Exoplanet Program Analysis Group Report

Astrophysics Subcommittee Meeting
July 22, 2015

Alan Boss
(ExoPAG EC Chair)

ExoPAG EC Membership

Alan Boss (Chair)	Carnegie Institution
Daniel Apai	University of Arizona
Rus Belikov	NASA Ames Research Center
David Ciardi	NASA Exoplanet Science Institute
Nick Cowan	Amherst College
Shawn Domagal-Goldman	NASA Goddard Space Flight Center
Amy Lo	Northrup Grumman
Peter Plavchan	Missouri State University
Gene Serabyn	Jet Propulsion Laboratory
Maggie Turnbull	Global Science Institute
Lucianne Walkowicz	Adler Planetarium
Scott Gaudi (Past Chair, Ex officio)	Ohio State University
Martin Still (Ex officio)	NASA Headquarters
Wes Traub (Ex officio)	Jet Propulsion Laboratory

ExoPAG 12 (Chicago AbSciCon)

- Updates on LBTI, final reports on Exo-S, Exo-C, and AFTA-C mission concept studies
- Consistent analysis of science yields for Exo-S, Exo-C, and AFTA-C (Wes Traub)
- Closed out one SAG (SAG9)
- Chartered one new SAG (SAG13)
- Talks on polarization, oxygen biosignatures, K2 microlensing workshop
- Continued work on response to Hertz charge - the SIG1 discussion – led by Scott Gaudi)

Requested SAG Approvals

- SAG9: Exoplanet Probe to Medium Scale Direct-Imaging Mission Requirements and Characteristics (Rémi Soummer, Chair)
- SAG9 Final Report approved by ExoPAG EC – APS?
- SAG13: Exoplanet Occurrence Rates and Distributions (Rus Belikov, Chair)
- SAG13 Charter approved by ExoPAG EC – APS?

SAG9: Exoplanet Probe to Medium Scale Direct-Imaging Mission Requirements and Characteristics

- **Conclusions**
- SAG-9 refocused goals to avoid overlap with Exo-C/S and AFTA-SDT
- Main results:

‣ DRM studies as a function of scale and coronagraph/starshade approach (R. Brown ApJ 2015)

‣ Sensitivity study to main parameters for AFTA

- Resolution and Throughput impact total mission time but preserve the same number of characterized planets

- IWA directly impacts the number of characterized planets regardless of mission time (factor ~2 between 3 and 4λ/D)

‣ Cross-validation and reconciliation of various exposure time calculations

• Initiated community discussions on RV surveys for direct imaging

‣ 2014 focused study by Howard & Fulton

‣ New RV facility announced by NASA

‣ Established a process to define RV surveys needed for future direct imaging missions (to be continued beyond SAG-9)

SAG13: Exoplanet Occurrence Rates and Distributions

- **Charter:**
- Over 5000 exoplanets and exoplanet candidates have been discovered to date. Many studies have been published and are on-going to determine exoplanet occurrence rates and distributions, particularly for potentially habitable worlds. These studies employ different statistical and debiasing methods, different definitions of terms such as eta_Earth and habitable zone, different degrees of extrapolation, and present distributions in different units from each other. The primary goal of this SAG is to evaluate what we currently know about planet occurrence rates, and especially eta_Earth, by consolidating, comparing, and reconciling discrepancies between different studies. A secondary goal is to establish a standard set of occurrence rates accepted by as much of our community as possible to be used for mission yield estimates for missions to be considered by the decadal survey.
- **Key objectives and questions:**
- Propose standard nominal conventions, definitions, and units for occurrence rates/ distributions to facilitate comparisons between different studies.
- Do occurrence estimates from different teams/methods agree with each other to within statistical uncertainty? If not, why?
- For occurrence rates where extrapolation is still necessary, what values should the community adopt as standard conventions for mission yield estimates?

ExoPAG Future Activities

- Continue to work with Scott Gaudi on SIG1 response to Hertz charge
- Continue monthly ExoPAG EC telecons
- Hold ExoPAG 13 meeting prior to AAS winter meeting: January 3-4, 2016 in Kissimmee, Florida