

AURORAS OF GANYMEDE



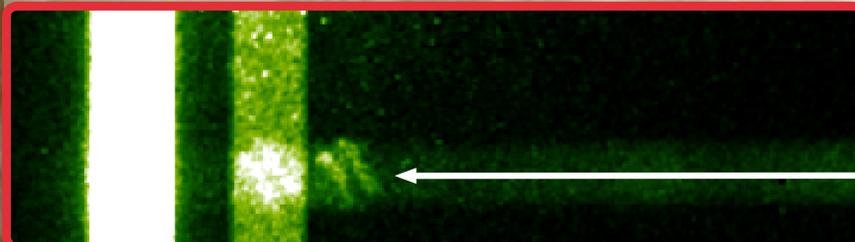
Andreea Mosila,
American Public University
PI: Dr. Melissa McGrath

ABSTRACT

The aurora of Ganymede has been studied in the past two decades for a better understanding of its magnetosphere, especially since the largest moon in the solar system is the only one featuring a magnetosphere within the magnetosphere of Jupiter.

For this purpose, we analyzed two new sets of data acquired with the Hubble Space Telescope's Space Telescope Imaging Spectrograph (STIS) instrument in 2010 and 2011. The project involved data reduction and analysis, as well as data comparison to previously analyzed four sets of data spanning over nine years of observations.

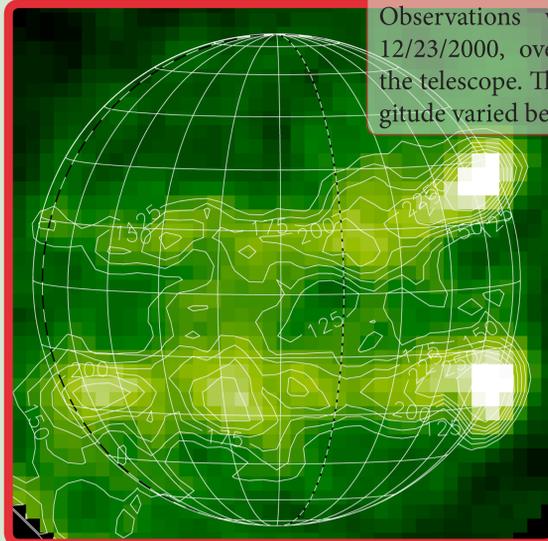
As a result, we have concluded that the old and new sets of data present similarities in regard to the location of the aurora, its brightness, and its emission patterns.



- Ganymede is the largest moon in the solar system, larger than Pluto and Mercury, and slightly smaller than Mars. It can be viewed with the naked eye from Earth.
- Ganymede is the only known satellite with a magnetosphere within a magnetosphere in the solar system, having a tenuous oxygen atmosphere generated by the sputtering of surface ice by the Jovian magnetic plasma.
- Auroras on Ganymede have a different origin than the auroras on Earth. They are generated when the surface oxygen is excited by the Jovian plasma. Auroras occur because on Ganymede the magnetosphere and the tenuous oxygen atmosphere interact.

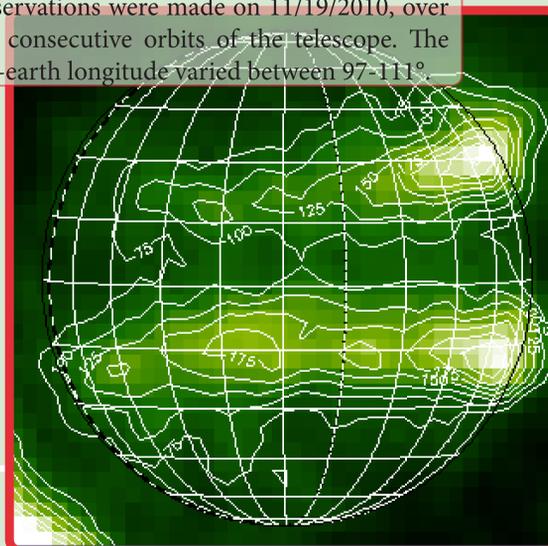
VISIT OF 2000

Observations were made on 12/23/2000, over two orbits of the telescope. The sub-earth longitude varied between 105-108°.



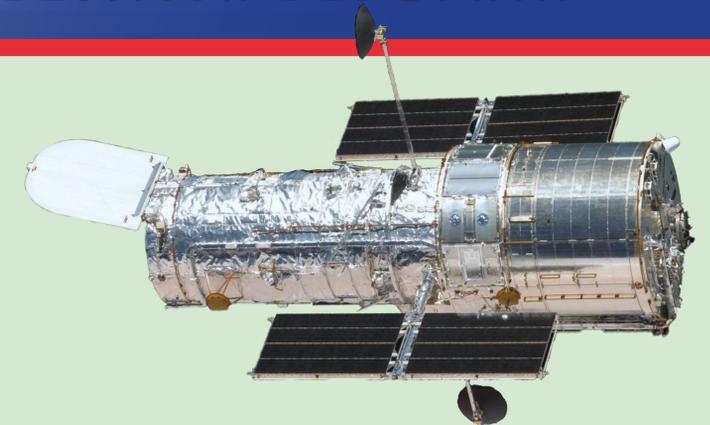
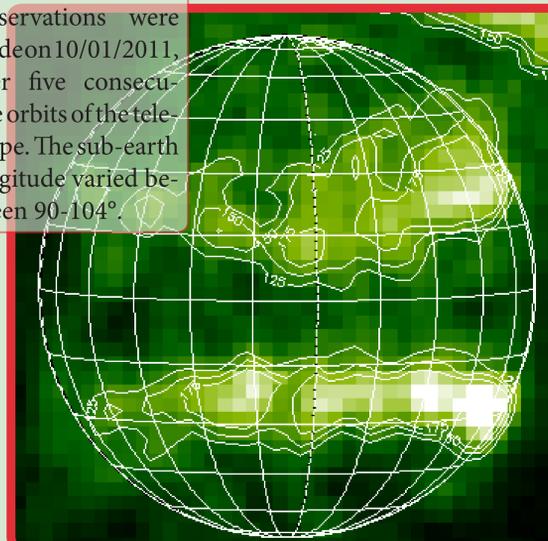
VISIT OF 2010

Observations were made on 11/19/2010, over five consecutive orbits of the telescope. The sub-earth longitude varied between 97-111°.



VISIT OF 2011

Observations were made on 10/01/2011, over five consecutive orbits of the telescope. The sub-earth longitude varied between 90-104°.



METHODOLOGY & CONCLUSIONS

The project consisted in rotating the images, so that Ganymede's north is up in the displayed pictures, as opposed to the spectra un-rotated image. Using the ten acquired ultraviolet images for each visit, we generated a single image for each visit, as displayed in this poster. Over the summed images, a grid of latitude and longitude was superimposed, as well as brightness contours.

Some of the conclusions of these observations are:

- During all three visits, the position of Ganymede in orbit was eastern leading.
- Auroras on Ganymede mainly occur in high latitudes just like on Earth, and display similar emissions during each visit. Bright regions are localized.
- Ganymede magnetic pole is tilted 4° from the spin axis (Kivelson et al. 2002).
- Northern aurora is aligned with the magnetic axis (McGrath, 2012).
- Aurora pattern appears to remain stable over the observations.

ACKNOWLEDGMENTS

References: McGrath et al, 2012; Hall et al. 1998; Kivelson et al. 2002.

Images sources: NASA.gov

Many thanks to Dr. Melissa McGrath for her support and guidance in preparing this poster.