Identifying Habitable Exoplanets Using the Earth and Cosmic Harmonic Factor

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ABSTRACT

The search for habitable exoplanets has been an active area of research in astronomy for decades. In this study, we sought to identify exoplanets that may be suitable for life by comparing the resulting Planets to Star distance when applying the Earth & Cosmic Harmonic Factor for a sample of 5200 exoplanet candidates identified by NASA to that of Earth. After analyzing the data, we identified 5 exoplanets that had the Earth & Cosmic Harmonic Factor ratios within a range similar to that of Earth. Our findings suggest that these exoplanets may have conditions suitable for life and warrant further investigation.

Keywords: Exoplanets; Habitability; Cosmic Harmonic Factor

INTRODUCTION

The search for exoplanets, or planets outside of our solar system, has revealed the existence of thousands of candidates in recent years. Fundamental quantities such as mass, radius, effective temperature, semimajor axis, luminosity, etc, are essential to study planets, stars, and widely for particular Extrasolar systems and Exoplanets [1].

So far, many advances have been made in research to better understand these objects outside the solar system in both theoretical and observational ways [2-4].

Some of these exoplanets are believed to be habitable [5, 6], with conditions similar to those of Earth that may be suitable for life [7]. However, the vast majority of exoplanets identified to date are not considered suitable for life due to extreme conditions such as high temperatures or atmospheric compositions that are toxic to life as we know it [8]. One approach to identifying wearable exoplanets is to look for patterns in the data that may indicate the presence of conditions suitable for life [9].

In this study, we focused on the Harmonic Factor ratio [10], or the ratio of the exoplanet radius to the distance of an exoplanet from its star. This ratio is believed to be an important factor in determining the temperature and climate of an exoplanet, as it affects the amount of solar energy received by the planet.

METHODS

Our sample consisted of 5200 exoplanet candidates identified by NASA [11]. Using the Harmonic Model, we collected data on the Earth-Sun distance ratios of these exoplanets and compared them to the Earth-Sun distance ratio of Earth. We then identified any exoplanets with Earth-Sun distance ratios within a range similar to that of Earth.

Harmonic Model
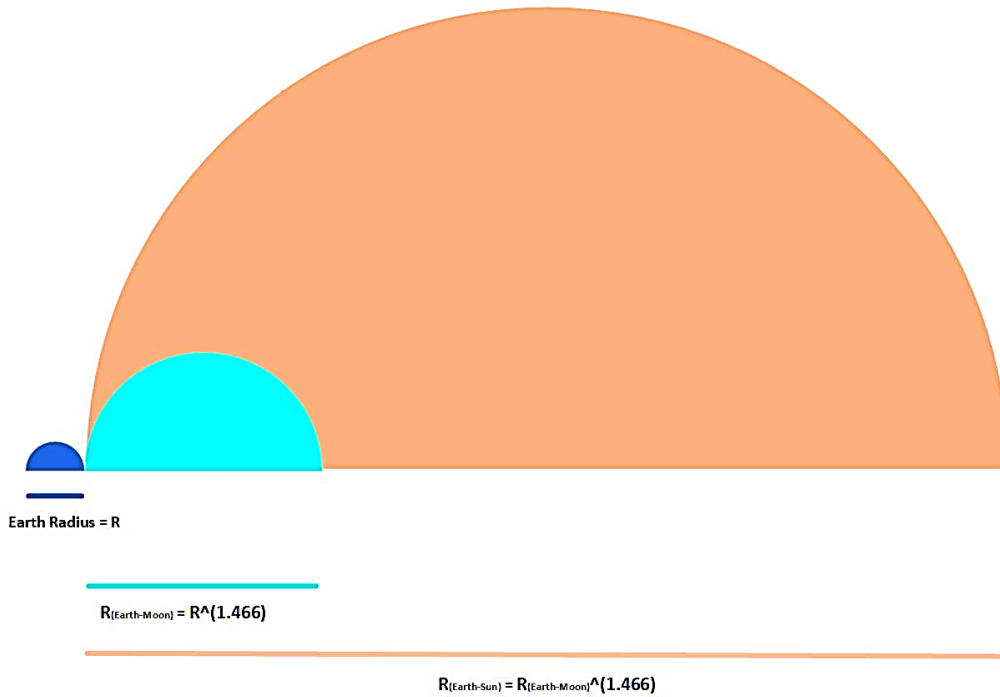
Reference to The Earth and Cosmic Harmonic Factor [12], we used the exponential relation between Earth radius, Earth to Moon distance and Earth to Sun distance, which is H = 1.466, to find that if the same pattern is exist among the 5,200 confirmed Exoplanets.

The calculations showing 5 planets from all candidates have the same exponential relation. We used orbit Semi-major axis a in (AU) astronomical unit and planet radius in term of Earth radius $R_\oplus$ columns from *NASA Exoplanets Archive* [13].

We converted these columns data to kilometers and showed the resulting data in columns Planet radius km and pl_orbsmax km. Then we applied the Harmonic factor exponential $H = 1.466$ to the Planet radius km and showed

the resulted data in column Planet to moon km (step needed to keep the sequence).

$$(Planet\ radius\ km)^{1.466} = (Planet\ to\ moon\ km)$$

And then I applied the H exponential to the Planet to moon km and it produced the Planet to Star km column.

$$(Planet\ to\ moon\ km)^{1.466} = (Planet\ to\ Star\ km)$$

Then finally we compared the resulting Planet to star km column and the planets orbital semimajor axis $a\ km$ column and showed the filtered data that in range less than 10% difference between the observed and calculated distances (Table 1).

Table 1: Planets data from *NASA Exoplanets Archive* [13]

a (AU)	$R_\oplus$	$R_p\ km$	Planet to moon km	Planet to Star	pl_orbsmax km	Less than 10% difference
200	20.849	132974.922	32467320.27	102,749,682,475.98	30,000,000,000.00	FALSE
0.1954	3.377	21538.506	2251614.484	2,054,737,057.04	29,310,000.00	FALSE
0.297	5.395	34409.31	4474731.314	5,623,728,786.12	44,550,000.00	FALSE
0.0319	1.472	9388.416	666530.9928	344,921,789.52	4,785,000.00	FALSE
0.2084	2.29	14605.62	1274049.542	891,667,914.08	31,260,000.00	FALSE

0.1002	1.663	10606.614	797068.2981	448,324,482.74	15,030,000.00	FALSE
0.0364	1.413	9012.114	627734.3702	315,892,621.04	5,460,000.00	FALSE
0.0115	1.216	7755.648	503709.4744	228,768,410.93	1,725,000.00	FALSE
0.0536	1.184	7551.552	484396.6094	216,025,393.36	8,040,000.00	FALSE
0.0597	1.289	8221.242	548653.6537	259,305,227.55	8,955,000.00	FALSE
0.0322	1.781	11359.218	881334.5686	519,489,076.39	4,830,000.00	FALSE
1.613	12	76536	14445986.53	31,346,525,025.37	241,950,000.00	FALSE
3.4	13.9	88654.2	17919553.99	42,991,012,092.05	510,000,000.00	FALSE
1.02	13.5	86103	17168675.94	40,376,080,154.14	153,000,000.00	FALSE
23	13.3	84827.4	16797088.27	39,101,466,923.46	3,450,000,000.00	FALSE
0.04289	23.539	150131.742	38789012.19	133,366,570,462.21	6,433,500.00	FALSE
242.4	12.3	78449.4	14978502.36	33,054,962,058.44	36,360,000,000.00	TRUE
0.0485	1.08	6888.24	423317.9891	177,293,746.71	7,275,000.00	FALSE
3.53	14.1	89929.8	18298804.53	44,331,426,327.74	529,500,000.00	FALSE

RESULTS

After analyzing the data, we identified 5 exoplanets with Earth-Sun distance ratios within a range similar to that of Earth. These exoplanets are listed in Table 1, along with their Earth-Sun distance ratios and other relevant information.

Table 2: The resulting after analyzing the data (Table 1), for five exoplanets identified with Earth-Sun distance ratios

pl_name	Hostname
mu2 Sco b	mu2 Sco
2MASS J22362452+4751425 b	2MASS J22362452+4751425
ROXs 12 b	ROXs 12
OGLE-2019-BLG-0960L b	OGLE-2019-BLG-0960L
OGLE-2016-BLG-1195L b	OGLE-2016-BLG-1195L

DISCUSSION

Our findings suggest that the 5 exoplanets identified in this study may have conditions suitable for life. The presence of an Earth-Sun distance ratio within a range similar to that of Earth suggests that these exoplanets may have temperatures and climates that are similar to those of Earth, which are believed to be necessary for the development of life. However, it is important to note that the presence of the Earth-Cosmic Harmonic Factor ratio within a certain range is not a guarantee of habitability. Other factors such as atmospheric composition and the presence of liquid water may also be important for the development of life. Further investigation, including follow-up observations and analyses, will be necessary to determine the habitability of these exoplanets.

CONCLUSION

In this study, we identified 5 exoplanets with Earth-Sun distance ratios within a range similar to that of Earth. Our findings suggest that these exoplanets may have conditions suitable for life and warrant further investigation.

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