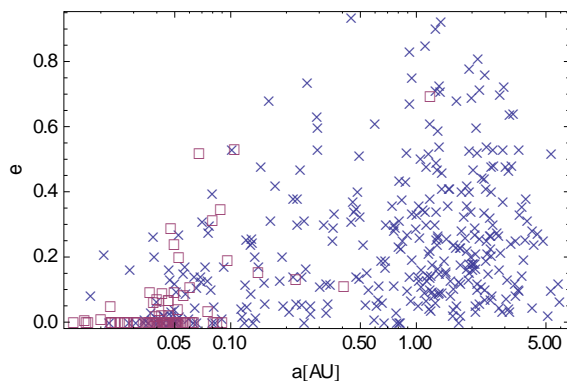


Formation of the solar system

- 3-min question: How do the planets in the solar system form?
- Questions to answer:
 - How does Jupiter form?
 - How does Earth form?
 - Where do Jovian and terrestrial planets form?
 - What determines the eccentricity?

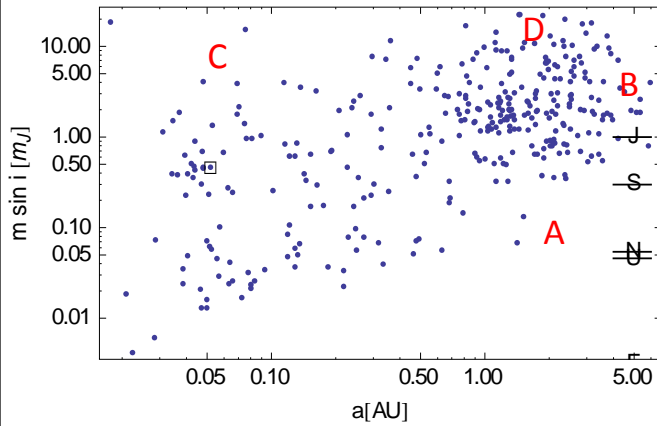
Sample biases



Semi-major axis and eccentricity of all extra-solar planets

1. The period of the planets with SMA=1AU is about
 - A. 10yr
 - B. 1yr
 - C. 0.1yr
 - D. 0.01yr
2. One sample was discovered by the transit method, and one by the radial velocity method. Data plotted with ____ is the radial velocity method.
 - A. squares
 - B. crosses

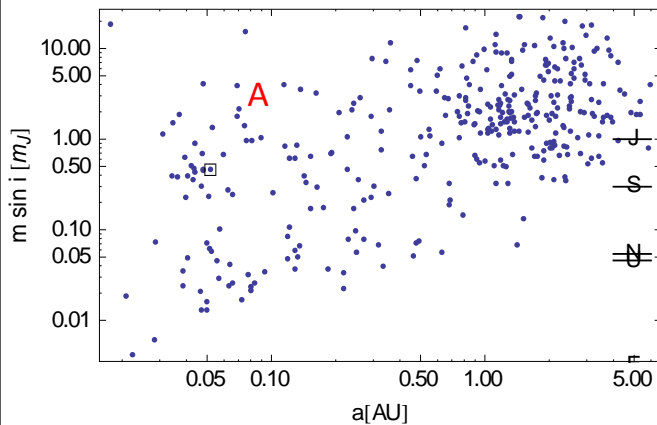
Mass & orbital radius of RV planets



Exo-planets found by measuring radial velocities from exoplanet.org
 Lines: Mass of planets in the solar system.
 Box: 51Peg b

- There are few planets in region A because
 - The velocities are too small to measure
 - The periods are too long for reasonable data series
 - Both A & B
 - There are few planets in reality.

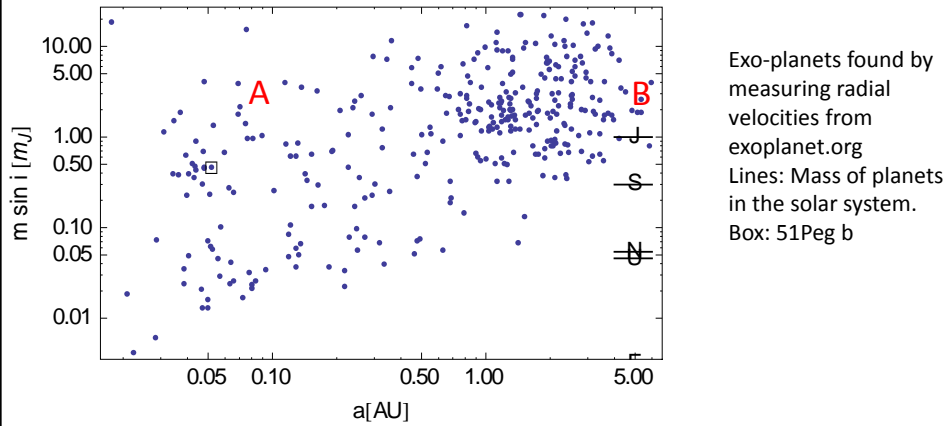
Mass & orbital radius of RV planets



Exo-planets found by measuring radial velocities from exoplanet.org
 Lines: Mass of planets in the solar system.
 Box: 51Peg b

- 3-min question: In what way is the formation of planets in region A a puzzle?

Mass & orbital radius of RV planets



- Jovian planets must form beyond the ice line at $a > 5\text{AU}$.
- 3-min question: What is needed for planets to migrate from region B to region A?