

Planetary Decadal Survey



Giant Planets Panel *Status Update to OPAG*

Heidi Hammel
Chair, Giant Planets Panel (GPP)

GPP Membership

Reta Beebe

NMSU

atmos. dynamics

Brigette Hesman

NRAO

atm chemistry

Wayne Richie

NASA Langley

engineer

John Casani

JPL

engineer, NAE

William Hubbard

University of Arizona

interiors

Kunio Sayanagi

CalTech

dynamics, theory

John Clarke

Boston University

aurorae, magnetos.

Mark Marley

NASA Ames

exoplanets

Amy Simon-Miller

NASA Goddard

panel vice-chair

Heidi Hammel

Space Science Institute

panel chair

Phil Nicholson

Cornell University

rings

Decadal Process

(and where we stand with it)

Overall Schedule 2008-2011

2008

4th Quarter

Informal request received, NRC approves initiation,
Formal request received, Proposal to NASA.

2009

1st Quarter

Funding received, Chair identified,
Chair and vice chair appointed

2nd Quarter

Steering Group appointed, Panels Appointed

3rd Quarter

Meetings of the Steering Group and Panels begin

4th Quarter

Panels' period of peak active,

Mission Studies Begin, **Proposal to NSF,**

Contract with Independent Cost Estimator

2010

1st Quarter

Mission Studies Continue, chapter being drafted

2nd Quarter

Final Panel meetings, Panel reports finalized

2nd-3rd Quarter

Prioritization and drafting of survey report

4th Quarter

Draft survey report to reviewers, Report revised

2011

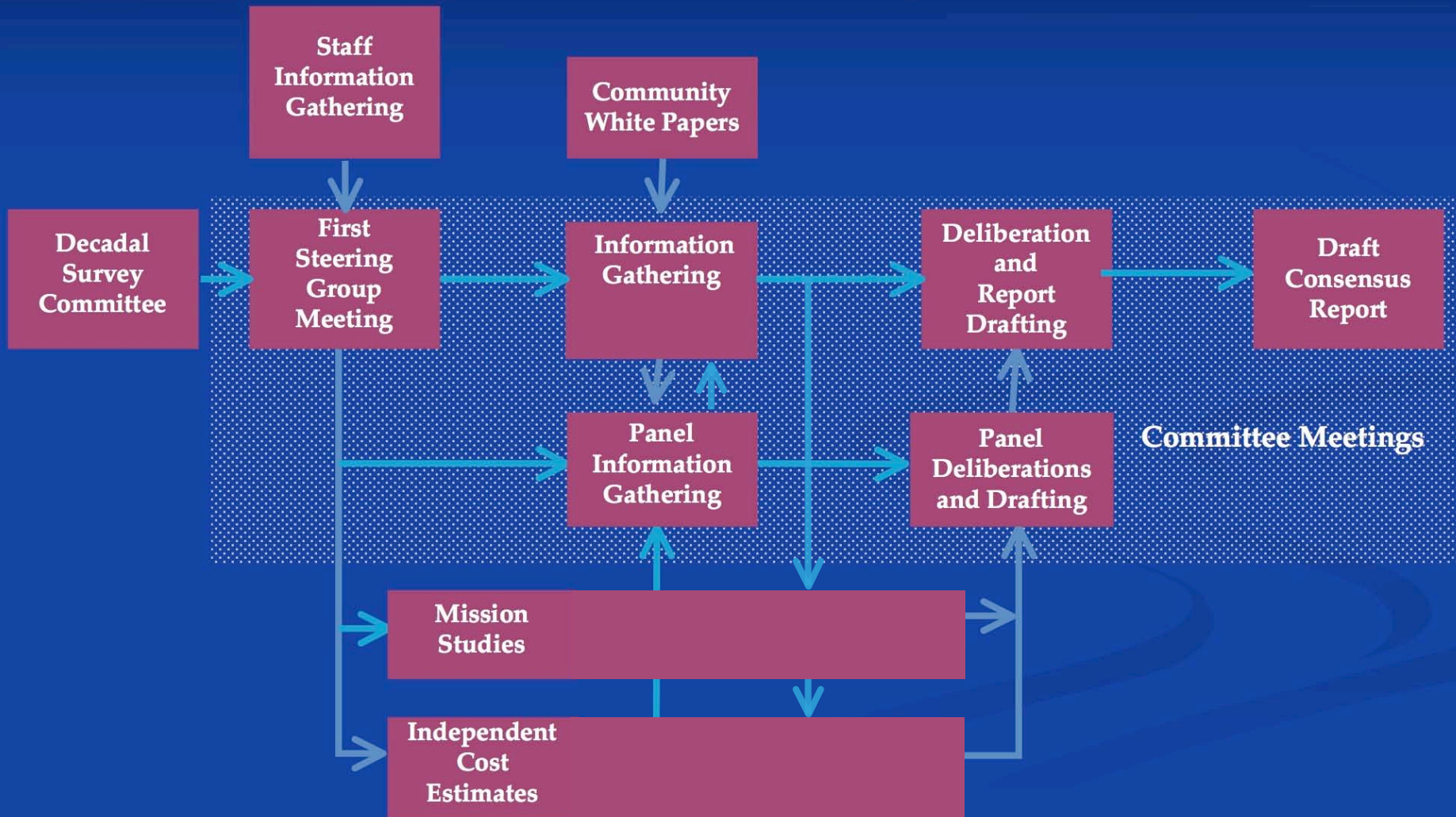
1st Quarter

Report approved, NASA briefed
and report released (prepublication-format)

3rd Quarter

Printed report released

Steering Group/Panel Interactions



GPP White Papers

~ 100 white papers submitted to GPP

Science cases

Specific mission concepts

Needed technologies

Existing facilities

Laboratory and theory work

Other topics

All read, all discussed, all provide
important basis for ongoing activities

Thank You
for your input!

GPP Outreach Activities

Date	Meeting	Location	Plan
13 July 2009	OPAG	Columbia, MD	Attend/Follow-up
27-31 July 2009	Mag. Outer Planets	Cologne	Attend/Follow-up
Through Sep 2009	n/a	email	White papers
4-9 Oct 2009	DPS	Puerto Rico	Workshop
14-18 Dec 2009	AGU	San Francisco	Special Session
8-9 Feb 2010	OPAG	Washington, DC	THIS PRESENTATION
1-5 March 2010	LPSC	Houston	Attend/Follow-up

Thank You for your input!

GPP Science Themes

Giant Planet Systems are:

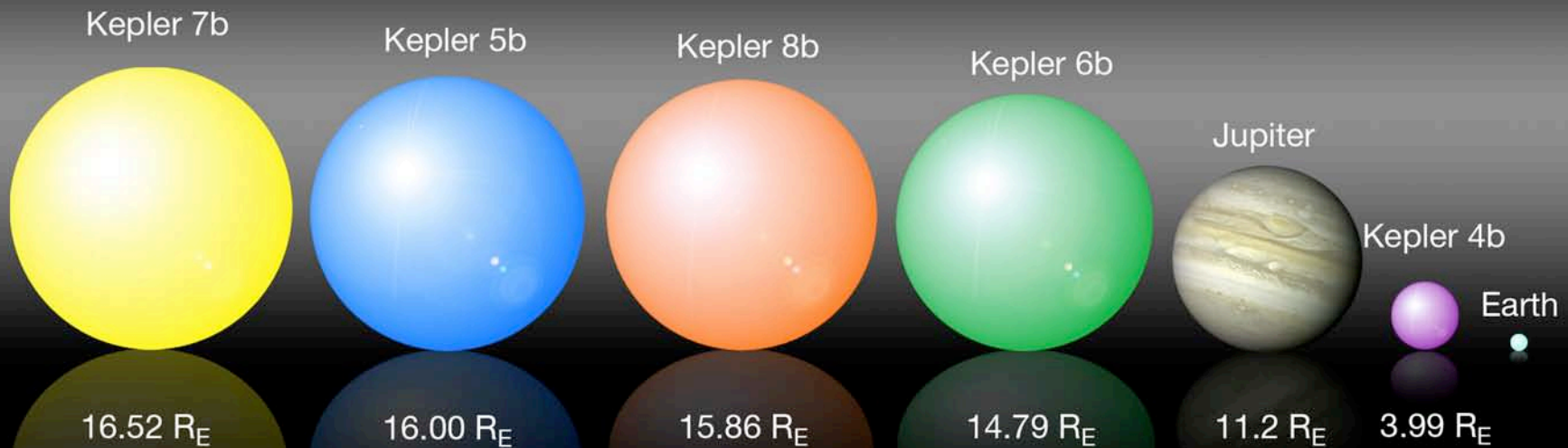
Laboratories for properties and processes on Earth

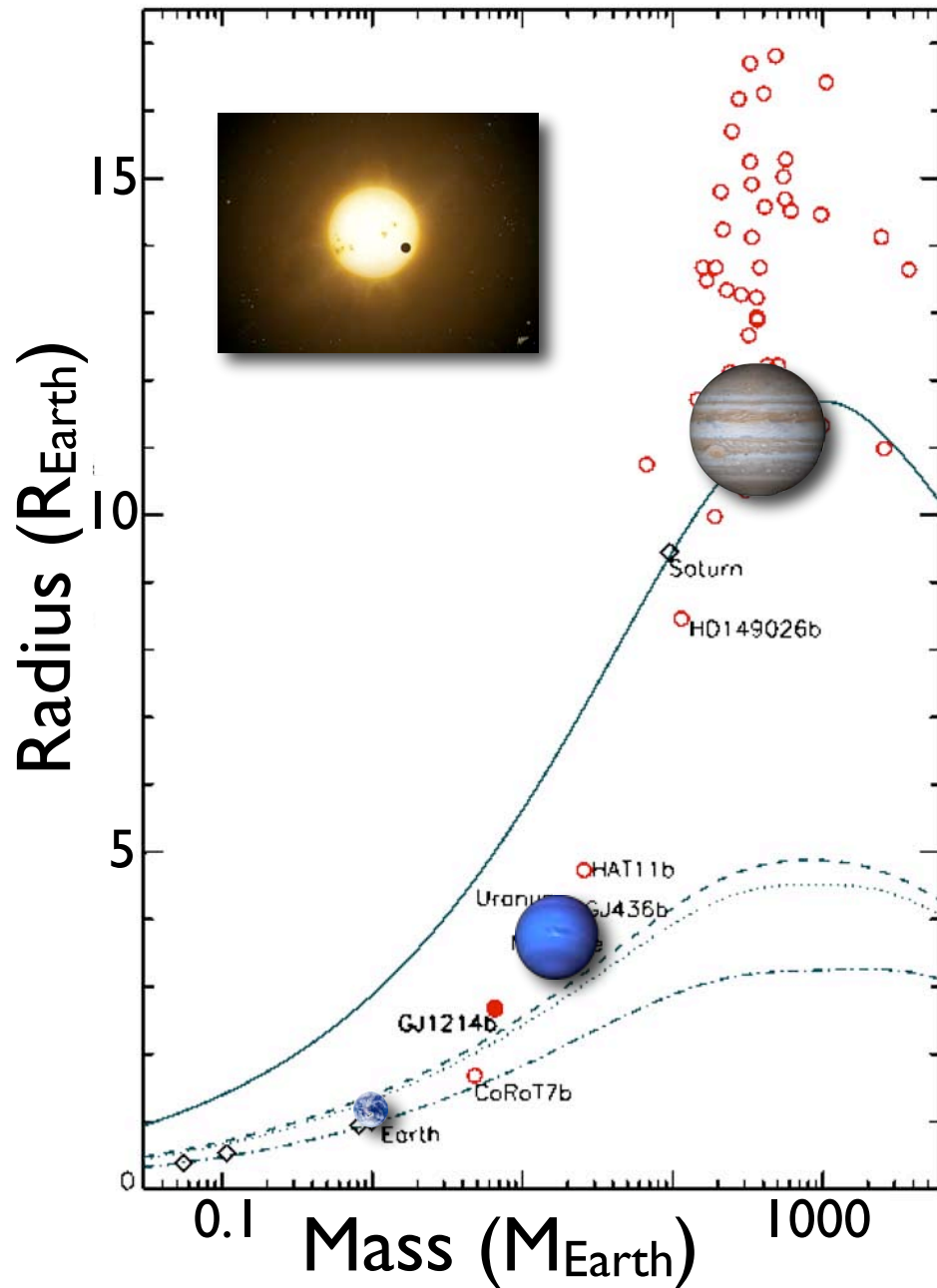
Tracers of properties and processes in the interplanetary environment

Ground truth for properties and processes exhibited by planets around other stars

local giant planets

discrete samples of a
planetary continuum





Transiting planets

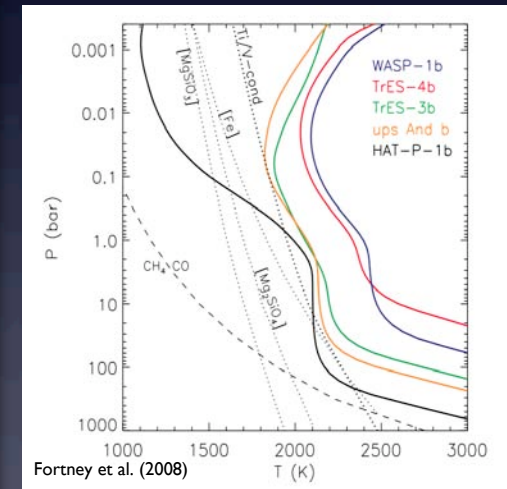
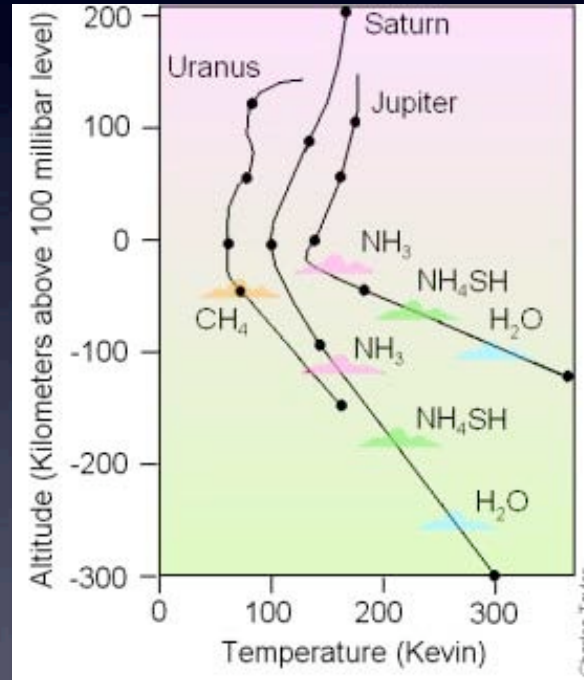
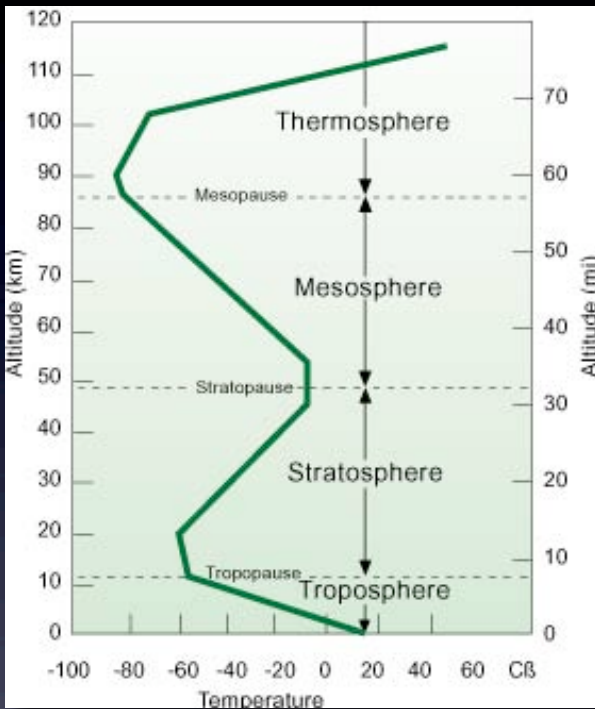
- continuum of M, R

Microlensed planets

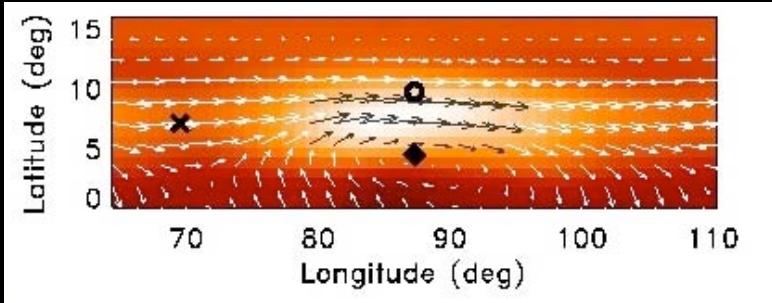
- neptunes are common

Planetary Stratospheres

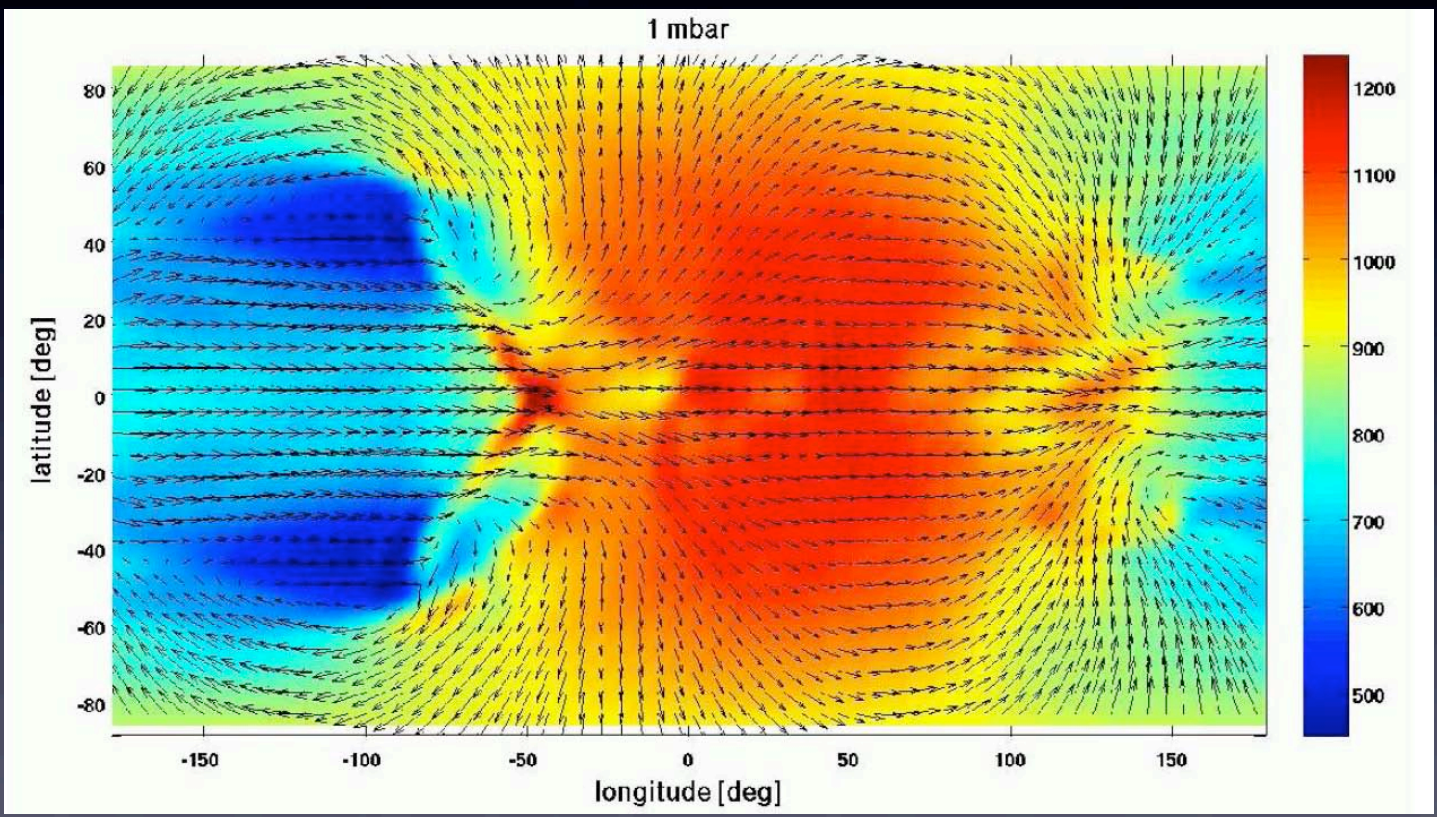
Photochemistry is important
in every case



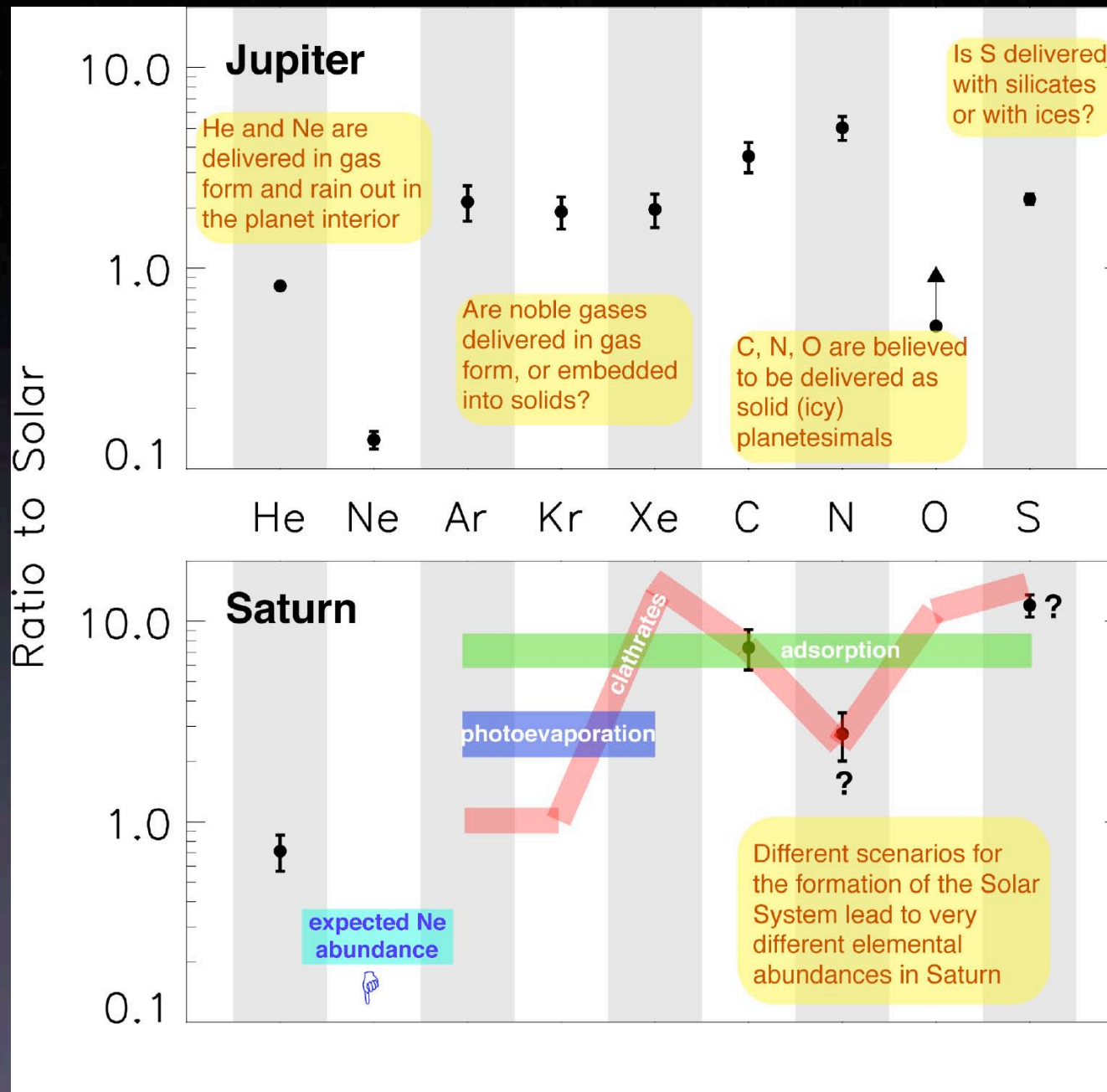
Fortney et al. (2008)



Strong downdrafts at
Jovian hotspots
(Showman & Dowling 2000)



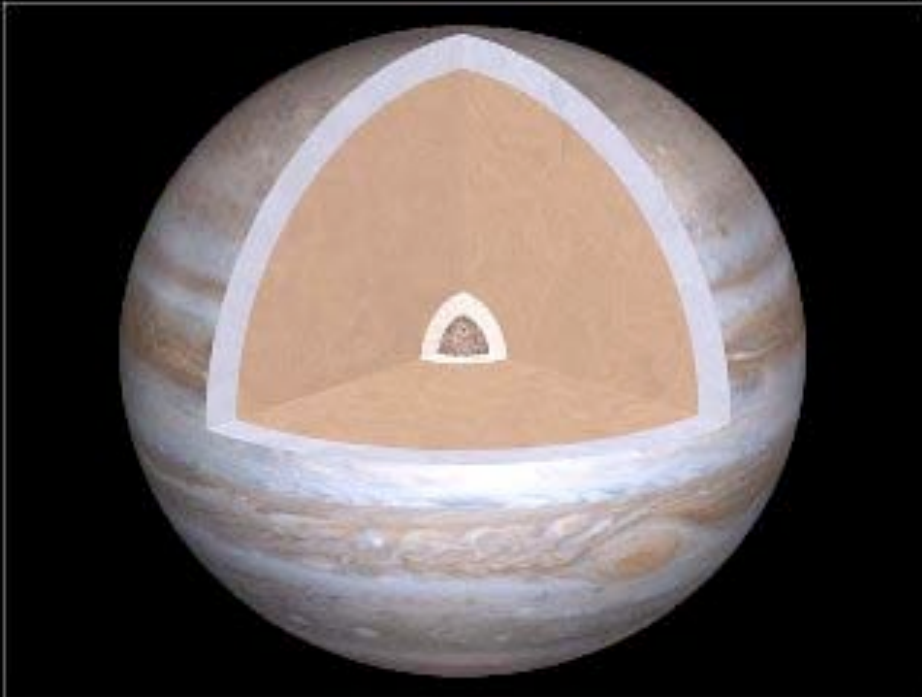
Hot Jupiter GCM
(Showman et al. 2008)



PROPERTY:
 What are Saturn's noble gas abundances and isotope ratios?

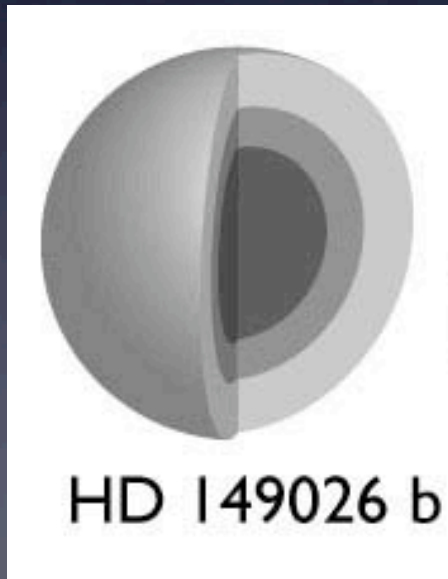
What are they for Neptune or Uranus?

Core Masses?



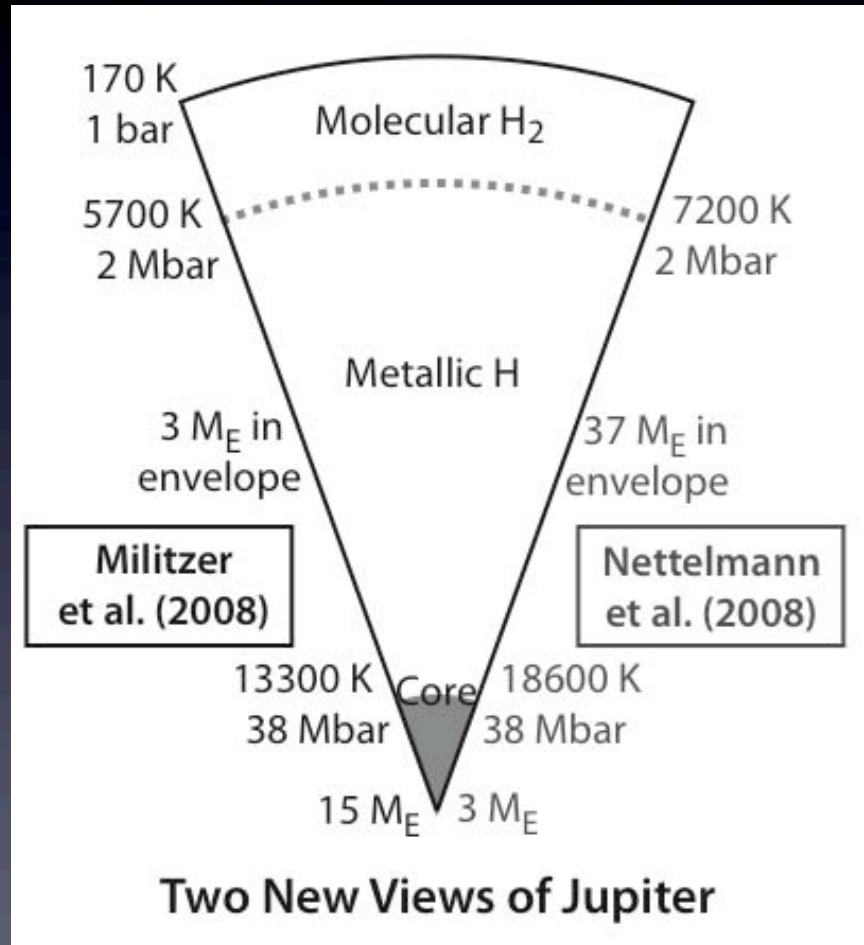
The Interior of Jupiter

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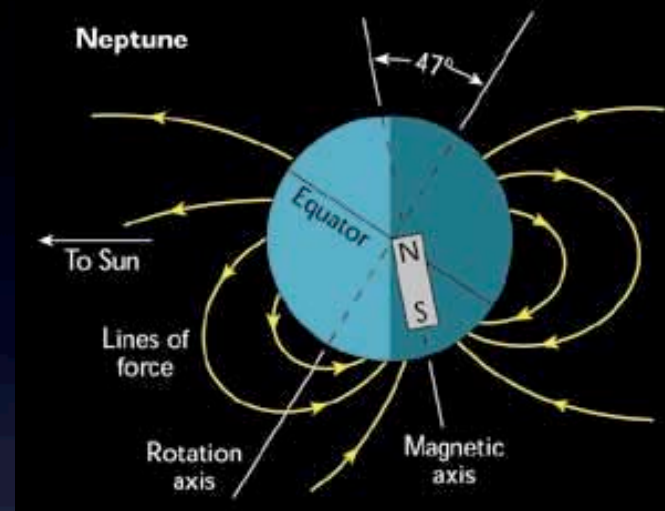
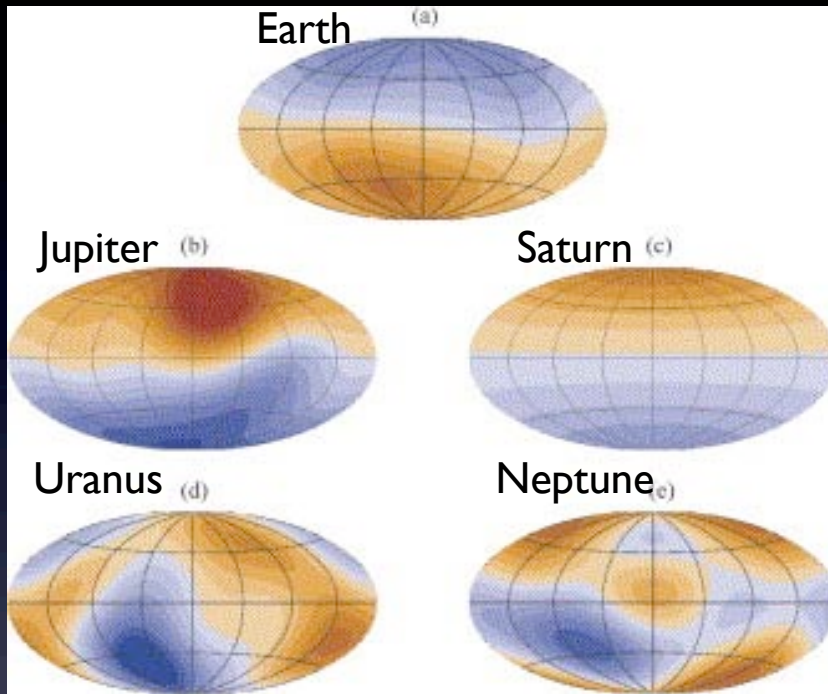
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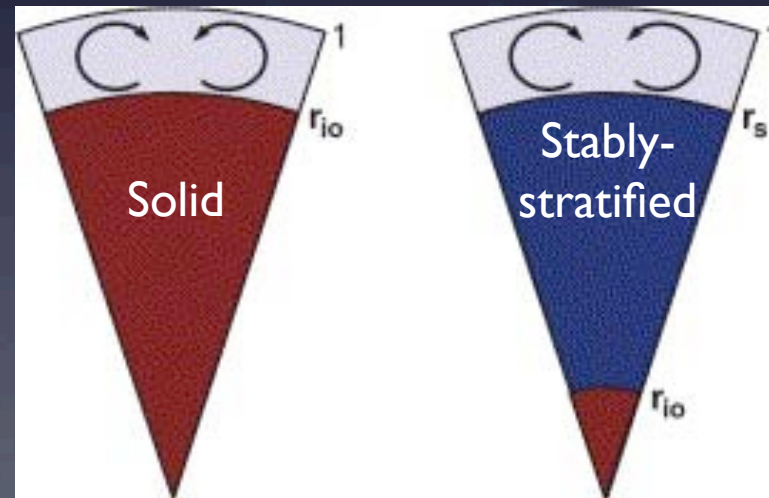


Fortney et al. (2009)

Ice Giant Magnetospheres



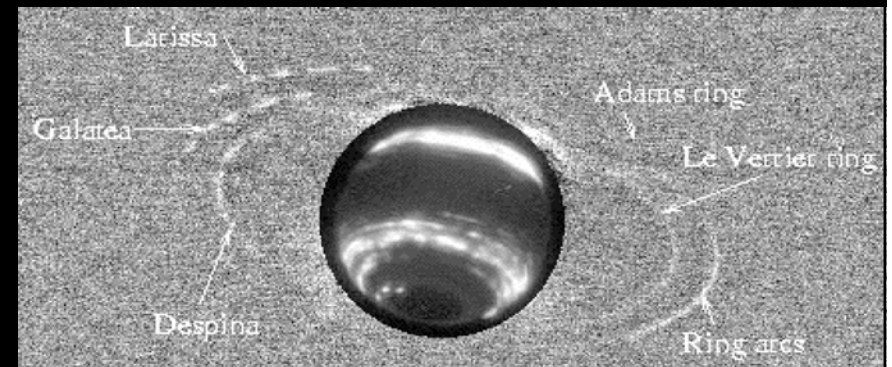
Stanley & Bloxham (2006)



Nearly all aspects of
Uranus and Neptune systems detectable
from Earth have **changed significantly**
since 1986 and 1989 Voyager Encounters

Neptune ring system changed
Arcs evolved within <8 yrs

de Pater et al. (2005) Icarus 174, 263



Red = Saturn G ring, Uranus R2
Blue = Saturn E ring, Uranus R1

Photo-illustration compares Saturn & Uranus ring systems

de Pater et al. (2006) Science 312, 92

Evaluation of Candidate Missions

- Compared to previous decadal surveys, this one will place much greater emphasis on evaluation of the technical maturity and probable costs of candidate missions.
- The panels and the steering group include members who are expert in engineering, project management, and cost estimation.
- Resources are available to do moderate-fidelity (and conservative!) cost estimates for a limited number of high-priority candidate missions.
- The objective is to produce a realistic (i.e., not heavily over-subscribed) set of candidate missions for NASA to carry out in the coming decade.

Initial Mission Study Candidates

Architecture Studies

- Mercury lander (APL)
- Venus near-surface mobile explorer (GSFC)
- Mars 2018 skycrane capabilities (JPL)
- Uranus system (APL)
- Neptune/Triton (JPL)
- Enceladus flyby/sample return (JPL)

Full Mission Studies

- Mars trace-gas orbiter (GSFC)
- Titan lake lander (JPL)

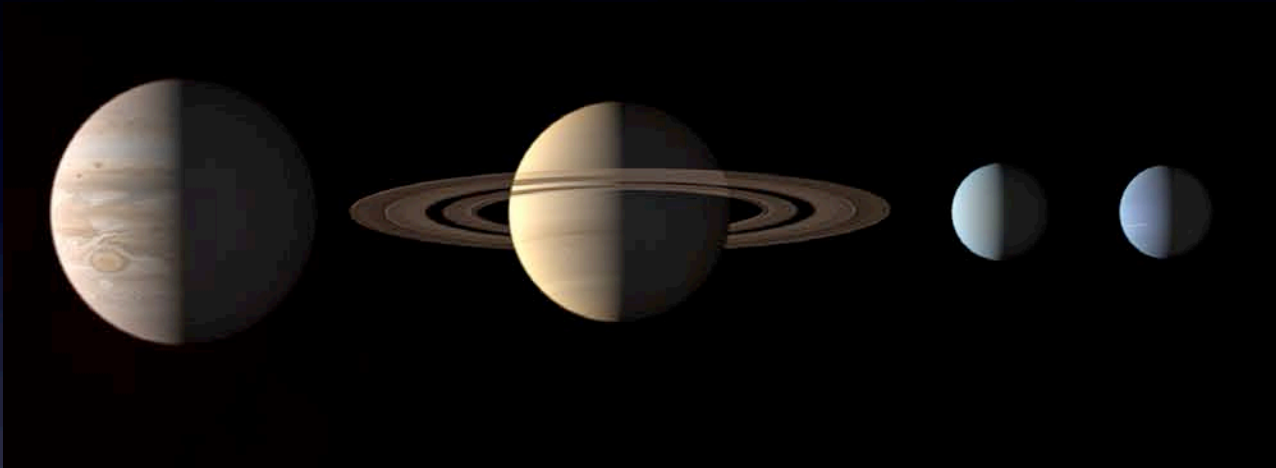
Other Studies

- NEO Target Assessment: Identify top 10 most accessible NEOs and investigate flyby options for the top three. (JPL)

Independent Cost Estimates

- JPL's Mars trace gas orbiter
- APL's Comet surface sample return

GPP: Three Architectures Studied



Neptune/Triton(/KBO) mission

Uranus System mission

Saturn Probe mission

Technology Issues

Power

Plutonium supply

ASRG lifetime

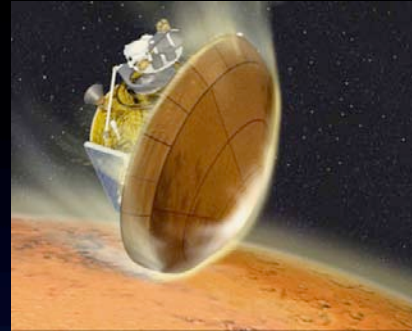
Communications (DSN)

Aerocapture/Aerobraking

Entry probes of various types

Nanosats

Instrumentation



It's Not Just Missions

Beyond describing a prioritized set of NASA planetary missions, the survey report will address several other issues:

- NSF-funded ground-based telescopes and other facilities
- NASA-funded facilities
- Technology development for future NASA planetary missions
- The NASA and NSF planetary R&A programs
- Education
- Public Outreach

Drew Sheneman, February 2010



Official Decadal Survey Website

http://sites.nationalacademies.org/SSB/CurrentProjects/ssb_052412

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February 4, 2010

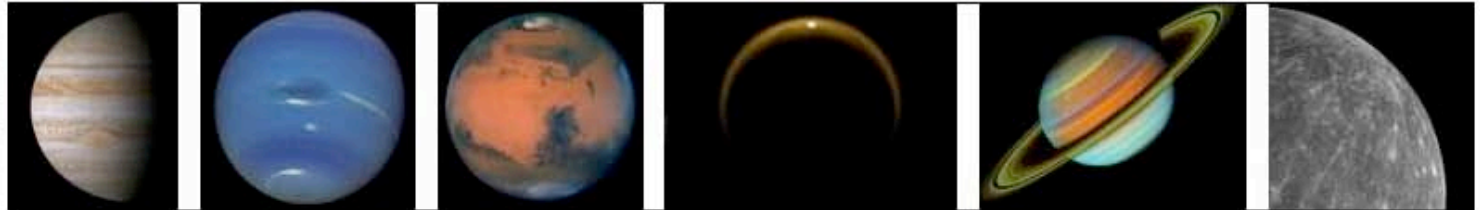
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Planetary Science Decadal Survey



Project Information

- [Statement of Task](#)
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Missions Being Considered by the
Planetary Science Decadal Survey

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