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COMMISSION 53 EXTRASOLAR PLANETS

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TRIENNIAL REPORT 2009-2012

1. Introduction

Commission 53 was created at the 2006 Prague General Assembly (GA) of the IAU, in recognition of the outburst of astronomical progress in the field of extrasolar planet discovery, characterization, and theoretical work that has occurred since the discovery of the first planet in orbit around a solar-type star in 1995. Commission 53 is the logical successor to the IAU Working Group on Extrasolar Planets (WGESP), which ended its six years of existence in August 2006. The founding President of Commission 53 was Michael Mayor, in honor of his seminal contributions to this new field of astronomy. The current President is Alan Boss, the former chair of the WGESP. The current members of the Commission 53 (C53) Organizing Committee (OC) began their service in August 2009 at the conclusion of the Rio de Janeiro IAU GA.

2. Exoplanet Definitions and Lists

The WGESP developed in 2001 a Working Definition of what is a 'planet', subject to change as we learn more about the population of extrasolar planets. The Working Definition was last modified in 2003 to address the question of objects found by imaging surveys in regions of active star formation. The current Working Definition can be found on the WGESP web pages located at:

http://www.dtm.ciw.edu/boss/iauindex.html

Note that this definition does not attempt to address the lower mass limit for the range of bodies that should be considered as planets, other than to say that the lower mass limit should be same as that used for our Solar System. In 2006, the IAU adopted a definition for Solar System planets, which can be found here:

http://www.iau.org/public/pluto/

where the definition of a planet is given as:

'A celestial body that (a) is in orbit around the Sun, (b) has sufficient mass for its self-gravity to overcome rigid body forces so that it assumes a hydrostatic equilibrium (nearly round) shape, and (c) has cleared the neighbourhood around its orbit.'

Unfortunately, for exoplanet systems, we can be sure of (a), but not of (b) [even for transiting systems], much less (c). Hence the above definition in practice cannot be applied to determine the lower mass limit for exoplanets. However, this is not problem for exoplanets, at least not to date. This is because, with the exception of certain pulsar planets, all the extrasolar planets discovered to date are more massive than the Earth. The C53 OC thus has not seen fit to modify this Working Definition, though the situation may well change in the future.

The WGESP maintained a list of planetary candidates that met its criteria for acceptance as planets up until its demise in August 2006. This list also established a criterion for discovery rights, namely the date of submission for publication in a refereed journal. This list can be found on the WGESP web pages. C53 has decided not to try to continue to maintain this list of planets, given the immense popularity and greater usefulness of the list maintained by Jean Schneider and his colleagues at the Extrasolar Planets Encyclopaedia web site:

http://exoplanet.eu/

As of June 2011, the Extrasolar Planets Encyclopaedia raised the upper mass limit for inclusion in the Encyclopaedia to a value of 25 Jupiter masses This inclusion formally violates the WGESP upper mass limit for an object to be called a 'planet' of 13 Jupiter masses (for solar metallicity). However, in the past the Encyclopedia has routinely listed objects more massive than the WGESP limit, e.g., the RV detection with m sin i = 14.4 Jupiter masses of HD 162020b. The Encyclopaedia's reasoning is that it is preferable to base the upper mass limit for exoplanets on the empirical evidence based on the census of low mass stars, brown dwarfs, and Jupiters, as argued in their paper (Schneider *et al.* 2011), which may be downloaded from this web page:

http://exoplanet.eu/README.html

Schneider *et al.* (2011) invoke the 'brown dwarf desert' as an empirical indicator of two different populations, the 'exoplanets' and the 'binaries' (see Figure 2a on page 3 of Schneider *et al.* 2011), and suggest that these two populations separate at a mass of about 25 Jupiter masses. This empirical approach to defining the upper mass limit for an exoplanet thus differs greatly from that of the WGESP, which was based on the ability of objects to undergo thermonuclear fusion of deuterium. The question of the definition of what constitutes an 'exoplanet' evidently is one that will continue to be discussed and debated.

3. Nomenclature

In the last several years the C53 OC discussed and debated at some length several issues regarding the nomenclature for newly discovered extrasolar planets. The first issue arose as a result of a detailed paper written by W. Lyra proposing a scheme for naming exoplanets by using a number of names from the classical (Greek, Latin) literature, rather than by the more mundane, but functional, current system of using the star's name (e.g. 51 Peg) followed by lower case letters, in order of discovery, e.g., 51 Peg b, c, d. [The use of proper names, such as those in use for asteroids and comets, was also considered.] The C53 OC decided against changing the current system of naming exoplanets, which is geared toward the clarity of astronomical databases of stars and exoplanets.

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The second nomenclature issue dealt with the preferred means for naming exoplanets in systems of binary stars, e.g., Alpha Cen AB, where the planets could orbit either of the binary stars or could orbit both stars, i.e., a circumbinary planet. The C53 OC members discussed and voted upon several specific schemes for handling all possible combinations of binary and multiple star systems, but the C53 OC was unable to arrive at a consensus recommendation. Hence, no recommendation was made, and journal articles about exoplanets in binary systems are now published with nomenclatures agreed upon by the authors and journal editors involved.

4. Organizing Committee

The C53 Organizing Committee (OC) now has six members, one from the USA, two from Europe, one from Japan, one from Chile, and one from Australia, in accordance with IAU rules, which state that the OC should not have more than eight members and that OC members should be geographically diverse. Given that OC members are allowed to serve for two terms, the current OC is expected to serve again during 2012-2015.

5. Symposium and Special Session Sponsorship

C53 has been asked to support various proposals to hold IAU Special Sessions and Symposia, either at the 2012 IAU GA, or on their own. Many of these proposals were judged to be appropriate for C53 support. One of the successful proposals is of particular relevance for C53, namely IAU Symposium 293 on the Formation, Detection, and Characterization of Extrasolar Habitable Planets, to be held during the Beijing IAU GA.

6. New Members

As a recently formed IAU Commission, C53 continues to seek astronomers who wish to be recognized as C53 members. We encourage interested IAU members to ask to join C53, which can be accomplished simply by sending an e-mail to the C53 President or Vice President.

7. C53 Web Pages

The web pages for C53 are located at:

http://www.dtm.ciw.edu/boss/c53index.html

where a listing of the current members of C53 can be found, along with links to the WGESP web pages and to other items of interest.

8. Closing Remarks

C53 held its first Business Meeting during the IAU General Assembly in Rio de Janeiro on August 12, 2009. Several dozen current and prospective members of C53 attended and participated in the meeting. We look forward to holding our second C53 business meeting at the 2012 IAU GA and hope for an even larger attendance. At this meeting, we expect to welcome the selection of a new Vice President and to accept a number of new members of C53.

Alan P. Boss
President of the Commission