

ISS-IMAPによって観測された 中性大気・電離大気結合と大気上下結合

A.Saito, Y. Hozumi (Kyoto University)

T. Sakanoi, S. Perwitasari (Tohoku University),

I. Yoshikawa (University of Tokyo), A. Yamasaki (ISAS/JAXA),

Y. Otsuka, T. Yamada (Nagoya University),

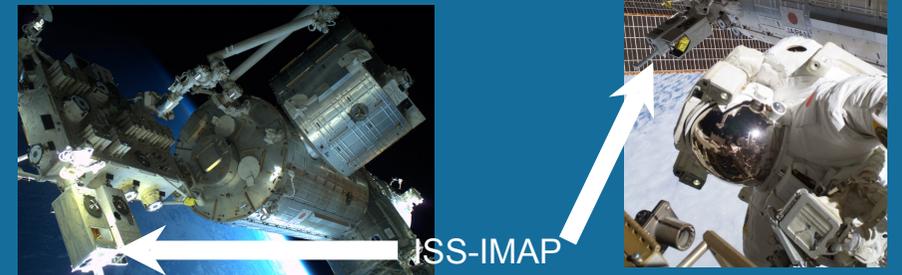
H. Nakata, A. Takahashi (Chiba University) and IMAP working group

- Outline of ISS-IMAP observation
- VISI observation of concentric wave structures

Can gravity waves from the lower atmosphere seed plasma bubble?

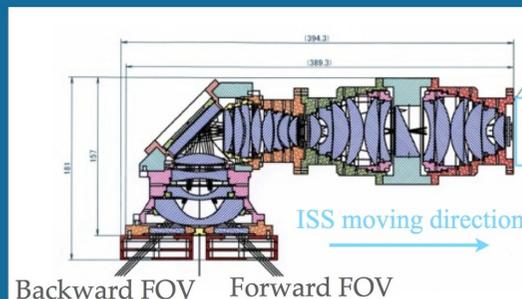
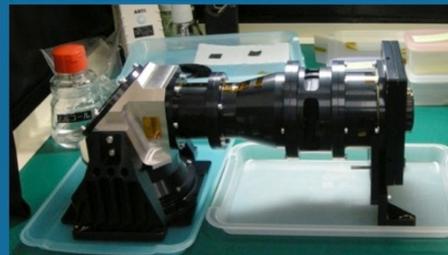
Outline of ISS-IMAP

- ISS-IMAP was installed on the exposure facility (EF) of Japanese experimental module 'Kibou' on International Space Station (ISS).
- ISS-IMAP consisted of two sets of images.
 - VISI for the observation of the airglow in the nadir direction.
 - EUVI for the observation of the resonant scattering from ions in the limb direction.
- The ISS-IMAP observation was carried out from October 15, 2012 to August 24, 2015.



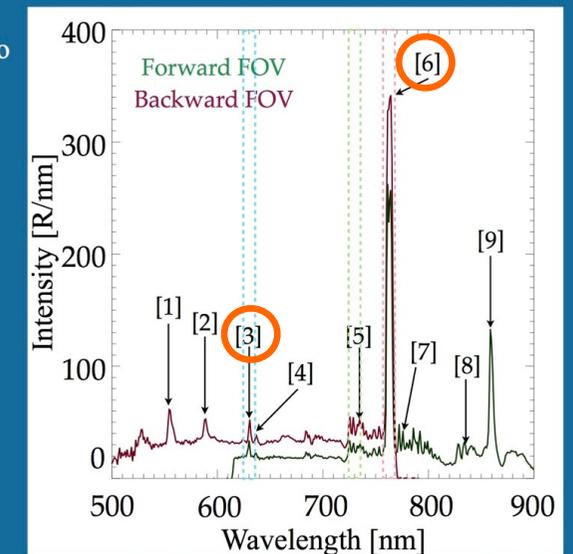
VISI: Visible-light and Infrared Spectral Imager

- Airglow
- 730nm (OH, Alt. 85km), 762nm (O₂, Alt 95km), 630nm(O, Alt.250km)
- Nadir looking with forward and backward slits perpendicular to the ISS trajectory
- Spatial Resolution: 18km (OH and O₂) and 25km(O)
- Exposure Time: 1 sec.-
- Weight 14.5kg



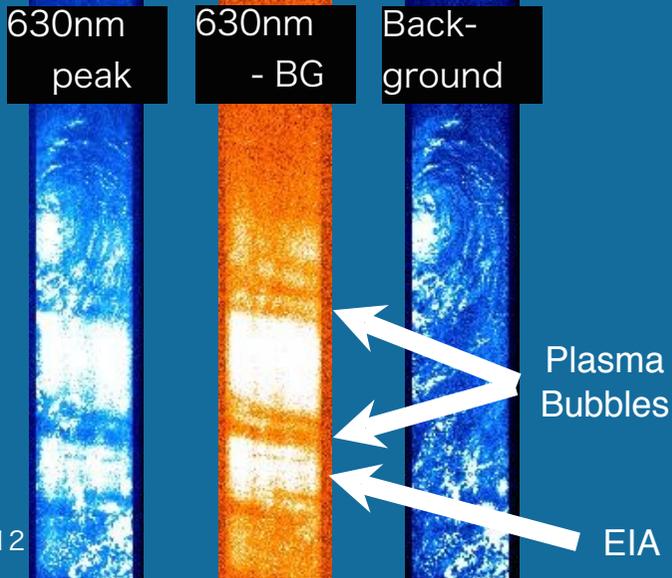
Airglow spectrum by VISI

- Averaged for 56 calibration mode data taken from August to December, 2012.
 - * [1] 557.7nm(O)
 - * [2] 589.6nm(Na)
 - * [3] 630.0nm(O)
 - * [4] 636.4nm(O)
 - * [5] 732.0nm(O⁺)
 - * [6] 761.9nm(O₂)
 - * [7] 777.4nm(O)
 - * [8] 844.6nm(O)
 - * [9] 864.5nm (O₂)



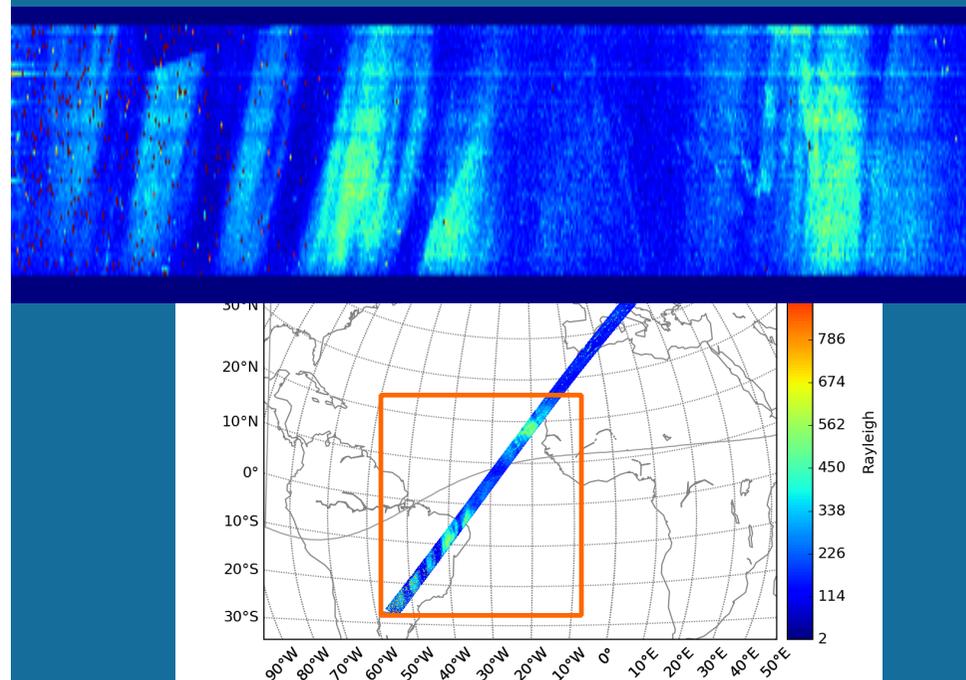
Plasma Bubble by VISI-630nm

- Background emission is subtracted from the 630nm emission
- Citylights and scattering from clouds are largely subtracted by this procedure.

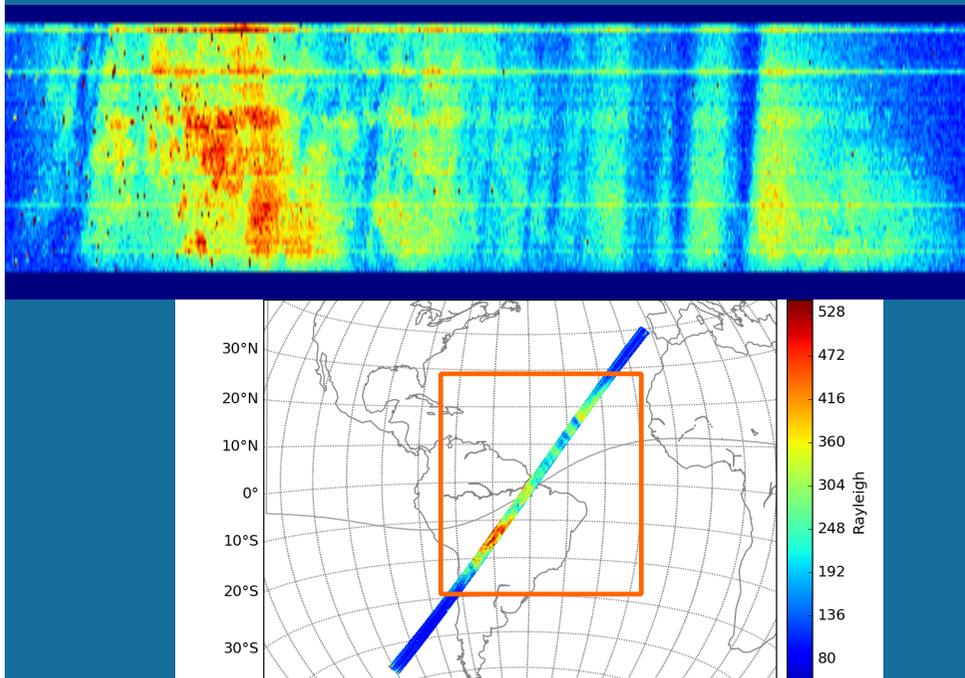


02:15UT Sept. 25, 2012

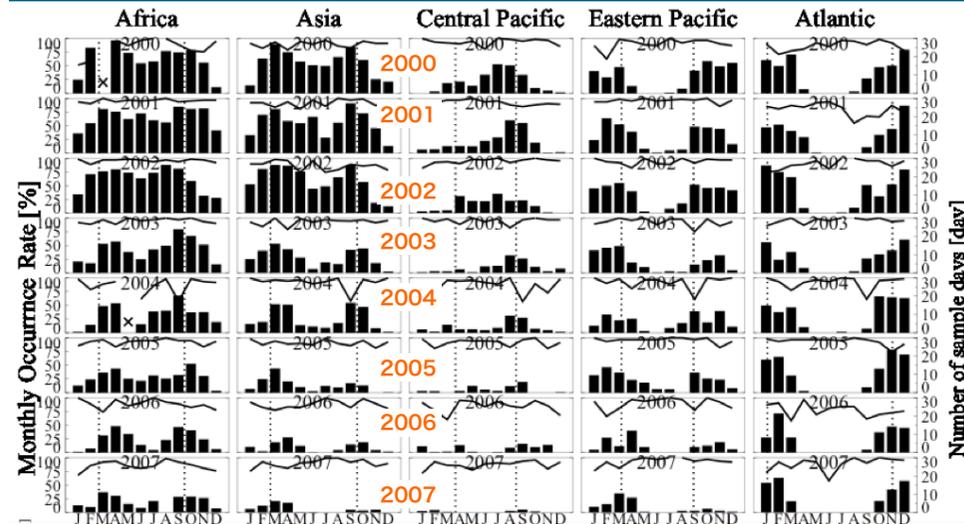
630nm airlow around 01:06 Nov. 22, 2013



630nm airlow around 03:58 March 16, 2015



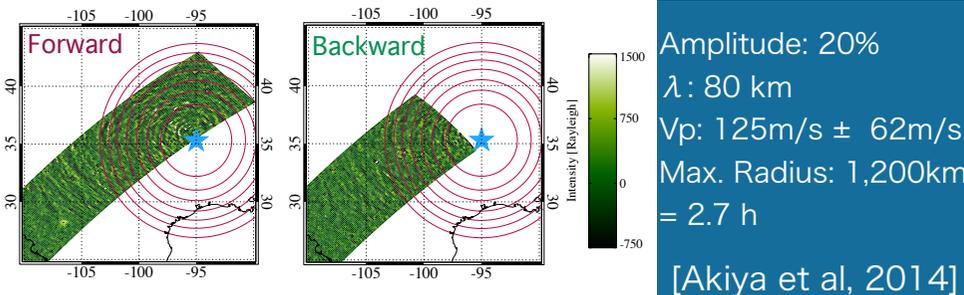
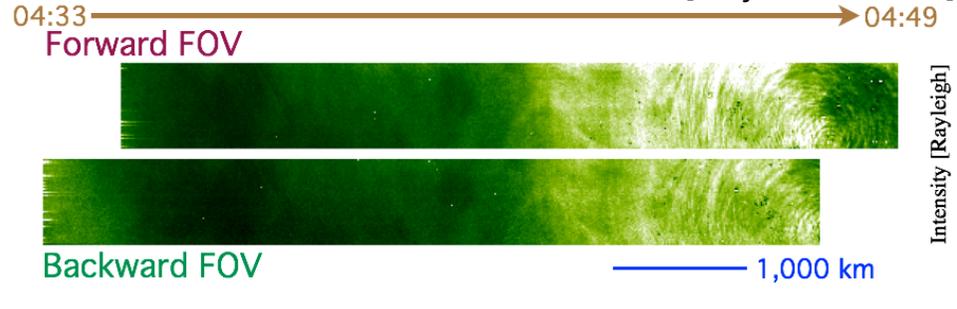
Occurrence rate of Plasma bubble measured with ground-based GPS-TEC data



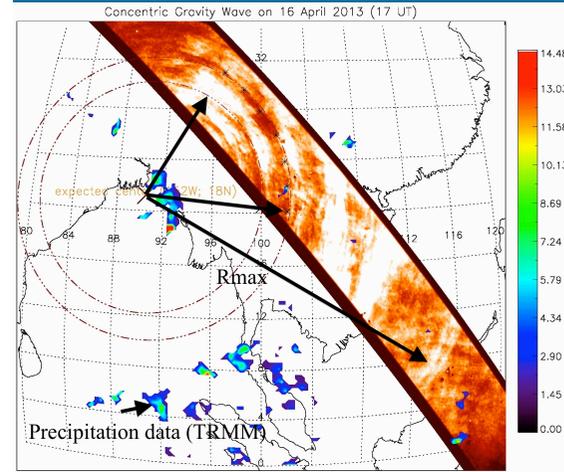
[Nishioka et al., 2008]

Concentric wave structure in 762nm on June. 1, 2013

[Akiya et al. 2014]



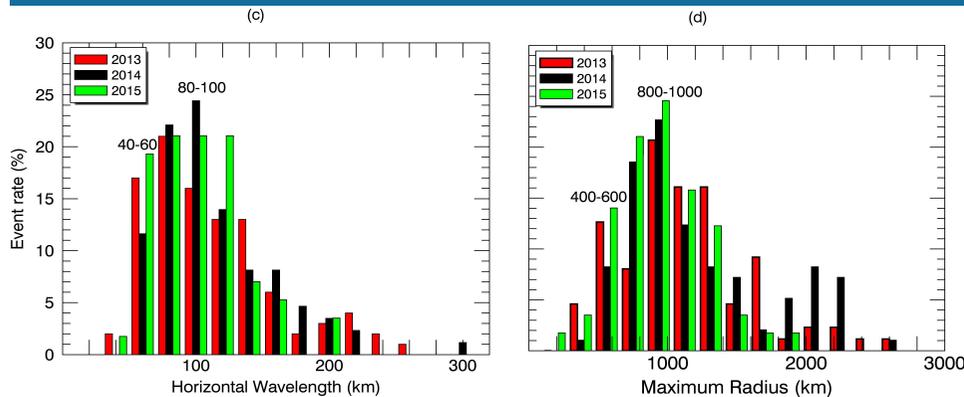
Statistical characteristics of the concentric wave structure in 762nm



- Location of the center
- Wavelength
- Maximum Radius

[S. Perwitasari et al., 2016]

Statistical characteristics of the concentric wave structure in 762nm

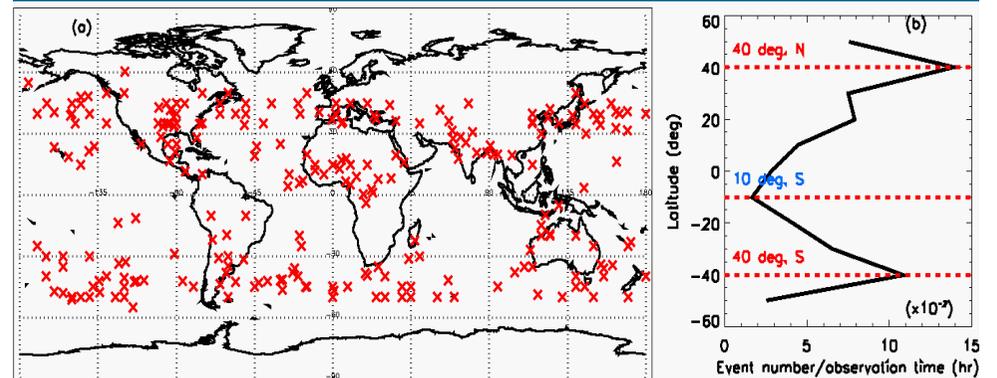


Horizontal Wavelength

Maximum Radius

[S. Perwitasari et al., 2016]

Geographical distribution of occurrence of the concentric wave structure in 762nm

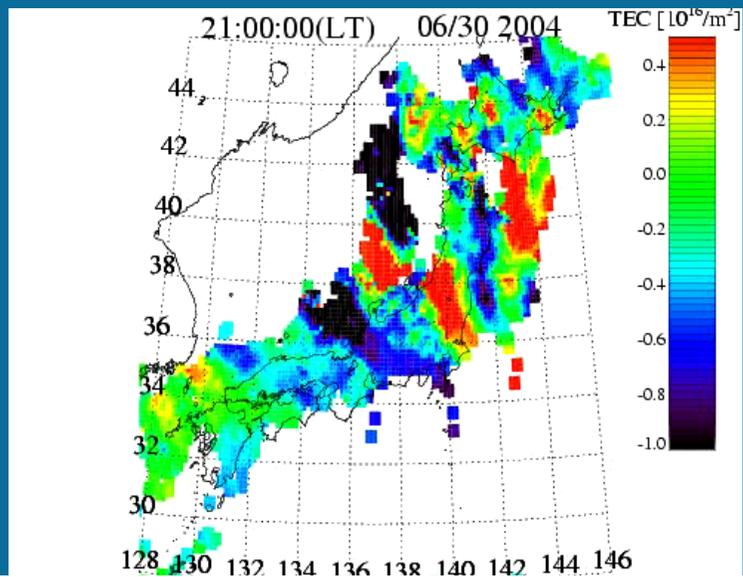


Geographical distribution of the occurrence of the concentric wave structures

Latitudinal profile of the occurrence rate (Event/hour)

[S. Perwitasari et al., 2016]

GPSによって観測された
夏の夜に日本上空でほぼ毎日見られる
プラズマの波状構造



Summary

- Concentric wave structure at 95km altitude is interpreted to be generated in the lower atmosphere and propagate upward.
- The horizontal wavelength is around 100km, (This could contain a bias by observational sensitivity.)
- The occurrence rate has maxima at ± 40 degrees in latitude, and low in the equatorial region.
- Although the role in seeding of plasma bubble is not clear, the hot spot in Africa could cause the high bubble activity in this region.