Variation characteristics of Jupiter's hectometric radiation during the Jupiter observation campaign in Jan., 2014

H. Misawa[1], F. Tsuchiya[1], T. Kimura[2] and A. Kumamoto[3]

1) PPARC, Tohoku Univ., Sendai, Japan, 2) ISAS/JAXA, 3) Grad. School Sci., Tohoku Univ.

E-mail: misawa@pparc.gp.tohoku.ac.jp

ABSTRACT: In the last winter around Jupiter's opposition to the earth, an intensive remote observations for Jupiter had been held by using the HISAKI(SPRINT-A) satellite and the other many optical and radio wave instruments. This observation campaign gave an important opportunity for the investigation of drivers of Jupiter's magnetospheric activities. We have analyzed Jupiter's hectometric radiations (HOM) by using the WIND spacecraft data for the period. HOM is known to be a counterpart of the auroral kilometric radiation (AKR) of the earth and one of indicators which reflect Jupiter's global magnetospheric activities (Louarn et al., 1998, 2014 etc.), and is implied to have some correlation with solar wind variations (Desch & Barrow, 1984 etc.). The campaign was held around the maximum of the current solar cycle and many intensive solar bursts were included in the radio data, however the preliminary analysis indicates some correlative radio intensity enhancement with that of auroral UV emissions and decrease of torus plasma luminositis detected with HISAKI/EXCEED.

Purpose of This Study

Investigation of global activity of Jupiter's magnetosphere and its driver from coordinated observations of radio wave & HISAKI (aurora/torus)

In early 2014, an intensive obs. for Jupiter had been held by using HISAKI and many optical and radio instruments. We have analyzed Jupiter's HOM data and compared them with the HISASKI data for investigating following subjects;

- How HOM varied during the campaign?
- What parameters and/or processes control the variations?
  -- So far, HOM is known to show weak solar wind control and more intense non-solar wind control, and show good relation with some inner process. HISAKI data offer information on relation among HOM activity, global magnetospheric activity suggested by aurora & heavy ions from torus, and solar wind variations.

Known variation characteristics of HOM

- Relation with solar wind variations

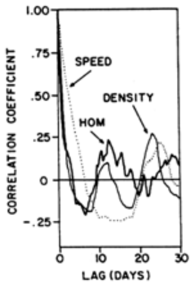


Fig. Autocorrelation coefficients vs. time-lag for HOM energy, solar wind density and velocity, observed by Voyager-2. (Desch & Barrow, 1984)

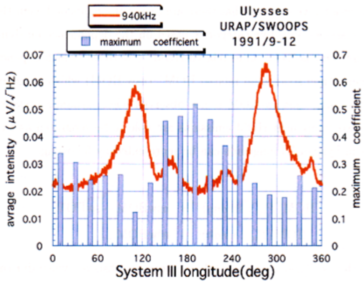


Fig. HOM occurrence dependence on CML and correlation coefficients for solar wind pressure. (Nakagawa et al., 2000)

- Non solar wind control event (substorm like event)

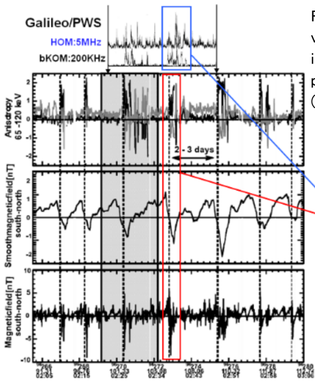
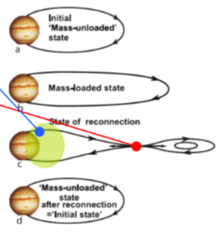


Fig. Relation between radio (HOM & bKOM) variations and "sub-storm like event" (SLE). SLE is proposed to be triggered by mass loading process of heavy plasma originated from Io. (Louarn et al., 1998 / Kronberg et al., 2005, 2007)



Radio data : WIND/WAVES

- **Data: Usage of space observation data from WIND/WAVES**

WIND: launched in Nov., 1994, orbiting around the earth or L1 point.

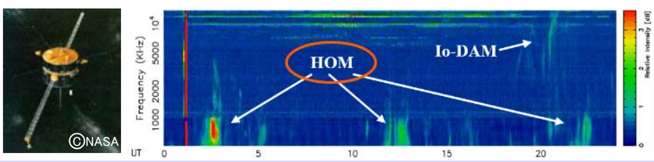
WAVES: Radio and Plasma Wave Investigation

- Radio Receiver Band 2 (RAD2)

Antennas: Ey(100m)+Ex(15m), Ez(12m)

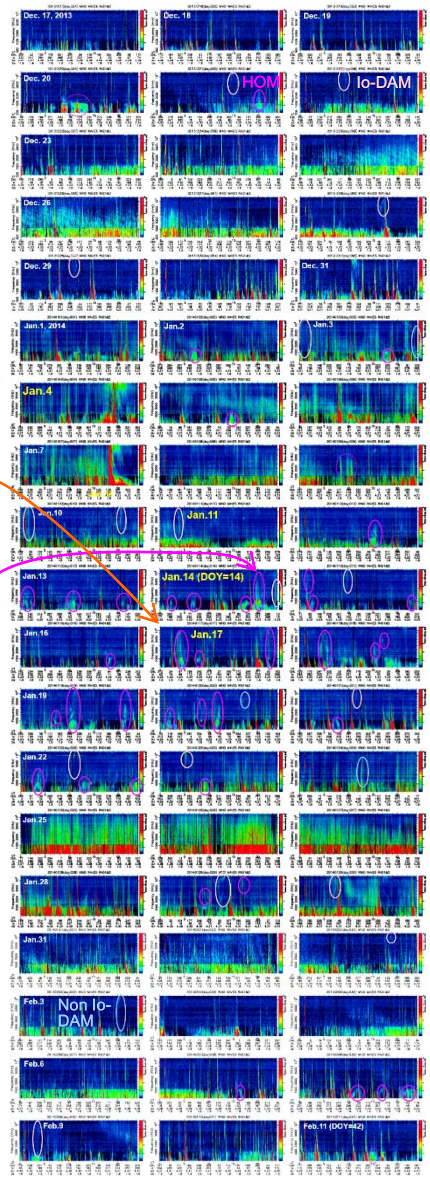
Frequency range: 1.075 – 13.825 MHz／RBW: 20 kHz ／Ch.:256

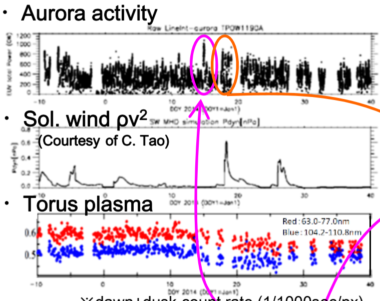
Sensitivity: 7 nV/Sqrt(Hz) (Bougeret et al.,1995)

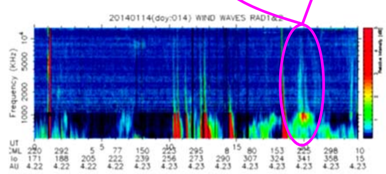


Results

- HISAKI aurora & torus data and Radio activity around the campaign period (Dec. 17, 2013 – Feb. 11, 2014)







Most intense HOM (so-called non SW comp.) in Jan., 2014

The HOM activity seems to be active for Jan. 12～23.

Summary

- Purpose: Investigation of global activity of Jupiter's magnetosphere and its driver.
- Method: Comparison between the radio data (WIND/WAVES) and HISAKI optical data.
- Results: 1. Radio activity enhanced around the middle of Jan., 2014.
  2. Most luminous aurora period corresponds to most intense HOM, however, HOM active periods did not always correspond to auroral intensity and SW pressure.
  3. HOM enhanced period corresponds to decreasing phase of torus luminosity.
  ➔ Jupiter's mag. storm is mainly brought by internal process? (∵Jan. 14 event & following HOM enhancement.), though SW press. effect is still uncertain.
  ･･･Further observations are needed for the confirmation.

Acknowledgements

The WIND/WAVES data were obtained from the NASA WIND/WAVES team page. We would like to thank M. L. Kaiser and the WIND/WAVES team for providing the data. The F10.7 and solar wind data were obtained from Geological Survey of Canada and NGDC, respectively.