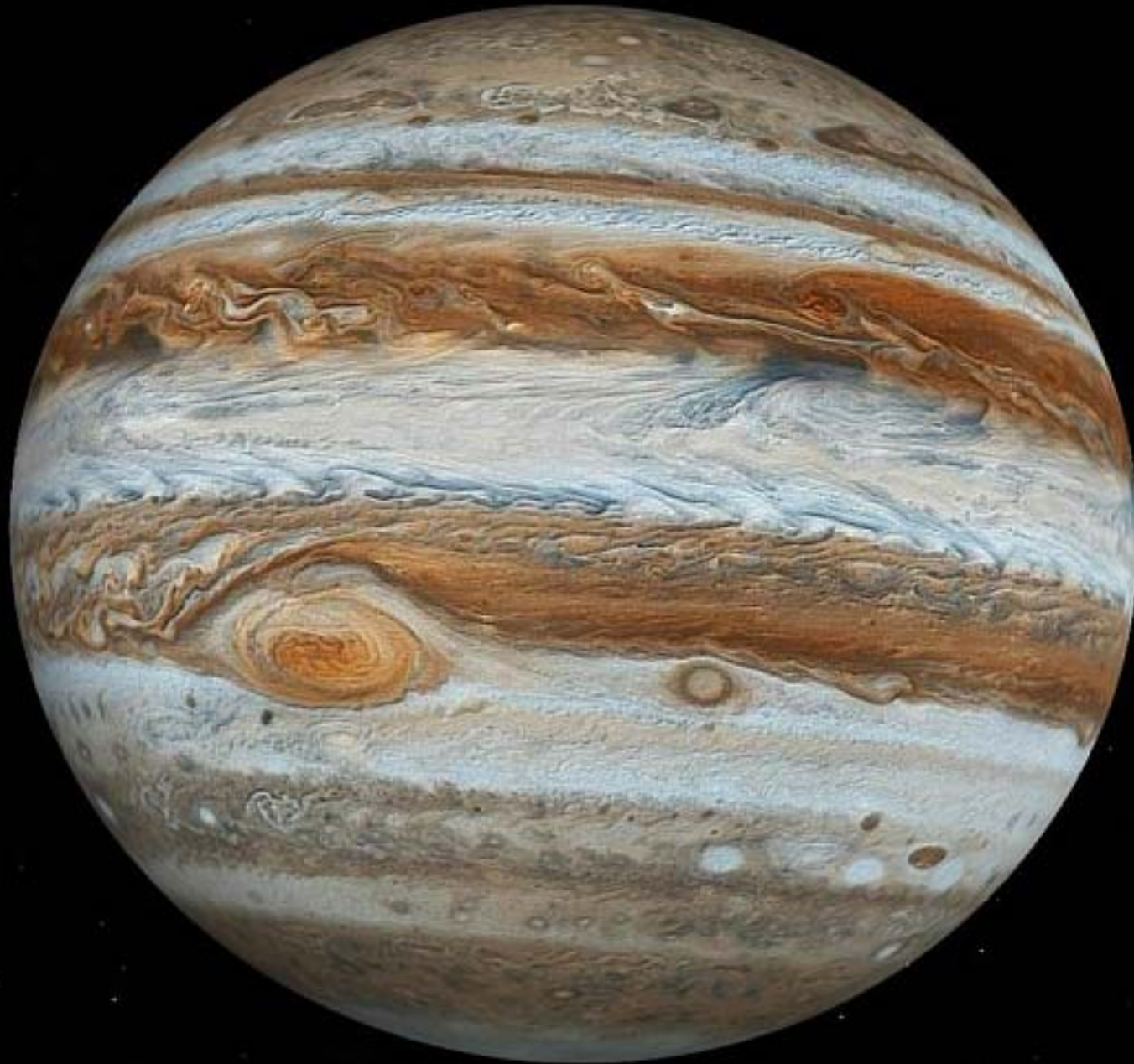


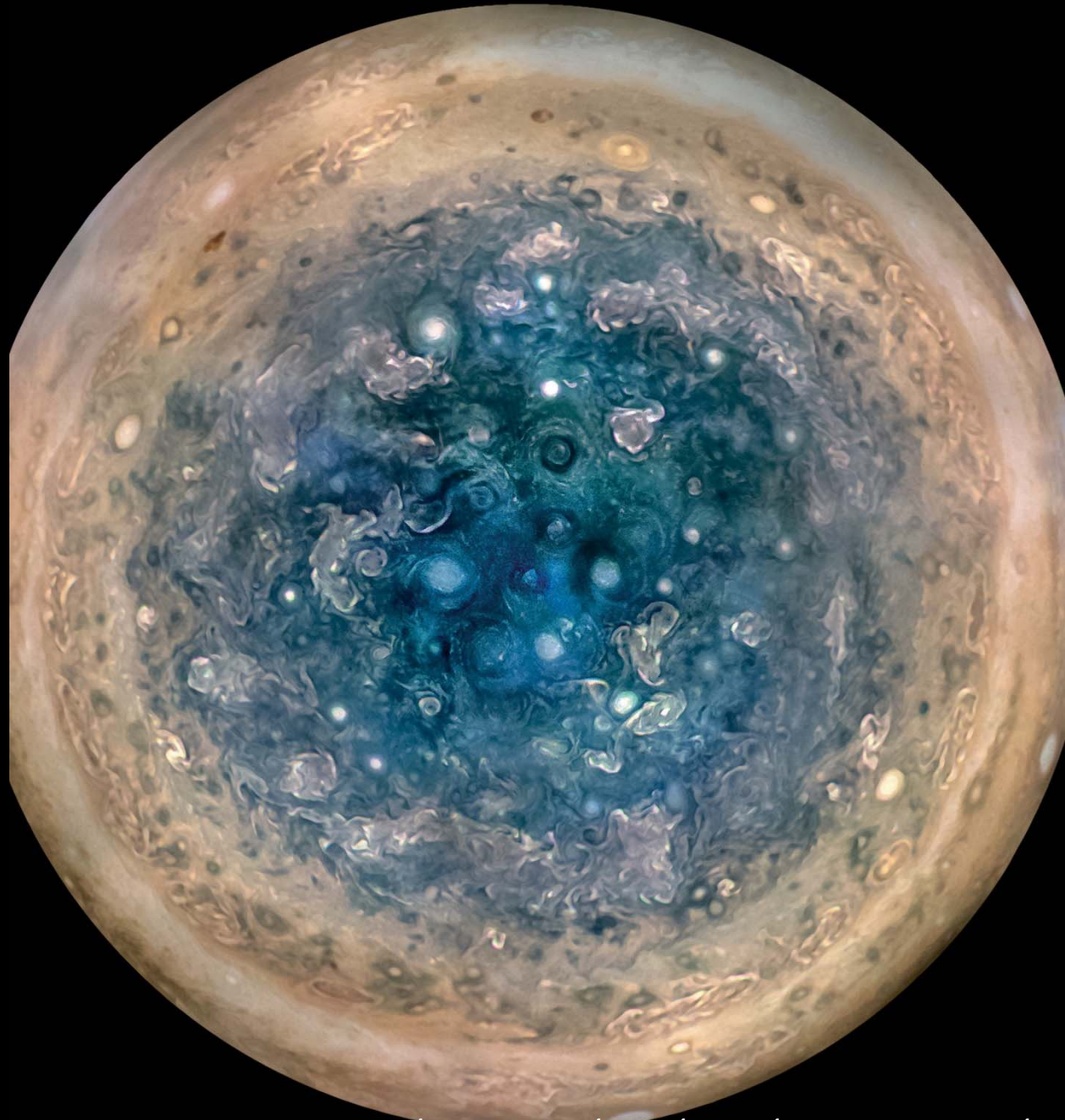
# Juno at Jupiter

Phil Valek

On behalf of the Juno team

**SwRI**





*Image Credit: NASA/JPL-Caltech/SwRI/MSSS/Betsy Asher Hall/Gervasio Robles*

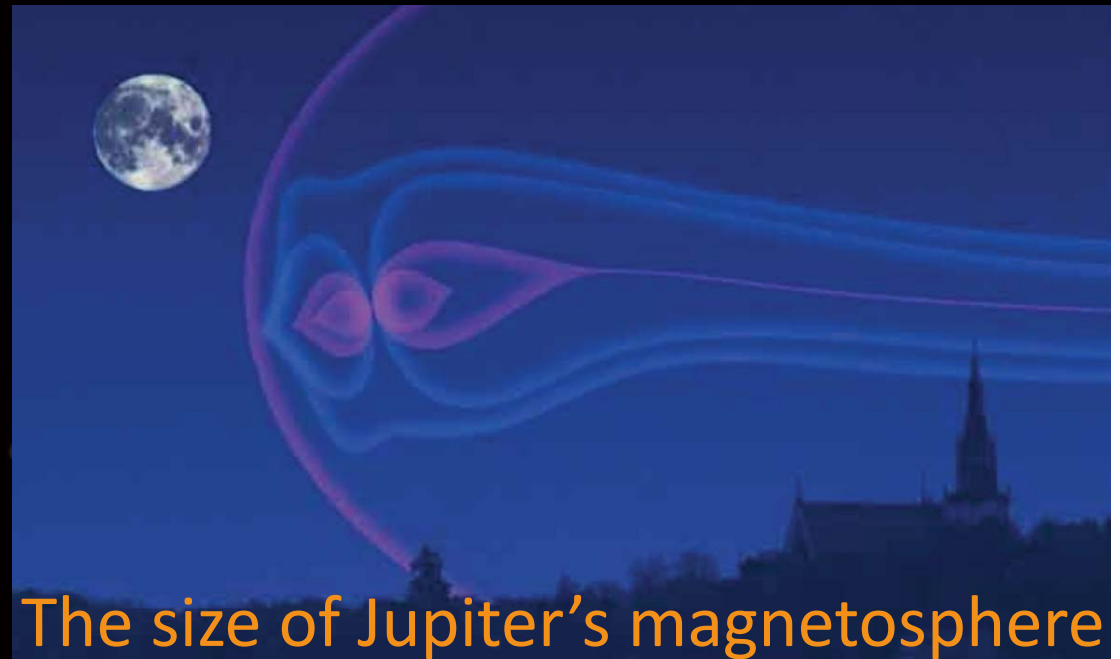
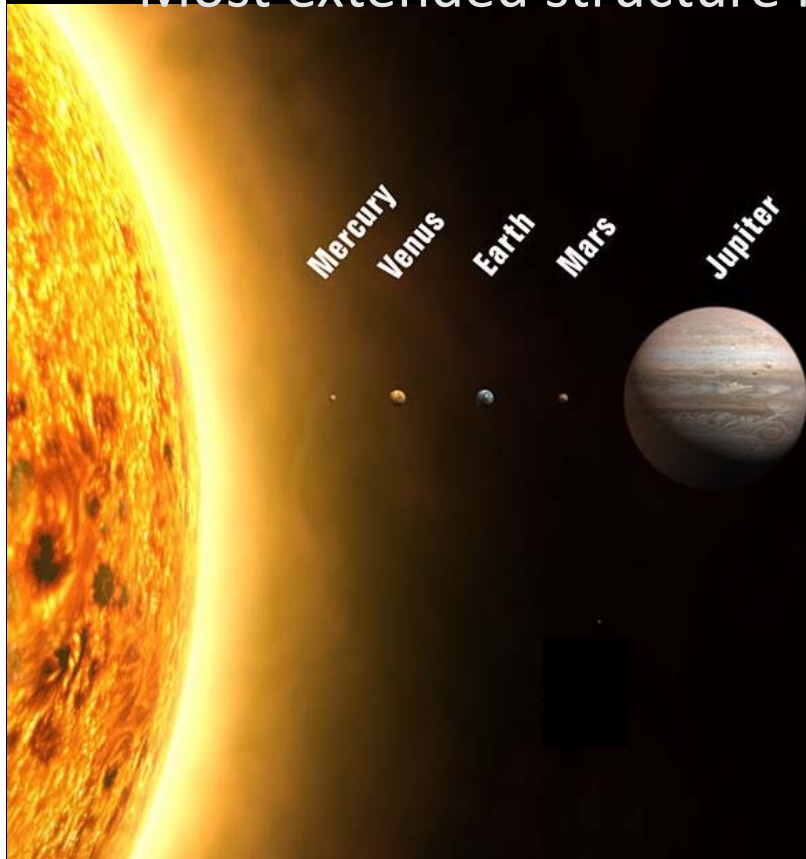


# The Planet



## Jupiter:

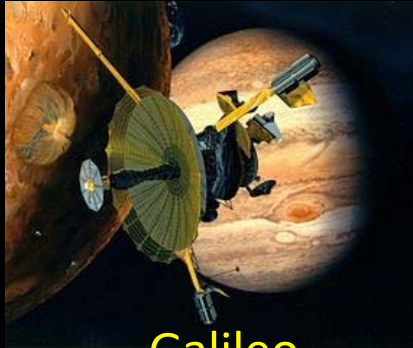
- ▶ Known by the ancients
- ▶ Seen with the naked eye (only The Moon and Venus are brighter)
- ▶ Most massive planet of our Solar System
- ▶ Most extended structure in the Solar System



The size of Jupiter's magnetosphere



# The Exploration of Jupiter



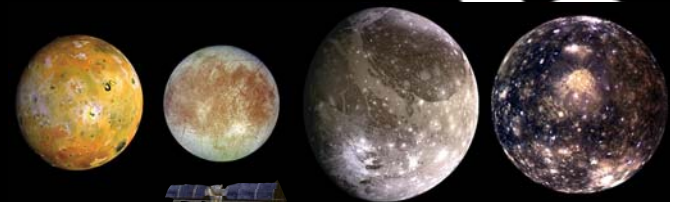
Galileo



Galileo probe



Juno



Io

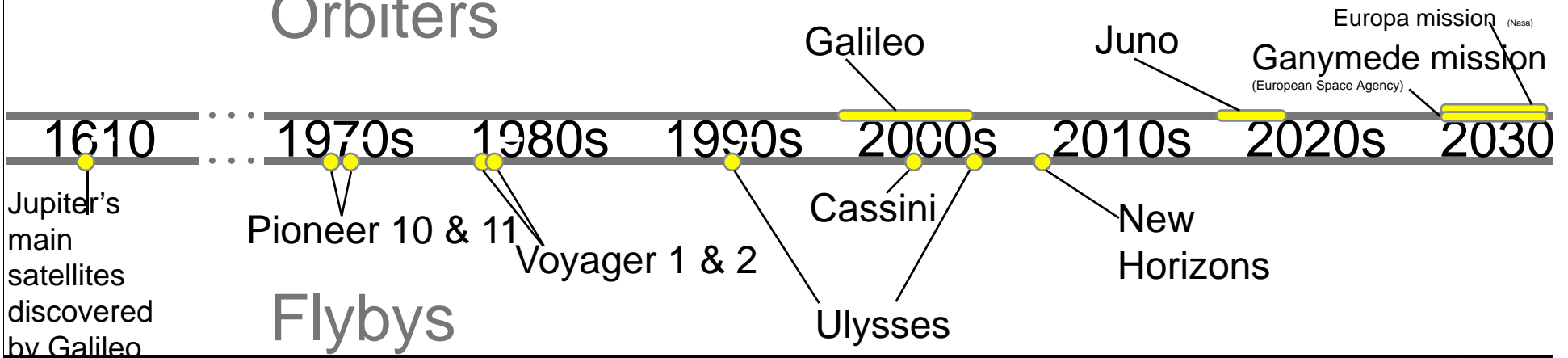
Europa

Ganymede

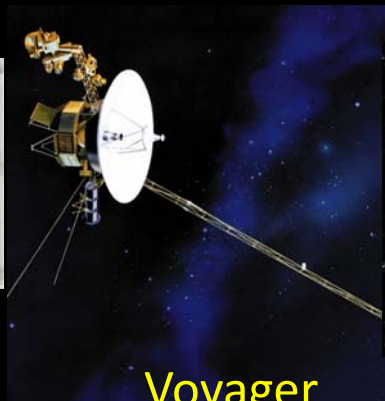
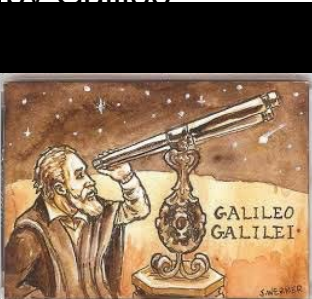
Callisto

Europa and Ganymede mission

## Orbiters



## Flybys



Voyager



Ulysses



Cassini-Huygens



New Horizon



# Juno Science Objectives



## Origin

Determine O/H ratio (water abundance) and constrain core mass to decide among alternative theories of origin.

## Interior

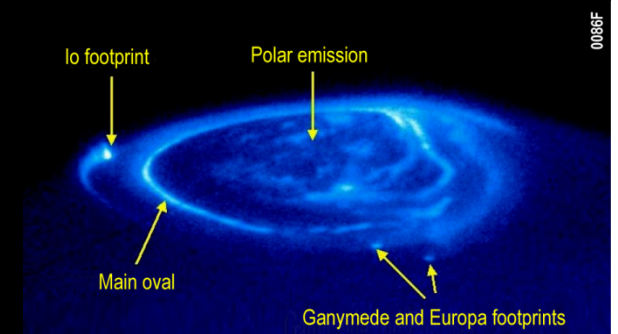
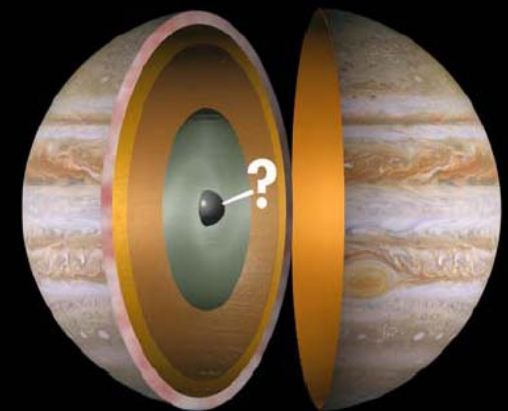
Understand Jupiter's interior structure and dynamical properties by mapping its gravitational and magnetic fields

## Atmosphere

Map variations in atmospheric composition, temperature, cloud opacity and dynamics to depths greater than 100 bars at all latitudes.

## Magnetosphere

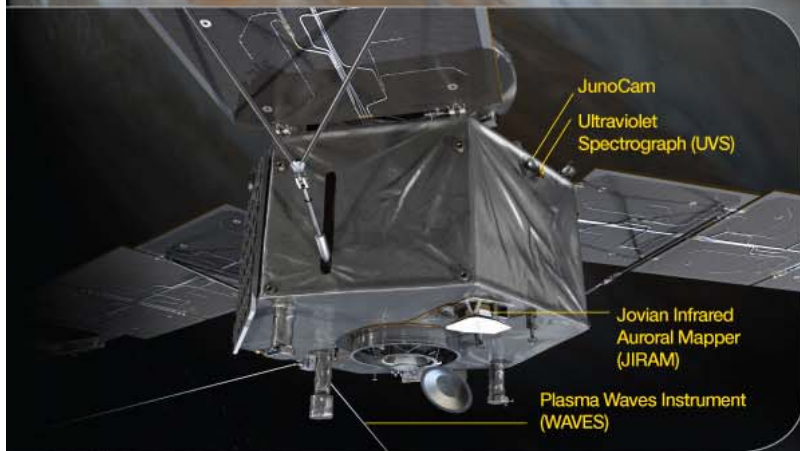
Characterize and explore the three-dimensional structure of Jupiter's polar magnetosphere and auroras.



0086F



# Juno Spacecraft



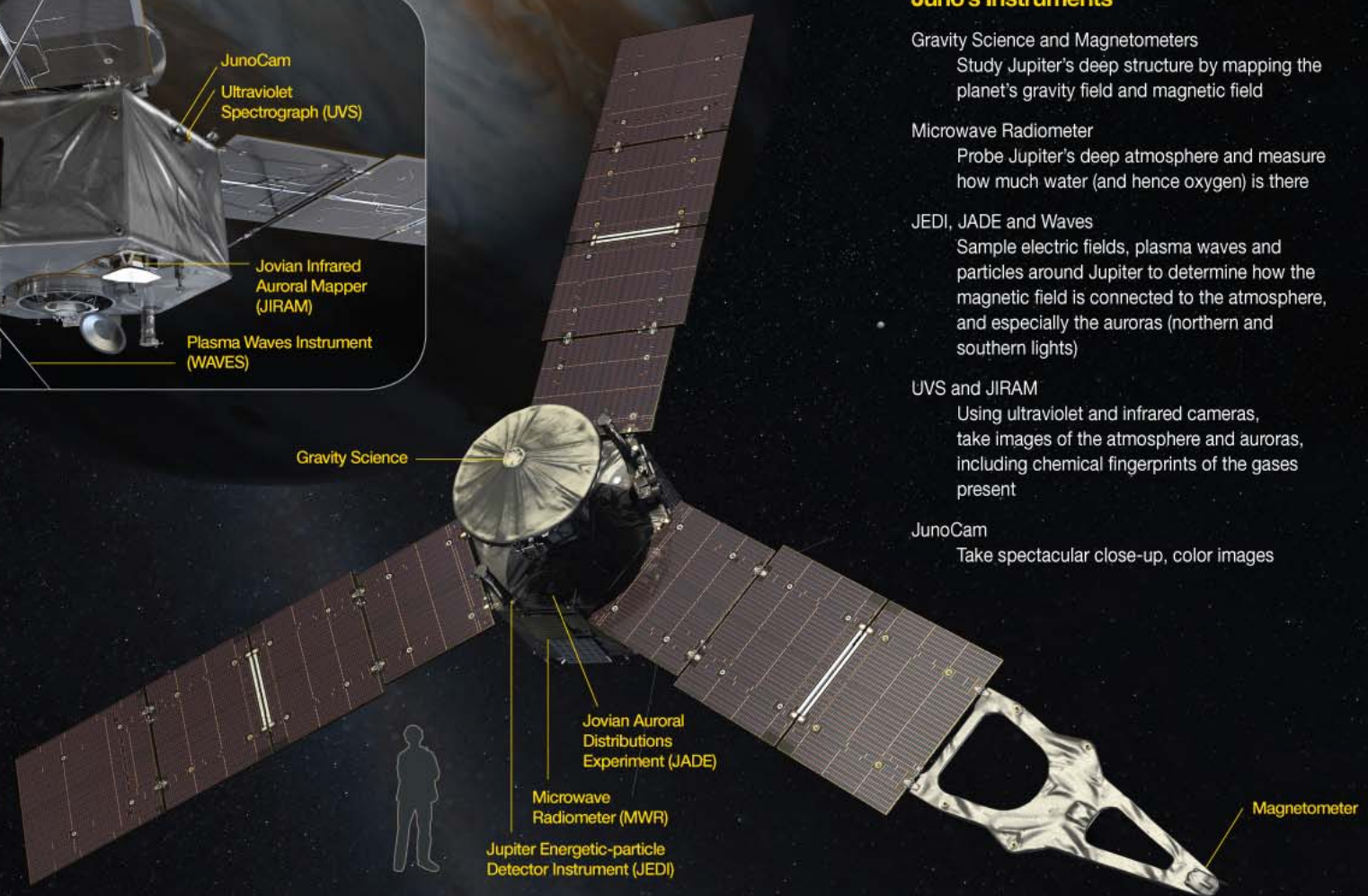
## SPACECRAFT DIMENSIONS

Diameter: 66 feet (20 meters)  
Height: 15 feet (4.5 meters)

For more information:  
[missionjuno.swri.edu](http://missionjuno.swri.edu) &  
[www.nasa.gov/juno](http://www.nasa.gov/juno)

National Aeronautics and Space Administration  
Jet Propulsion Laboratory  
California Institute of Technology  
Pasadena, California

[www.nasa.gov](http://www.nasa.gov)



## Juno's Instruments

### Gravity Science and Magnetometers

Study Jupiter's deep structure by mapping the planet's gravity field and magnetic field

### Microwave Radiometer

Probe Jupiter's deep atmosphere and measure how much water (and hence oxygen) is there

### JEDI, JADE and Waves

Sample electric fields, plasma waves and particles around Jupiter to determine how the magnetic field is connected to the atmosphere, and especially the auroras (northern and southern lights)

### UVS and JIRAM

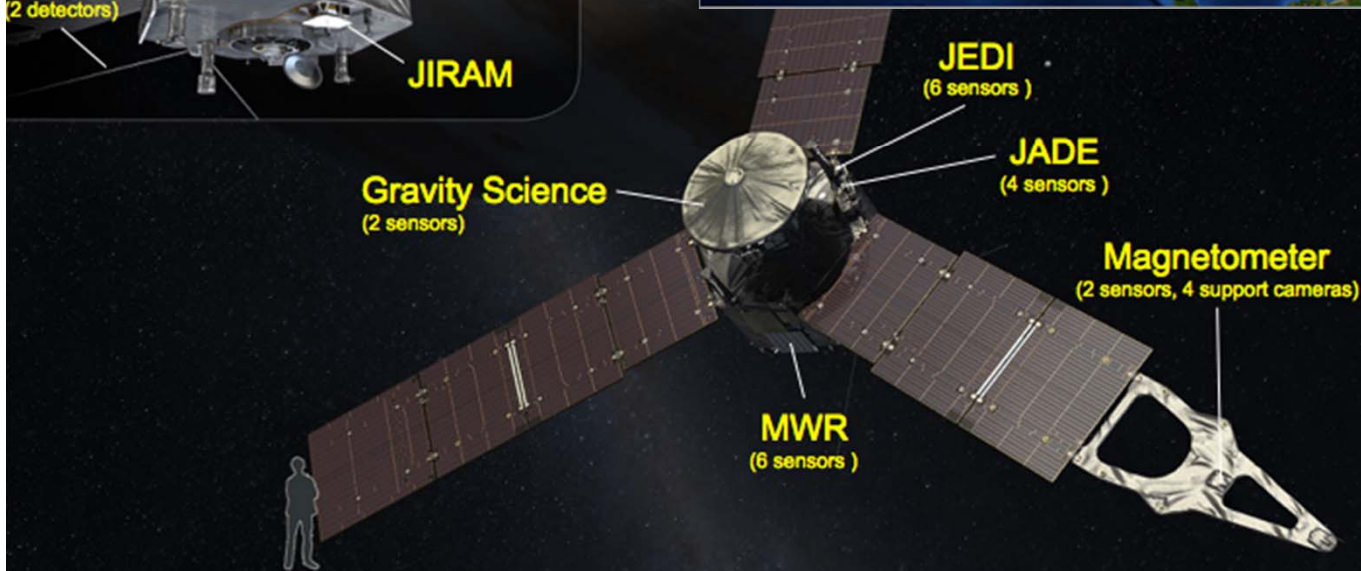
Using ultraviolet and infrared cameras, take images of the atmosphere and auroras, including chemical fingerprints of the gases present

### JunoCam

Take spectacular close-up, color images



# NASA's Juno Mission

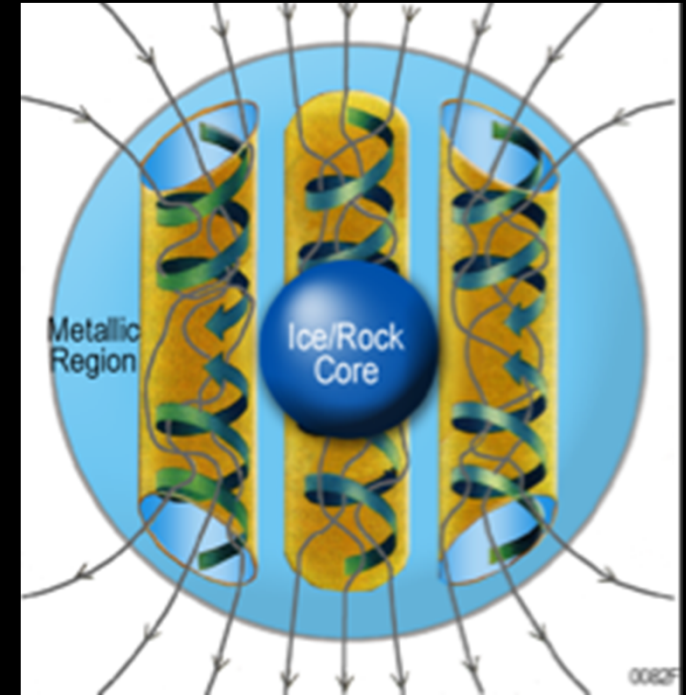
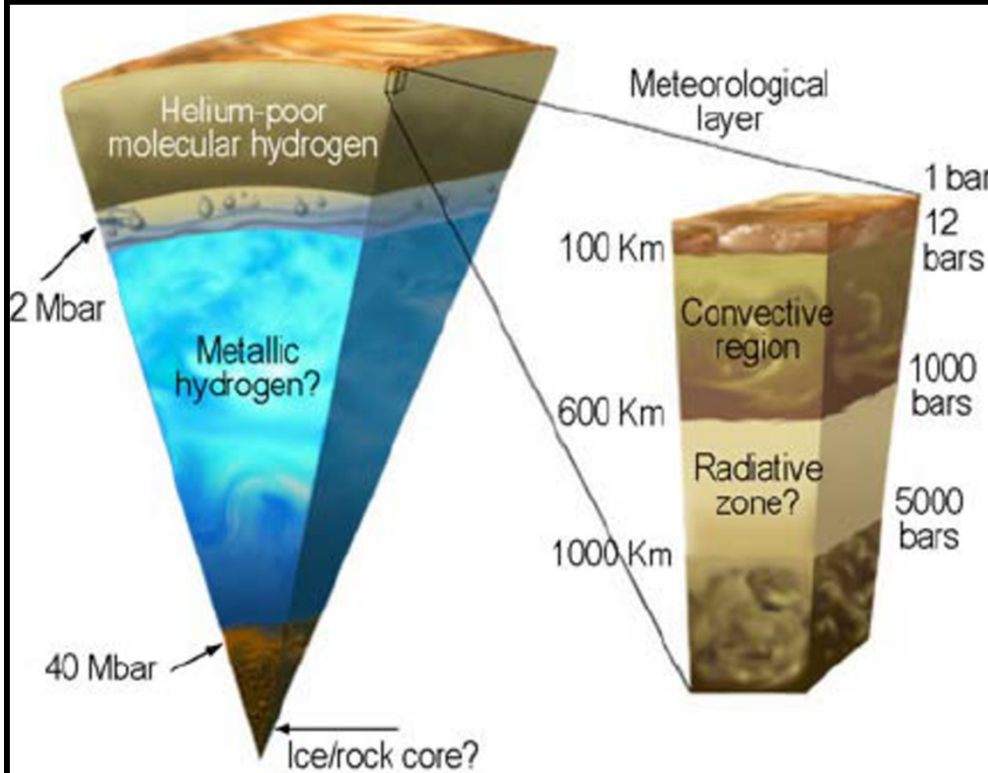


- SwRI:** Southwest Institute Research Institute (SwRI), TX
- JPL:** NASA Jet Propulsion Laboratory, CA
- GSFC:** NASA Goddard Space Flight Center, MD
- LMSSC:** Lockheed Martin Space Systems Company, CO
- UI:** University of Iowa, IA
- APL:** JHU Applied Physics Laboratory, MD
- MSSS:** Malin Space Science Systems, CA
- KSC:** NASA Kennedy Space Center, FL
- ULA:** United Launch Alliance, CO
- DTU:** Danish Technical University, Lyngby, Denmark
- ASI:** Italian Space Agency, Rome, Italy
- BELSPO:** Belgian Science Policy Office, Brussels, Belgium





# The Interior of Jupiter



- How big is Jupiter's inner core? Does it even have one?
- How complex is structured Jupiter?
- Where is the magnetic field generated?



# Cloud Tops of Jupiter



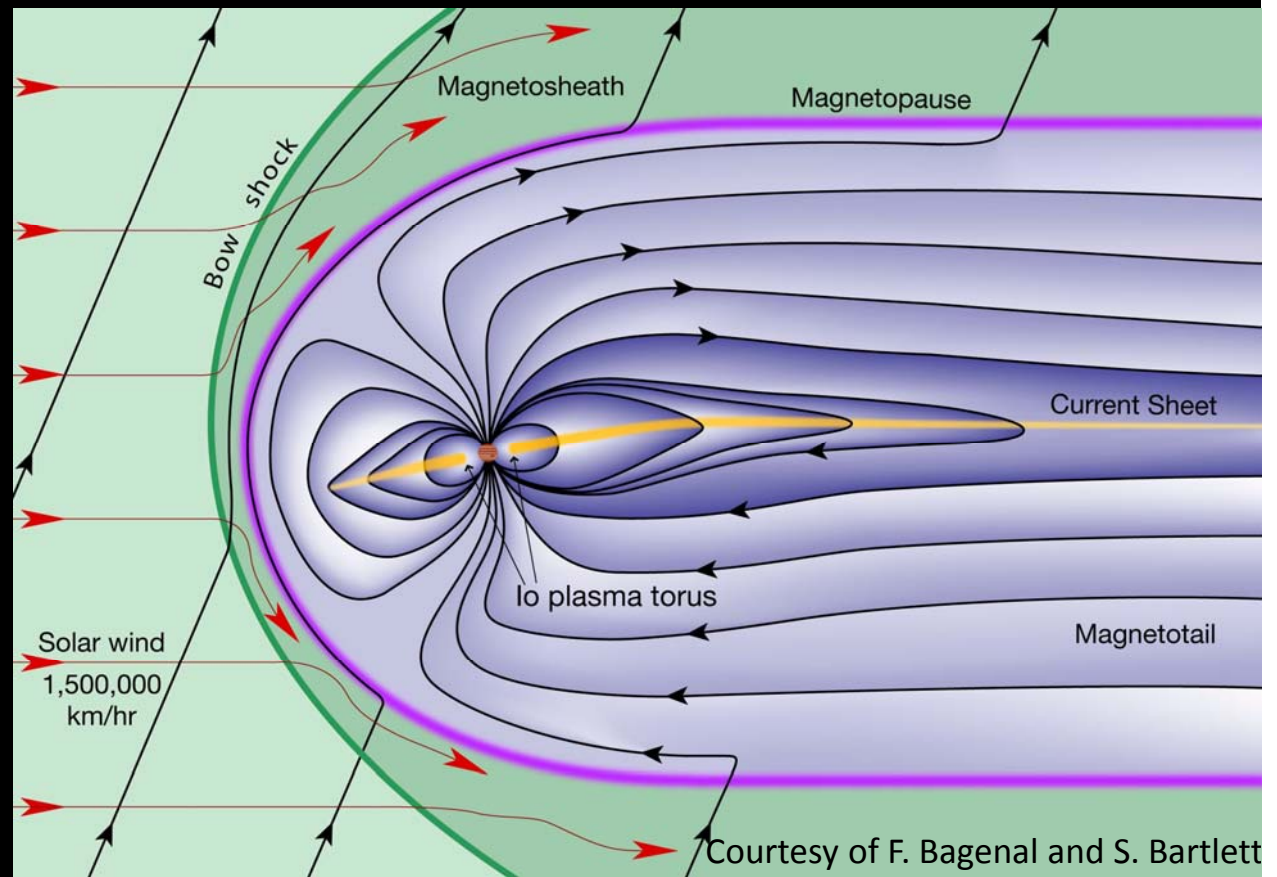
*Image Credit: NASA/SWRI/MSSS/Gerald Eichstädt/Seán Doran*



# Jupiter's Magnetosphere

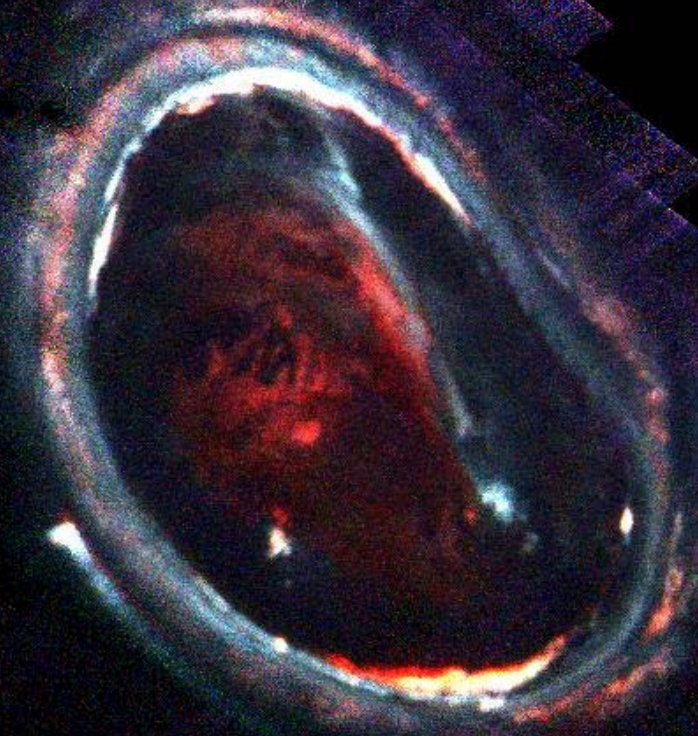
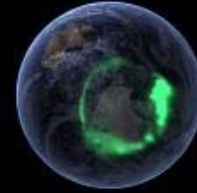


- Strong magnetic field
- Extended magnetosphere (~100 larger than Earth's)
- Io emits over a ton of  $\text{SO}_2$  emitted per sec in the Jovian system
- Magnetosphere rotation-dominated (rotation period ~10hr)
- Equatorial region studied by previous missions



→ Jupiter's Polar Magnetosphere completely unexplored

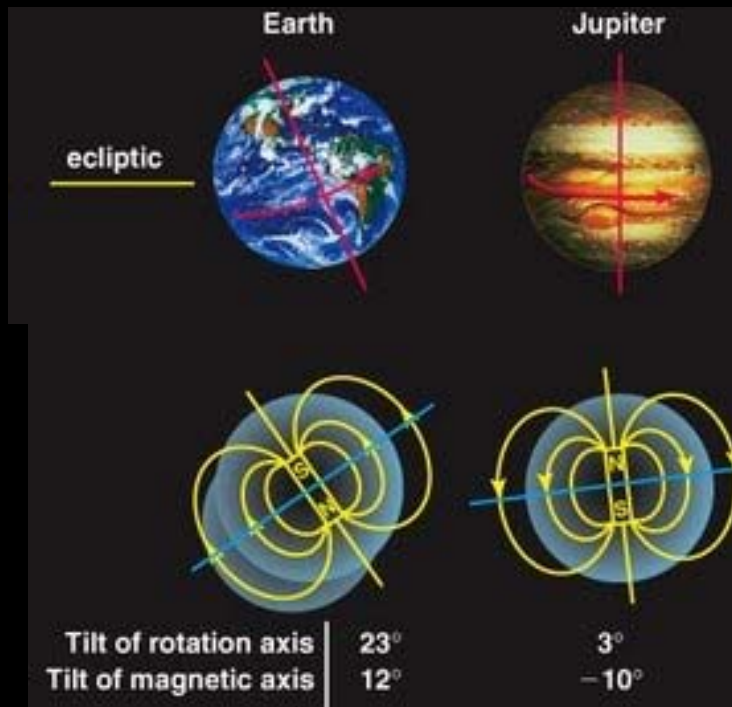
**SwRI**



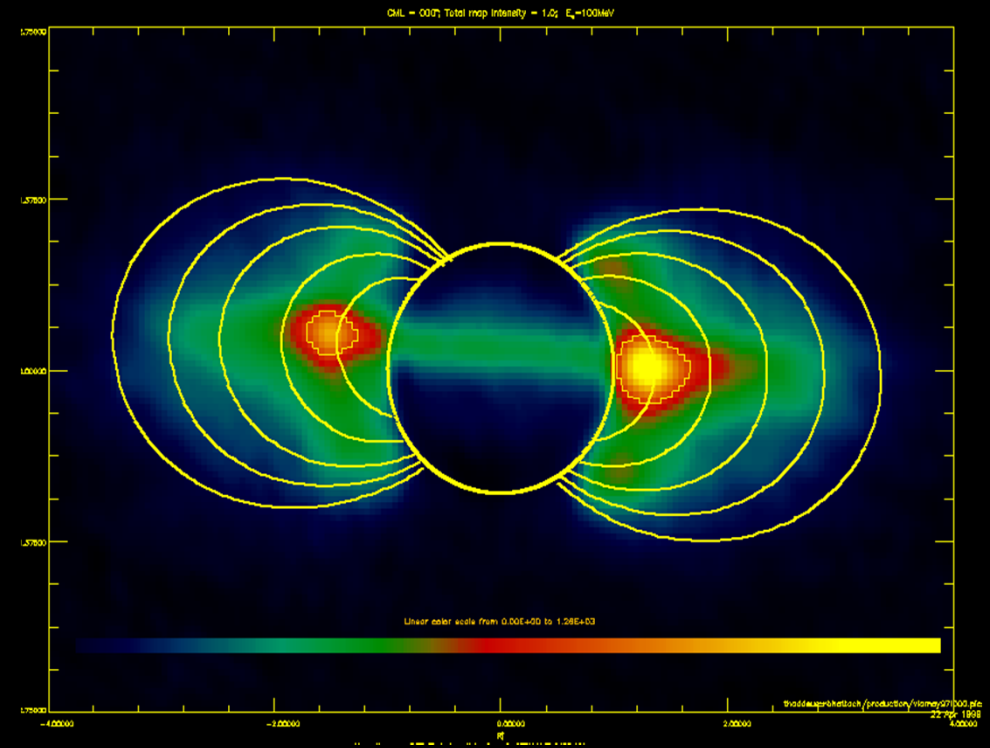
R. Gladstone



## Magnetic field of Earth vs Jupiter



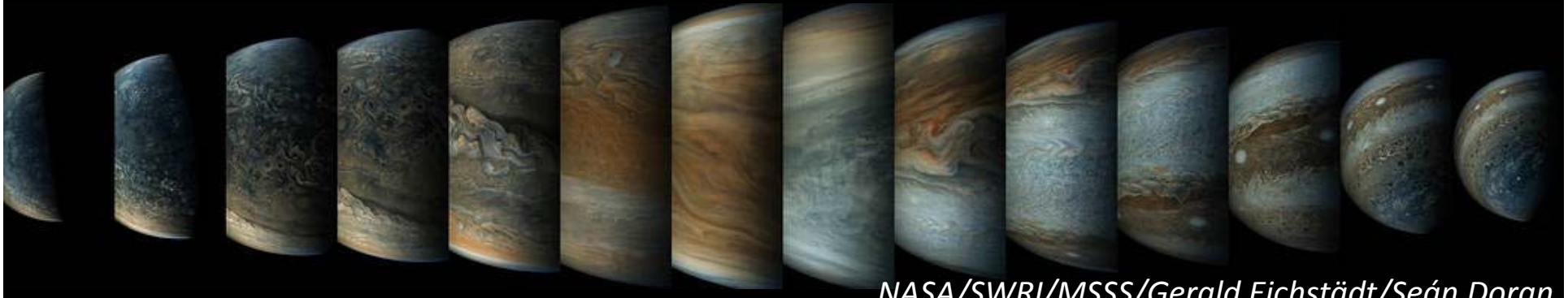
Source:  
[ifa.hawaii.edu](http://ifa.hawaii.edu)



## Jupiter's Synchrotron Emission



## What's next?



*NASA/SWRI/MSSS/Gerald Eichstädt/Seán Doran*

- Juno will continue in its 53 day orbits studying the Jovian system
- On July 11 Juno will have its seventh perijove and will fly directly over the Great Red Spot
- Further orbits will allow us to get a more complete map of the interior
- We will continue watch the atmosphere and magnetosphere to see how it changes



# Where to look for more on Juno

- The Juno mission website has the latest news from the mission and is the portal to Junocam
  - <https://www.missionjuno.swri.edu>
  - <https://www.missionjuno.swri.edu/junocam>
- The NASA Juno mission page
  - [www.nasa.gov/juno](http://www.nasa.gov/juno)
- Eyes on the Solar System allows is a simulation that allows you to visualize the solar system and learn more learn more about the Juno mission, and other Earth and Planetary missions.
  - <https://eyes.nasa.gov>

