

SIM Lite Astrometric Observatory

Double Blind Search for Earths -1

NASA HQ asked the SIM Project to quantify SIM Lite's capabilities for detecting Earths in realistic planetary systems.

A "double-blind" experiment was designed to address the question. Team A prepared a set of test systems, Team B generated simulated data sets (including noise) for some of the test systems, Team C analyzed the data and searched for planets, and Team D synthesized and reported on the results.

What are the interesting questions?

- What is the threshold of Earth-analog detection?

- Do other planets in the system interfere with the detection of terrestrial planets in the habitable zone?
- What is the reliability of detection?
- What is the completeness?
(= What are the chances that a planet will be detected?)

These questions are applicable to all planets, terrestrial planets, habitable zone planets, and habitable terrestrial planets.

TEST SYSTEMS

Planetary Systems

- Random systems from Data Pool, Solar System Analogs, One-Earth, and No-Planets.
- Randomized orientations and orbital phase.
- Generated synthetic SIM Lite astrometry and radial velocity data.

Target stars

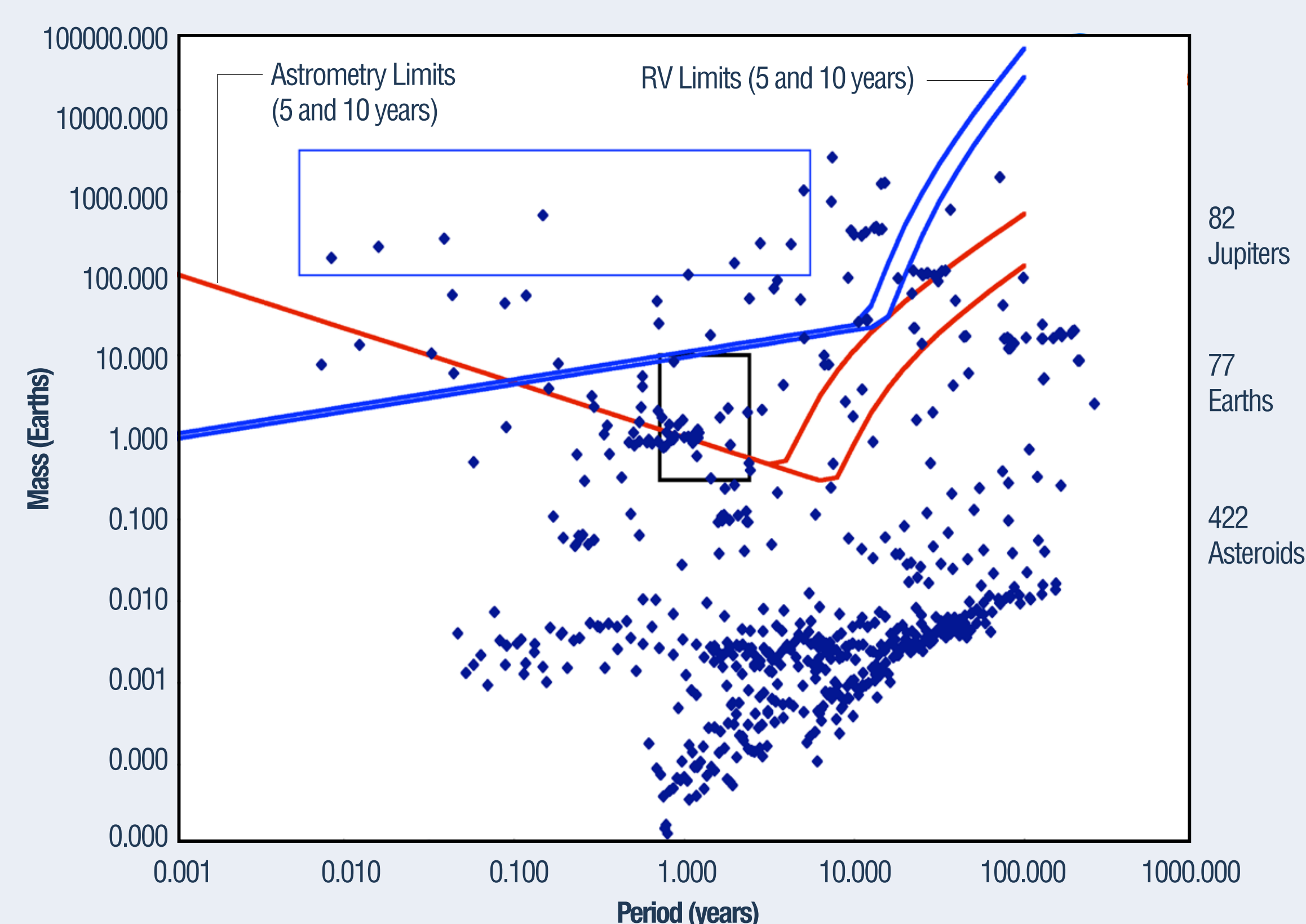
- One solar mass, 10 pc, 30 degrees latitude.

All significant effects are included in synthetic data

- Motion of observer (parallax effect).
- Space motion of target star (3-D space motion).
- Realistic sampling cadence.
- Astrophysical noise.
- Instrument systematic noise.

Blind Test Data

- 48 Stars and 581 Objects



Team A Groups: System modeling

Team A-1: Eric Ford, Univ. of Florida

Team A-2: Greg Laughlin, UC Santa Cruz

Team A-3: Hal Levison, Southwest Research Institute

Team A-4: Doug Lin, UC Santa Cruz

Team A-5: Sean Raymond, Univ. of Colorado

Team B: Generate simulated data sets, including noise

Andy Boden, NASA Exoplanet Science Institute

Valeri Makarov, NASA Exoplanet Science Institute

Team C Groups: Data analysis (different approaches)

Team C-1: Stefano Casertano, STScI

Team C-2: Debra Fischer, San Francisco State Univ.

Team C-3: Jeremy Kasdin, Princeton Univ.

Team C-4: Matt Muterspaugh, UC Berkeley

Team C-5: Mike Shao, JPL

Team D: Data synthesis

Chair: Wes Traub, JPL

Vice-Chair: Alan Boss, Carnegie Institution

Andy Gould, Ohio State University

Angelle Tanner, NASA Exoplanet Science Institute

Chas Beichman, NASA Exoplanet Science Institute

One member from each of the Team Cs & may include one member from Team A and one member from Team B.

External Independent Readiness Board (EIRB)

Chair: Vern Weyers, GSFC retired

Alan Boss, Carnegie Institution

Ed Groth, Princeton University

Joseph Wampler, consultant