Jovian H3+ auroral dynamics and Io volcanic activity obtained with IRTF and Haleakala telescopes

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Jovian aurora

Aurora is a good indicator of complicated coupling processes between solar wind, Jovian magnetosphere and atmosphere.

Which process is dominant?

Campaign for Jupiter in 2016

Hisaki/EXCEED and HST (UV aurora)

IRTF (IR aurora)

Juno (solar wind)
NASA IRTF

ISHELL: 2017
2 Ph.Ds
Uno et al., Planet. People, 2012
Kita et al., JGR, 2015
Kita et al., in revision.
Sakano et al., in prep.

CSHELL

SP: High resolution single order spectrograph

- Slit width: 0.5 arcsec
- Resolution: $\lambda/\Delta\lambda=43000$
- $H_3^+$ Q(1,0-) 3.953\(\mu\)m
- IM: CVF filter
- Wavelength: 3.43\(\mu\)m
- $H_3^+$ R(3,0), R(3,1), R(3,2), R(3,3)
- CML 130~210
Tohoku telescopes at Haleakala, Maui

- Continuous monitoring of planets
- Flexible and timely coordination with other instruments
- Unique instruments

Wide-FOV imager, Io sodium nebula (1998-)

DIPOL-2: Exoplanetary polarization (2014-)
[KIS, U.Turku]

MILAHI: Mid-infrared heterodyne spectr, Venus and Mars CO2 non-LTE emission (2015-)

Vispec: Visible echelle, Io plasma (S+) torus (2006-)

Fiber-array spectr. Venus UV cloud (2017-)

Planets 1.8m (Tohoku, UH, KIS)

Akatsuki (Venus)

MEX MAVEN ExoMars (Mars)

Hisaki HST Juno (Jupiter)
Time variation of $\text{H}_3^+$ and UV auroras

- **DOY~141**: solar wind shock
- **DOY~142**: Io volcanic activity
- **DOY~142-143**: UV and IR aurora enhancement

[Nicolas et al., 2017]
Relationship between $H_3^+$ and UV aurora

- $H_3^+$ intensity roughly corresponded to the UV auroral total power
  - Electron precipitation $\Leftrightarrow$ $H_3^+$ density

Averaged for one night in the CML range of 130-210
IR and UV auroras increased with the arrival of solar wind shock on DOY ~ 141 in 2016.

Almost simultaneously, Io volcanic event happened.

Thermospheric wind velocity seems to increase as auroral intensity increases.

How to distinguish the Io volcanic effect on aurora from the solar wind control?
The PLANETS telescope project is promoted and will be operated by the PLANETS foundation consists of Tohoku Univ., IfA/UH, KIS, Brazil, France etc.
Thank you!