

# Crossing Boundaries in Planetary Atmospheres

## Looking to the Future: the rest of the planets

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# Looking to the future of ...

Models, Laboratory Measurements, Archives

Atmospheres in our Solar System

Exoplanet atmospheres: space-based telescopes

Exoplanet atmospheres: ground-based telescopes

But **FIRST** – community assessment poll

# Community Assessment of **Exoplanet Characterizaion Parameters**

Aki Roberge, Kuno Sayanagi, Everett  
Schlawin, Jacqueline Radigan, Heidi Hammel

# Assess on two 5-level rating systems

## **Difficulty of Determination**

- 5 = Possible for most planets
- 4 = Possible for some planets
- 3 = Possible for few planets
- 2 = Not against the laws of physics
- 1 = Warp drive

## **Theoretical Importance**

- 5 = Crucial
- 4 = Important
- 3 = Useful
- 2 = Nice to have
- 1 = Irrelevant

**Implementation:** google poll will be established – stand by

# Parameter Categories

- Orbital
- Stellar
- Basic Physical Parameters  
(mass, radius, bulk composition)
- Surface Properties
- Interior Properties
- External Factors

# Orbital Parameters

- semi-major axis
- eccentricity
- obliquity
- inclination
- rotation rate

# Stellar Parameters

- stellar spectrum
- stellar age
- stellar variability
- stellar winds
- stellar metallicity

# Basic Planet Parameters

- mass / gravity
- radius
- bulk composition

# Surface Properties

- planet reflected spectrum
- planet thermal spectrum
- planet transmission spectrum
- Bond albedo
- surface ocean fraction
- atmospheric composition
- clouds vs. hazes
- Wind Speed

# Interior Properties

- magnetic field
- plate tectonics
- volcanic activity
- interior heat flux
- tidal heating
- interior density structure

# External Factors

- impact rate
- impact history
- rings
- moons
- interplanetary dust

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Models, Laboratory Measurements, Archives

# Atmospheres in our solar system



**Heidi B. Hammel** shared Geekologie's photo.  
about an hour ago · 🧑



your cat wants one, trust me

The solar system cat hat

<http://geekologie.com/2013/06/omg-he-needs-that-solar-system-hat-for-y.php>

# Atmospheres in our solar system

Start with the  
**outer solar system**

*(because I just happen to have this slide already handy)*

*((been showing it for the past decade, in fact))*

# Solar System Exploration: Giant Planets

Past

Present

Future

1975

1985

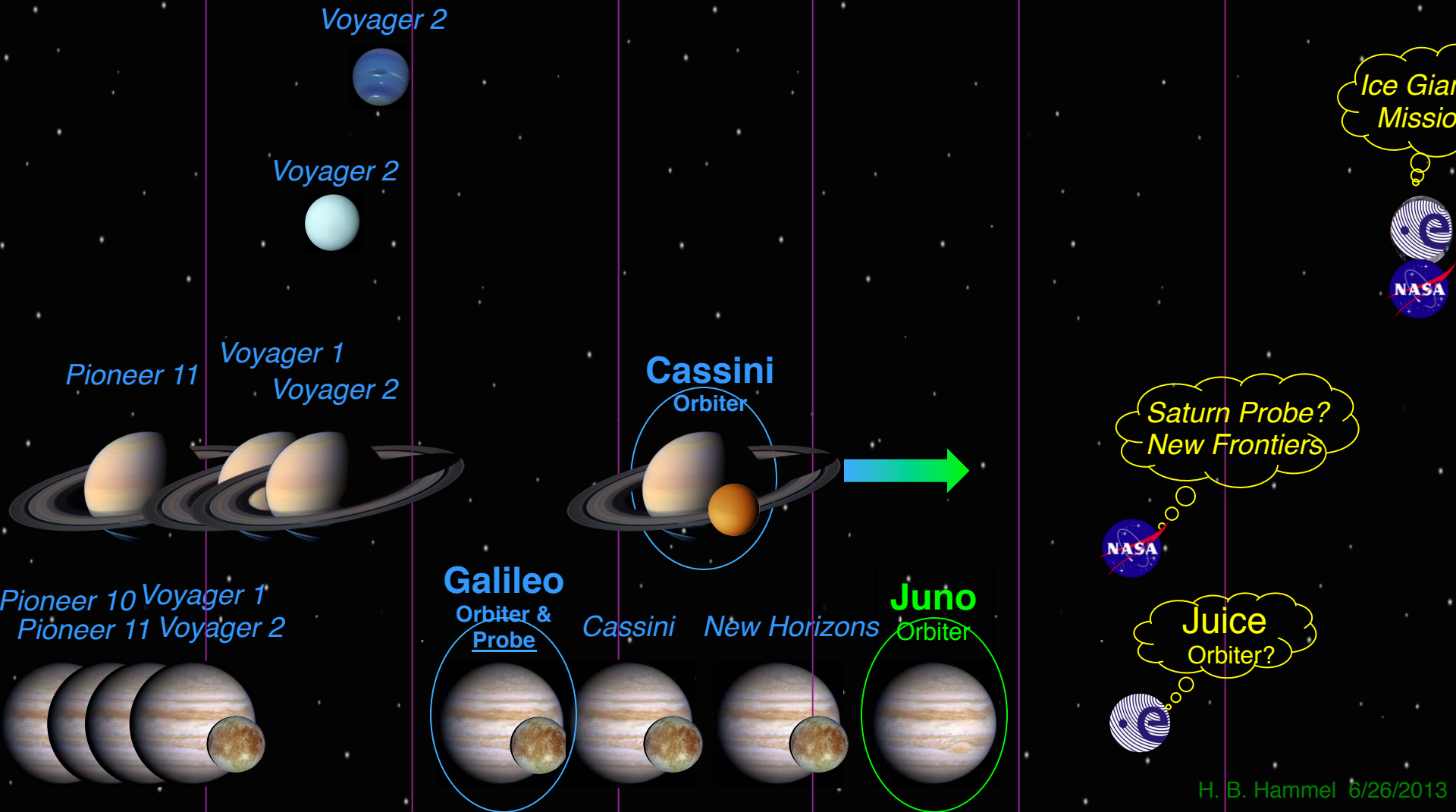
1995

2005

2015

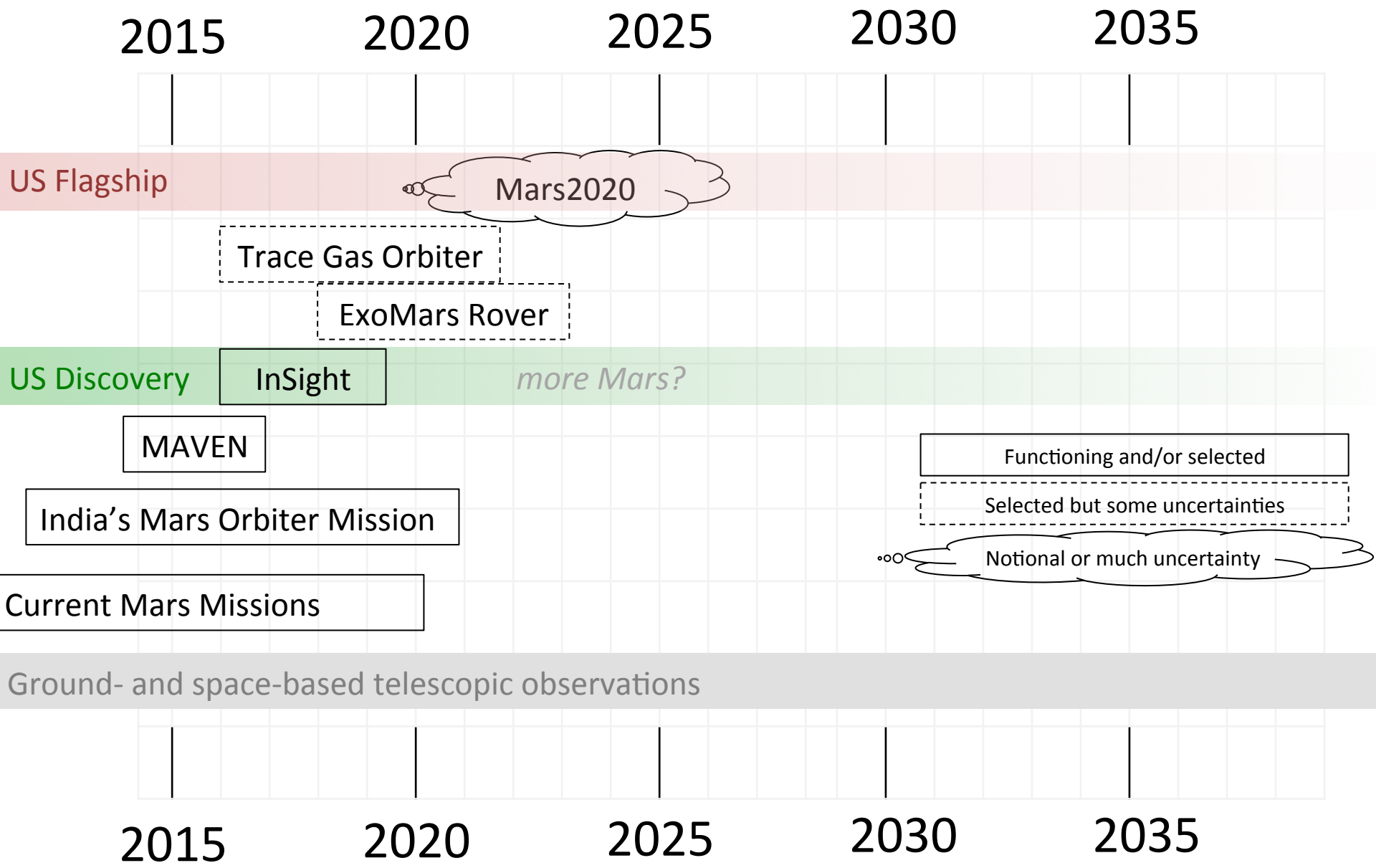
2025

2035

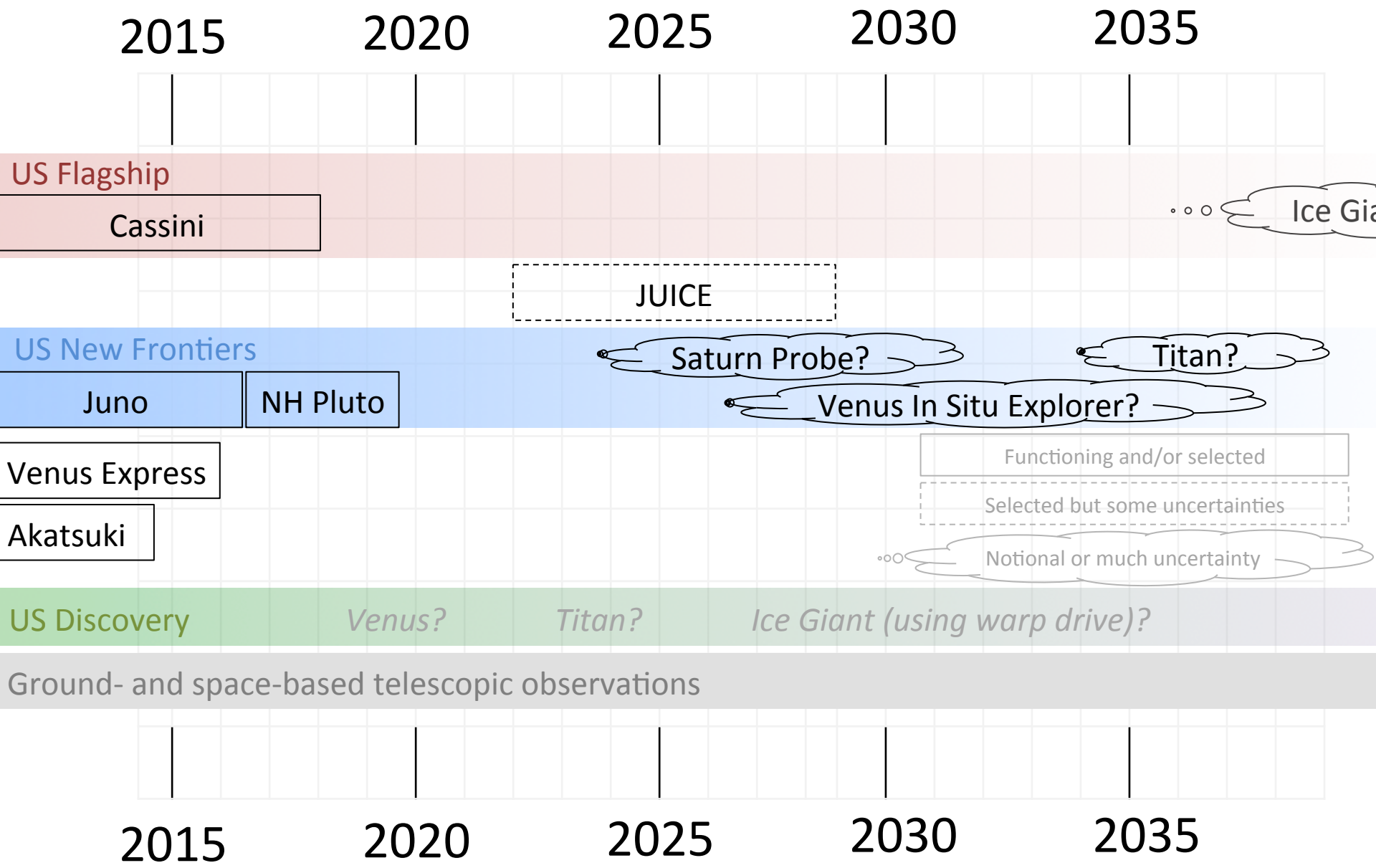


exploring atmospheres  
in our solar system  
with spacecraft

# Mars Atmosphere – NOTIONAL 6/28/2013

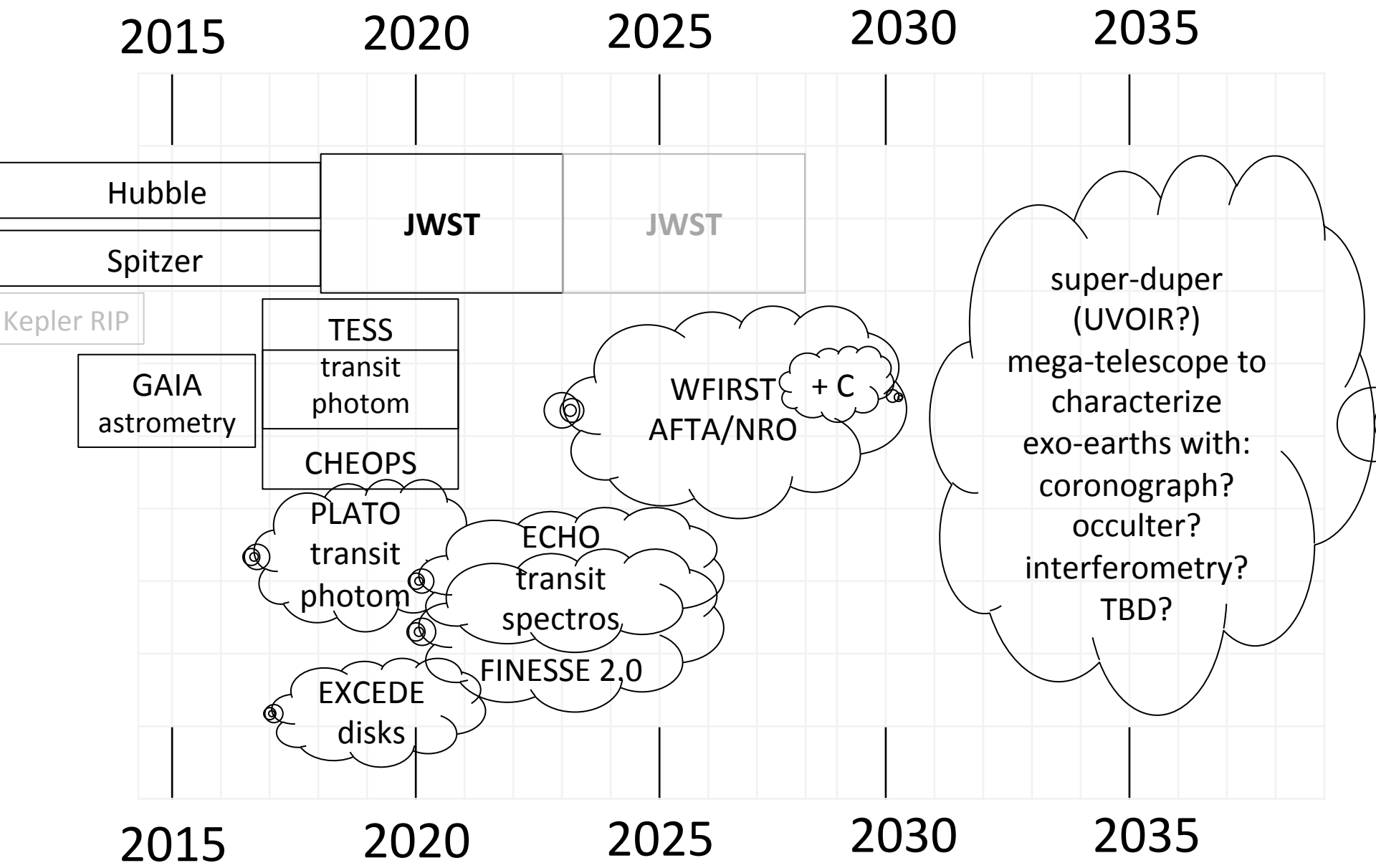


# Other SS Atmospheres – NOTIONAL 6/28/2013



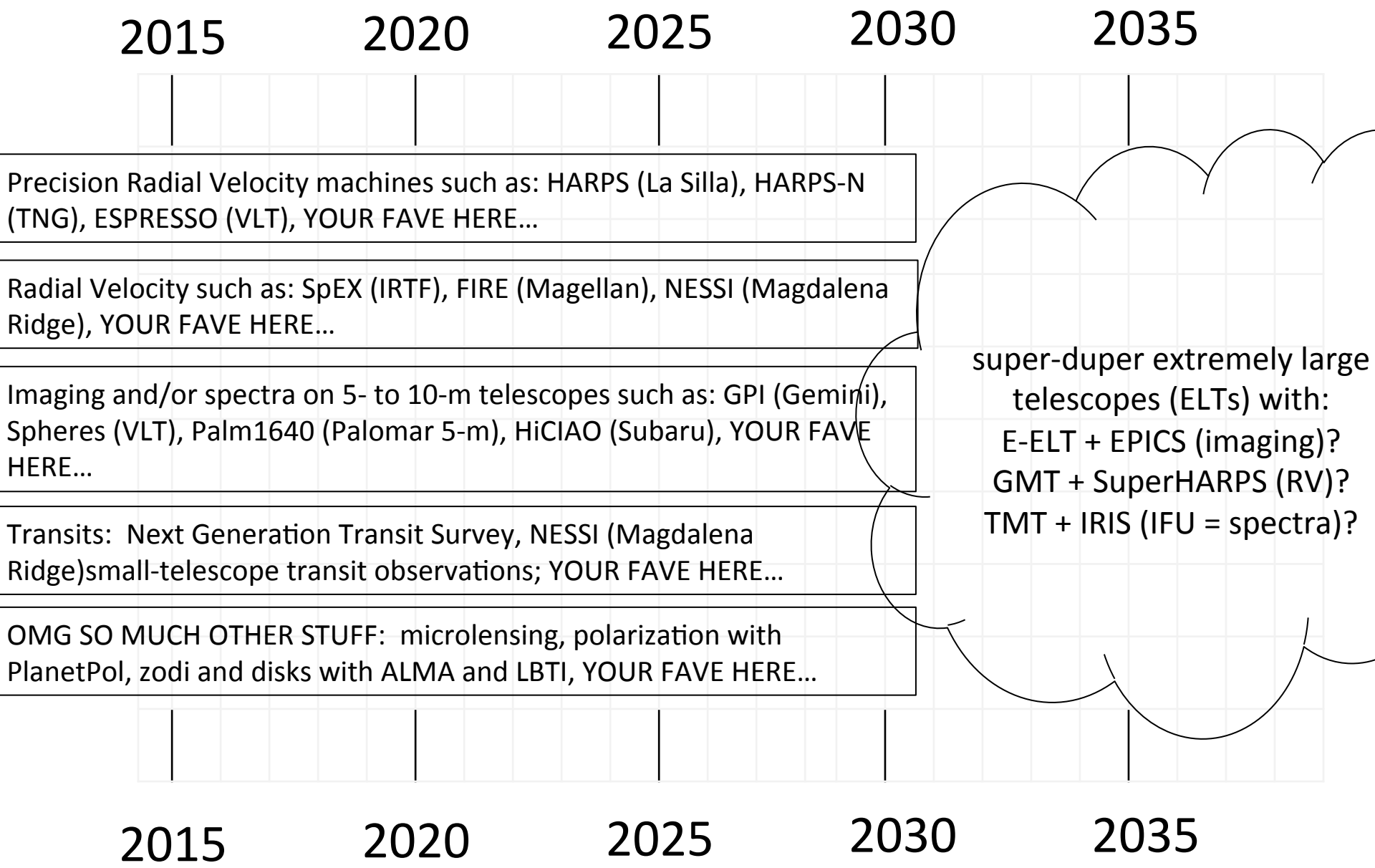
exploring atmospheres  
of exoplanets  
with spacecraft

# exoplanet atmospheres from space – NOTIONAL 6/28/2013



exploring atmospheres  
of exoplanets  
with ground-based telescopes

# exoplanet atmospheres from the ground – NOTIONAL 6/28/2013



# Looking to the future for Solar System planets



# Looking to the future

for exoplanets, the future's so bright  
you gotta wear shades

