Juno Status

- Launched 2011 and arrived 2016
- Prime mission operations ends July 2021
- 53 day polar orbiter; 34 orbits
- Extended mission proposal due 9/30/2020
- EM decision expected ~12/2020
- EM extends to orbits 34 – 76
- EM last orbit completes September, 2025
<table>
<thead>
<tr>
<th>Juno EM Science Payload</th>
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<tbody>
<tr>
<td>Gravity</td>
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<td>JIRAM</td>
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<td>JunoCam</td>
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<td>SRU</td>
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Juno Extended Mission Proposal

Juno evolves to a full Jovian system explorer with close flybys of satellites and rings.

Juno EM provides a diverse OPAG community with data from 2021 to 2025.

The final selection of science objectives & measurements may be limited by NASA budget.
A Sampling of EM Science Objectives
Addresses discoveries and new targets

Jupiter’s northern hemisphere and pole
The shearing of magnetic features
Characterizing the dilute core
Probing the polar magnetopause
In-situ exploration of the Io-Europa Torus
Multiple flybys of Io, Europa and Ganymede
Detailed characterization of the ring system
The migration of Juno’s perijove northward

The EM investigates the northern hemisphere and probes the low altitude acceleration region above Jupiter’s polar cap aurora.
The northern progression of perijove enables Satellite flybys and penetrates Jupiter’s ring halo.
Orbit planet projection: EM orbits reach deep into the southern magnetosphere.
High-resolution views “fill the gap” between the halo and Jupiter.

Juno will search for clumps throughout the rings as seen in this image near Adrastea.

Waves dust impacts through PJ21 (color), future observations are shown in purple.
The EM provides 3D maps probing the depths of Jupiter’s polar cyclones.

Example microwave mapping coverage over Jupiter’s poles during the EM. Colored swath is JIRAM data showing Jupiter’s polar cyclones.
Characterizing the Dilute Core

• The discovery of a dilute core was completed unexpected and is critical to understanding the formation and evolution of Jupiter.

• Juno’s EM will help characterize the dilute core via
  – tidal response
  – global water abundance
  – MOI
  – zonal field
  – tesseral harmonics.
The EM bisects Prime mission longitudes to create a magnetic map with ever-increasing spatial resolution; appropriate to sources that we now know are more shallow than anticipated.
The EM performs a high-resolution magnetic survey above the Great Blue Spot (GBS) to characterize the distortion (shear) of the GBS due to zonal winds at few 1,000 km depths.
First radio occultations to cover a wide range of latitude and longitude

Probing upper atmosphere and ionosphere along the Io Flux Tube footprint, polar auroral oval, and mid-latitudes
Clipper-JUICE Radiation Environment

Dissecting the Io-Europa-Ganymede Torus:
- In-situ F&P
- Update radiation
- Coverage of low & high latitudes
Juno’s Satellite Encounters

– Ganymede
  • Surface composition, space weathering maps, magnetospheric interaction (thru wake)

– Europa
  • Ice shell, plume search, organics maps, surface sputtering

– Io
  • Magma ocean, polar volcanoes & SO$_2$ maps, magnetospheric interaction

– Semi-major axis of each moon to compare with astrometry from other missions (LaPlace resonance)
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Ganymede Science

- Investigate the 3-D structure of Ganymede’s magnetosphere
- Surface composition, role of radiolytic processes in surface weathering
- Investigate surface changes since Voyager and Galileo

JIRAM Ganymede map at 23km resolution
Juno Europa Science

Ice shell characterization:

- Identify regions where ice is thick, thin or has subsurface liquid
- Map surface with MWR

~120-200 km resolution
Europa Science
Surface Composition and Sputtering

- Map water ice, CO₂ and organics (10 km res)
- Ions/ion cyclotron waves infer chlorine
- F&P constrain surface sputtering
- Juno’s plasma instrument represents a significant advancement for constraining sputtering
Juno Europa Science

Plume Search:

- Search for surface changes (1-2 km resolution)
- JunoCam, SRU (High phase forward scattering)
- In-situ F&P to characterize mag field, wave emissions, electron densities and dust environment
Io Science

- Juno will constrain $k_2$ to help clarify the physical origin of Io’s volcanism.

- Juno will monitor Io volcanic activity, including the polar region. Global mapping addresses where internal dissipation of tidal heating occurs.