

september 23, 2024

exoplanet exploration

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⚠ Data may not be self-consistent if drawn from multiple sources, including calculations. (Learn more)

Planetary Systems Composite Data

Planet Name	Host Name	Number of Stars	Number of Planets	Discovery Method	Discovery Year	Discovery Facility	Controversial Flag	Orbital Period [days]	Orbit Semi-Major Axis [au]	Planet Radius [Earth Radius]	Planet Radius [Jupiter Radius]	Planet Mass or Mass+sin(i) [Earth Mass]	Planet Mass [Jupiter Mass]
11 Com b	11 Com	2	1	Radial Velocity	2007	Xinglong Station 0		323.21 ^{+0.08} _{-0.08}	1.178±0.007	12.2	1.09	4914.9 ^{+38.1} _{-38.7}	15.464 ^{+1.9} _{-1.9}
11 UMi b	11 UMi	1	1	Radial Velocity	2009	Thursteiner Lande 0		516.2199743±20000	1.53±0.07	12.43	1.09	4685±795	14.74±2
14 And b	14 And	1	1	Radial Velocity	2008	Okayama Astroph 0		186.76 ^{+0.11} _{-0.12}	0.775±0.000	13.1	1.16	1131 ⁺³⁹ ₋₃₉	3.559 ^{+0.9} _{-0.9}
14 Her b	14 Her	1	2	W. M. Keck Obser 0	2002	W. M. Keck Obser 0		1765.03890 ^{+1.87709} _{-1.87709}	2.774 ^{+0.109} _{-0.109}	12.6	1.12	2559 ⁺³⁹¹ ₋₃₉₁	8.053 ^{+1.9} _{-1.9}
16 Cyg B b	16 Cyg B	3	1	Radial Velocity	1996	Multiple Observat 0		798.50000±1.00000	1.66±0.03	13.5	1.2	566±25	1.78±0.0
17 Sco b	17 Sco	1	1	Radial Velocity	2020	Lick Observatory 0		578.38 ^{+0.03} _{-0.03}	1.45±0.02	12.9	1.15	1373 ⁺³⁸ ₋₃₈	4.32 ^{+0.1} _{-0.1}
18 Del b	18 Del	2	1	Radial Velocity	2008	Okayama Astroph 0		982.85 ^{+0.03} _{-0.03}	2.47±0.002	12.5	1.12	2926 ⁺⁵¹ ₋₅₁	9.207 ^{+1.9} _{-1.9}
1RXS J160929.1-210524 b	1RXS J160929.1-1	1	1	Imaging	2008	Gemini Observat 0			330	18.647	1.664	3000±300	8±1
24 Boo b	24 Boo	1	1	Radial Velocity	2018	Okayama Astroph 0		30.33 ^{+0.30} _{-0.01}	0.194±0.000	13.9	1.24	281 ⁺¹¹ ₋₁₄	0.883 ^{+0.1} _{-0.1}
24 Sex b	24 Sex	1	2	Radial Velocity	2010	Lick Observatory 0		452.8 ^{+12.1} _{-4.3}	1.333 ^{+0.004} _{-0.008}	13.4	1.19	632±46	1.96 ^{+0.3} _{-0.3}
24 Sex c	24 Sex	1	2	Radial Velocity	2010	Lick Observatory 0		883.0 ^{+12.4} _{-12.4}	2.06 ^{+0.02} _{-0.02}	13.9	1.24	273.32 ^{+89.82} _{-89.82}	0.86 ^{+0.2} _{-0.2}
2MA437 b	2MASS J04372171-1	1	1	Imaging	2021	Subaru Telescope 0			18.0±1.3	1.3	1.16	1217±318	4±1
2MASS J0333563-5515561 Ab b	2MASS J0103352	1	1	Imaging	2013	Paranal Observat 0			84	12.3	1.1	4132±318	13±1
2MASS J01255093-2439505 b	2MASS J0125205	1	1	Imaging	2013	W. M. Keck Obser 0			526	12.3	1.0	7786.5±794.5	24.5±2.5
2MASS J02192210-3625225 b	2MASS J0219221	1	1	Imaging	2015	Coro Tololo Inter-0			156±10	16.1±0.3	14.4±0.03	4118±350	13.6±1.1
2MASS J0249-0557 c	2MASS J0249-05.2	1	1	Imaging	2018	Mauna Kea Obser 0			1950±200	12.4	1.11	3687 ⁺⁴¹² ₋₃₁₈	11.9±1.1
2MASS J0305086+2003961 b	2MASS J0350961	1	1	Imaging	2024	European Space 0			57±2	12.2	1.08	5721±318	18±1
2MASS J04414489-2301513 b	2MASS J044144E	1	1	Imaging	2010	Hubble Space Tel 0			152±7	16.4±1.3	11.3	2383.6±794.5	7.5±2.5
2MASS J11011926-732383 b	2MASS J1101192	1	1	Imaging	2024	European Space 0			266±8	11.9	1.06	8899 ⁺³¹⁷⁸ ₋₂₂₀₅	28 ⁺¹⁰ ₋₇
2MASS J11550485-1919108 b	2MASS J1155048	1	1	Imaging	2024	European Space 0			268±8	12.1	1.08	6357±318	20±1
2MASS J12073436-3902539 b	2MASS J1207334	1	1	Imaging	2004	Paranal Observat 0			95±0.2	12.9	1.15	1589±636	5±2
2MASS J19383260+4603591 b	2MASS J193832E	2	3	Eclipse Timing Via 2015	2015	Kapler 0		406±4	0.92±0.02	13.4	1.2	604±32	1.9±0.1
2MASS J12525752-8138278 b	2MASS J125257E	1	1	Imaging	2024	European Space 0			749±11	12.4	1.1	3814±318	12±1

Showing records 1 to 28 of 5759 (5759 total)

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data sources

Solar system planetary data from NASA as well:

<https://nssdc.gsfc.nasa.gov/planetary/factsheet/>

Planetary Fact Sheet - Metric

	MERCURY	VENUS	EARTH	MOON	MARS	JUPITER	SATURN	URANUS	NEPTUNE	PLUTO
Mass (10^{24} kg)	0.330	4.87	5.97	0.073	0.642	1898	568	86.8	102	0.0130
Diameter (km)	4879	12,104	12,756	3475	6792	142,984	120,536	51,118	49,528	2376
Density (kg/m ³)	5429	5243	5514	3340	3934	1326	687	1270	1638	1850
Gravity (m/s ²)	3.7	8.9	9.8	1.6	3.7	23.1	9.0	8.7	11.0	0.7
Escape Velocity (km/s)	4.3	10.4	11.2	2.4	5.0	59.5	35.5	21.3	23.5	1.3
Rotation Period (hours)	1407.6	-5832.5	23.9	655.7	24.6	9.9	10.7	-17.2	16.1	-153.3
Length of Day (hours)	4222.6	2802.0	24.0	708.7	24.7	9.9	10.7	17.2	16.1	153.3
Distance from Sun (10^6 km)	57.9	108.2	149.6	0.384*	228.0	778.5	1432.0	2867.0	4515.0	5906.4
Perihelion (10^6 km)	46.0	107.5	147.1	0.363*	206.7	740.6	1357.6	2732.7	4471.1	4436.8
Aphelion (10^6 km)	69.8	108.9	152.1	0.406*	249.3	816.4	1506.5	3001.4	4558.9	7375.9
Orbital Period (days)	88.0	224.7	365.2	27.3*	687.0	4331	10,747	30,589	59,800	90,560
Orbital Velocity (km/s)	47.4	35.0	29.8	1.0*	24.1	13.1	9.7	6.8	5.4	4.7
Orbital Inclination (degrees)	7.0	3.4	0.0	5.1	1.8	1.3	2.5	0.8	1.8	17.2
Orbital Eccentricity	0.206	0.007	0.017	0.055	0.094	0.049	0.052	0.047	0.010	0.244
Obliquity to Orbit (degrees)	0.034	177.4	23.4	6.7	25.2	3.1	26.7	97.8	28.3	119.5
Mean Temperature (C)	167	464	15	-20	-65	-110	-140	-195	-200	-225
Surface Pressure (bars)	0	92	1	0	0.01	Unknown*	Unknown*	Unknown*	Unknown*	0.00001
Number of Moons	0	0	1	0	2	95	146	28	16	5
Ring System?	No	No	No	No	No	Yes	Yes	Yes	Yes	No
Global Magnetic Field?	Yes	No	Yes	No	No	Yes	Yes	Yes	Yes	Unknown
	MERCURY	VENUS	EARTH	MOON	MARS	JUPITER	SATURN	URANUS	NEPTUNE	PLUTO

formula to calculate HZ range

```
hz_zone_plot_data['hz_zone_inner'] = (((hz_zone_plot_data['st_rad'] * 696000) * (hz_zone_plot_data['st_teff'] ** 2) * (1.13 ** 2) * ((1 - 0.306) ** 0.5)) / (2 * (373.15 ** 2))) / 149598023
```

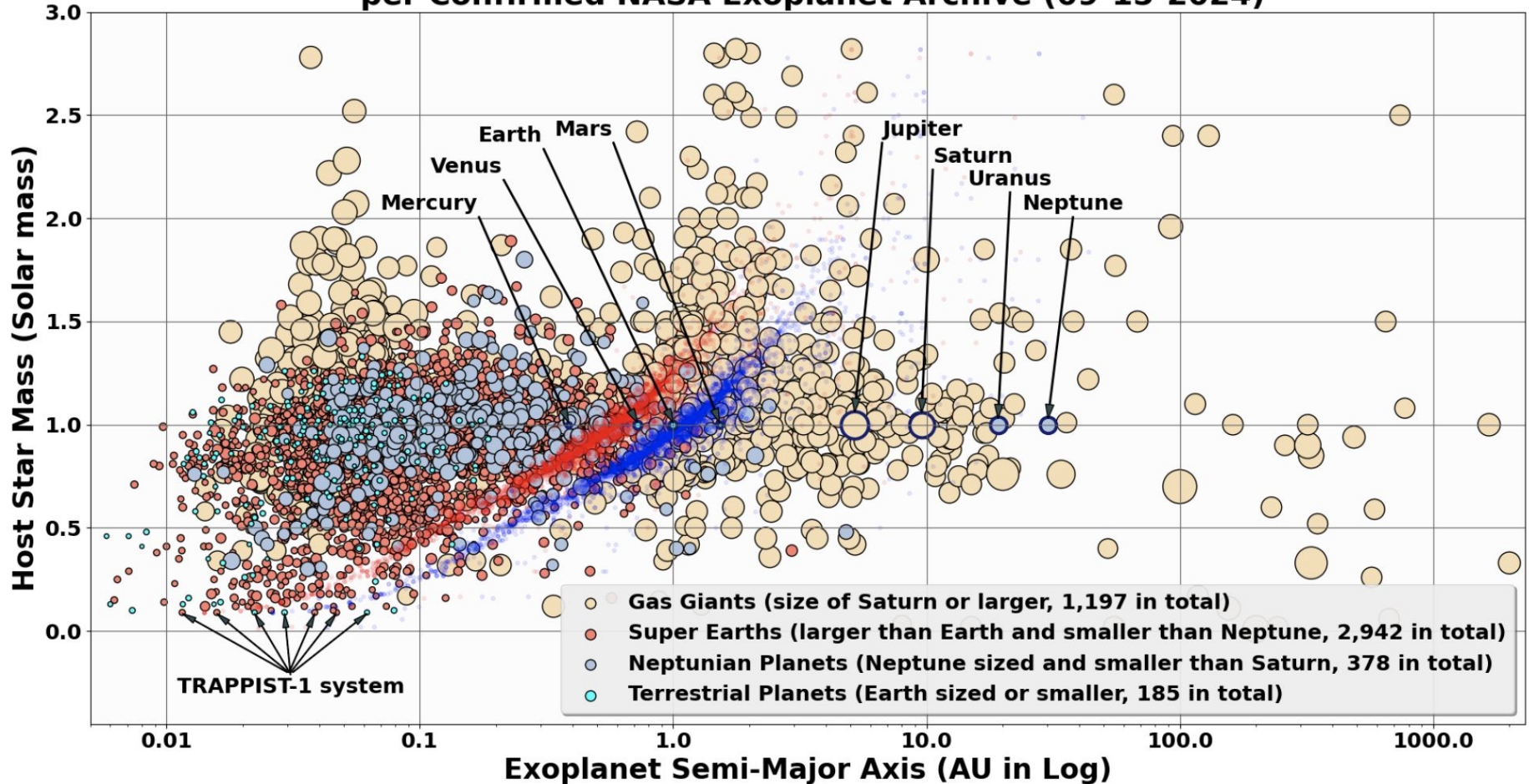
```
hz_zone_plot_data['hz_zone_outer'] = (((hz_zone_plot_data['st_rad'] * 696000) * (hz_zone_plot_data['st_teff'] ** 2) * (1.13 ** 2) * ((1 - 0.306) ** 0.5)) / (2 * (273.15 ** 2))) / 149598023
```

^^ based on the formula brought forth in our paper: $T_{surf,ave} = kT_{\odot}(1 - A)^{0.25}(\frac{R_{\odot}}{2d})^{0.5}$

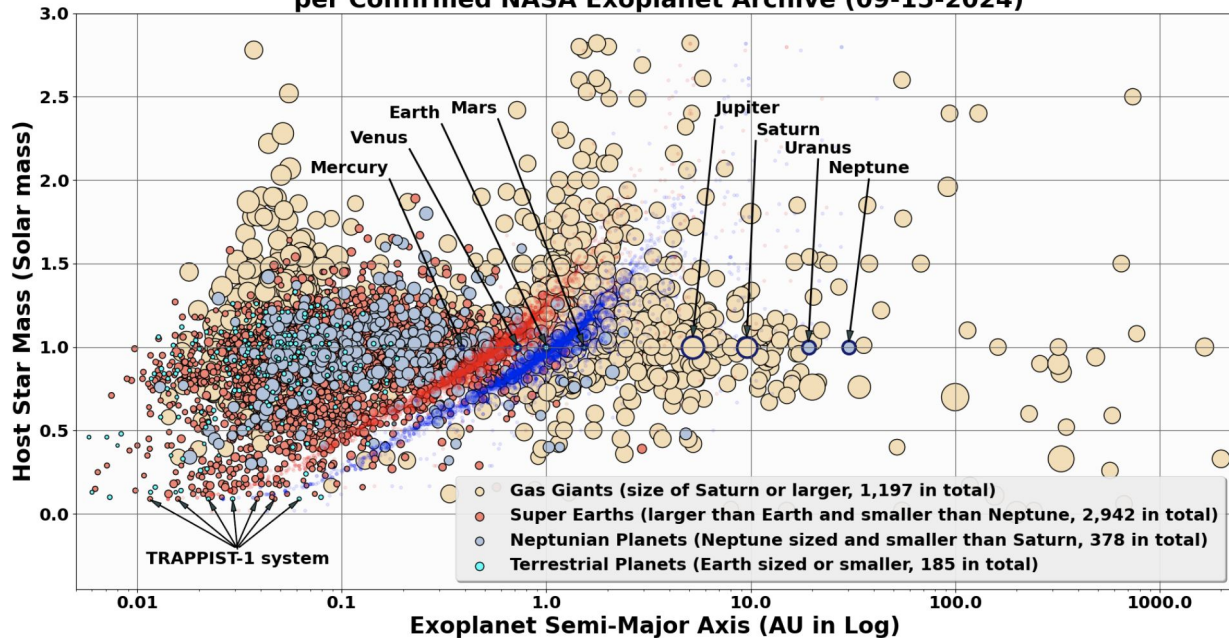
from the paper's formula, we can calculate the inner and outer HZ boundaries:

$$d = \frac{R_{\odot} \times (T_{\odot})^2 \times k^2 \times (1 - A)^{0.5}}{2 \times (T_{surfave})^2}$$

Single Host Star Mass vs. Exoplanet Orbit Semi-Major Axis per Confirmed NASA Exoplanet Archive (09-15-2024)



Single Host Star Mass vs. Exoplanet Orbit Semi-Major Axis
per Confirmed NASA Exoplanet Archive (09-15-2024)



thoughts

- noticed that compared to most of the **terrestrial planets**, earth is very far away from its host star → could be something?
- our solar system just happens to have planets very far away...
 - probably already studied; i'll go take a look on like jstor or something
- separately analyze 185 terrestrial for more patterns?

next steps

- **density graph** for areas harder to see?
- closer look + analysis of 185 terrestrial planets
- looking at these? → terrestrial planets within our habitable zone

