De value mainly controls the occurrence, the occurrence probability would increase around 2000-2001.

In order to confirm the process of the long term variation, we have investigated occurrence probabilties of Jupiter's auroral radio emissions based on the 12-year data observed by the WIND satellite.The reason why we have adopted the satellite data for this study is to avoid the terrestrial radio shieldling effect for the occurrence probability and examine the effects only originated from the solar and/or solar wind, and De variations. The WIND satellite has a highly sensitive radio observation instrument named WAVES whose frequency range is from DC to about 14MHz. We have mainly analized the high frequency range above 1MHz and derived occurrence probability around Jupiter's occultation period. The result is quite controversial; i.e., the yearly occurrence probabilities show almost monotonous decrease from 1995 to 2006. In the presentation, we will introduce the WIND data analysis and the results precisely, and discuss causalities of the unexpected occurrence probability by using the other long term Jupiter observation data.