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Why is it necessary to establish a classification of extra-solar planets?

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Abstract. While working with extra-solar planet databases, it is very useful to have a taxonomy scale (classification), for example, like the Harvard classification for stars. This new taxonomy has to be comprehensible and present the most relevant information about extra-solar planets. We propose an extra-solar planet taxonomy scale with five parameters.

Key words: Catalogues - Extra-solar planet - Planets

If you are told that a star is class G2V, what does that tell you about the star?

This is a main-sequence star with the temperature ranging from 5,200 K to 6,000 K and the mass from 0.8 $M_{\odot}$ to 1.04 $M_{\odot}$, etc.

Can we recognize planets in a similar way as we classify stars? There are several known taxonomies in astronomy (e.g. Sudarsky et al., 2003; Marchi, 2007; Lundock et al., 2009), all of which are very precise, but don't allow for a quick picture to be painted in your mind.

Is there a system out there which can provide us with quick data for labelling purposes?

Yes, such a system does exist. It was proposed by Plávalová (2012) and uses five abbreviated parameters, written as a code, to allow for rapid recognition of planet's characteristics. A schematic explanation is in Figure 1.

May we see some examples of this classification?

According to this taxonomy scale, for example, Earth is 1E0W0t, Neptune is 1N1.5F0i, and extra-solar planet 55 Cnc e is 9E-1.8R1.

Are there any other advantages of this classification?

Without quite a wide table, it is impossible to say which planet is the smallest, which has the farthest or the closest orbit, or which planet has the highest eccentricity, etc. Using our taxonomy, one can answer these questions practically immediately. You could try it yourselves using only the second line of Table 1.

What are the required values for this classification?

We need to know the values of the mass, semi-major axis, and the eccentricity of the extra-solar planet in question. We also need to determine the values of the radius and effective temperature of its parent star and from these five values we can classify an extra-solar planet.

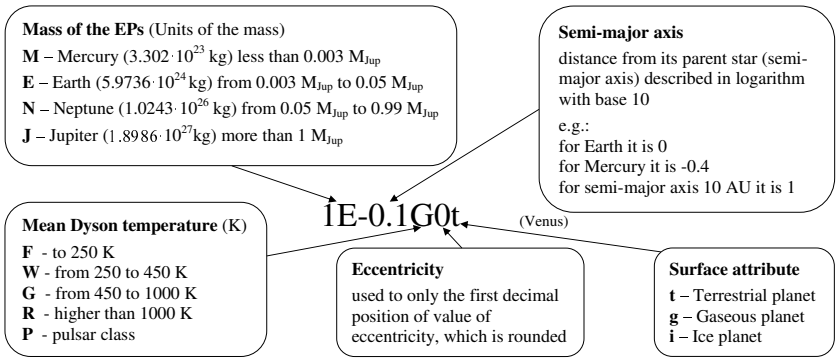

Figure 1. Schematic explanation - a definition of the taxonomy of the planets for which we are able to determine the taxonomy scale (Plávalová, 2012). This is a taxonomy class for Venus.

Table 1. Three extra-solar planets in system Kepler 20 and two in system Kepler 87.

Name	Kepler 20b	Kepler 20c	Kepler 20d	Kepler 87b	Kepler 87c
Taxonomy	9E-1.3R3	1N-1R4	1N-0.5G6	1J-0.3G0	6E-0.2G0
M $[M_{Jup}]$	0.027	0.051	0.06	1.02	0.0201
a $[au]$	0.04537	0.093	0.3453	0.471	0.664
log (a)	-1.34	-1.03	-0.46	-0.33	-0.18
MDT[1] $[K]$	1679.9	1169.0	600.5	746.5	628.7
e	0.32	0.4	0.6	0.036	0.039

1 MDT is the value of a Mean Dyson temperature (Plávalová, 2012).

Why is it necessary to establish a classification of the extra-solar planets?

Due to recent successful missions, such as Kepler and COROT, and the eminent launch of GAIA or near future projects such as TESS, CHEOPS and many others, we will soon be inundated with huge volumes of data for which we need to have a system in place ready to absorb this data.

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