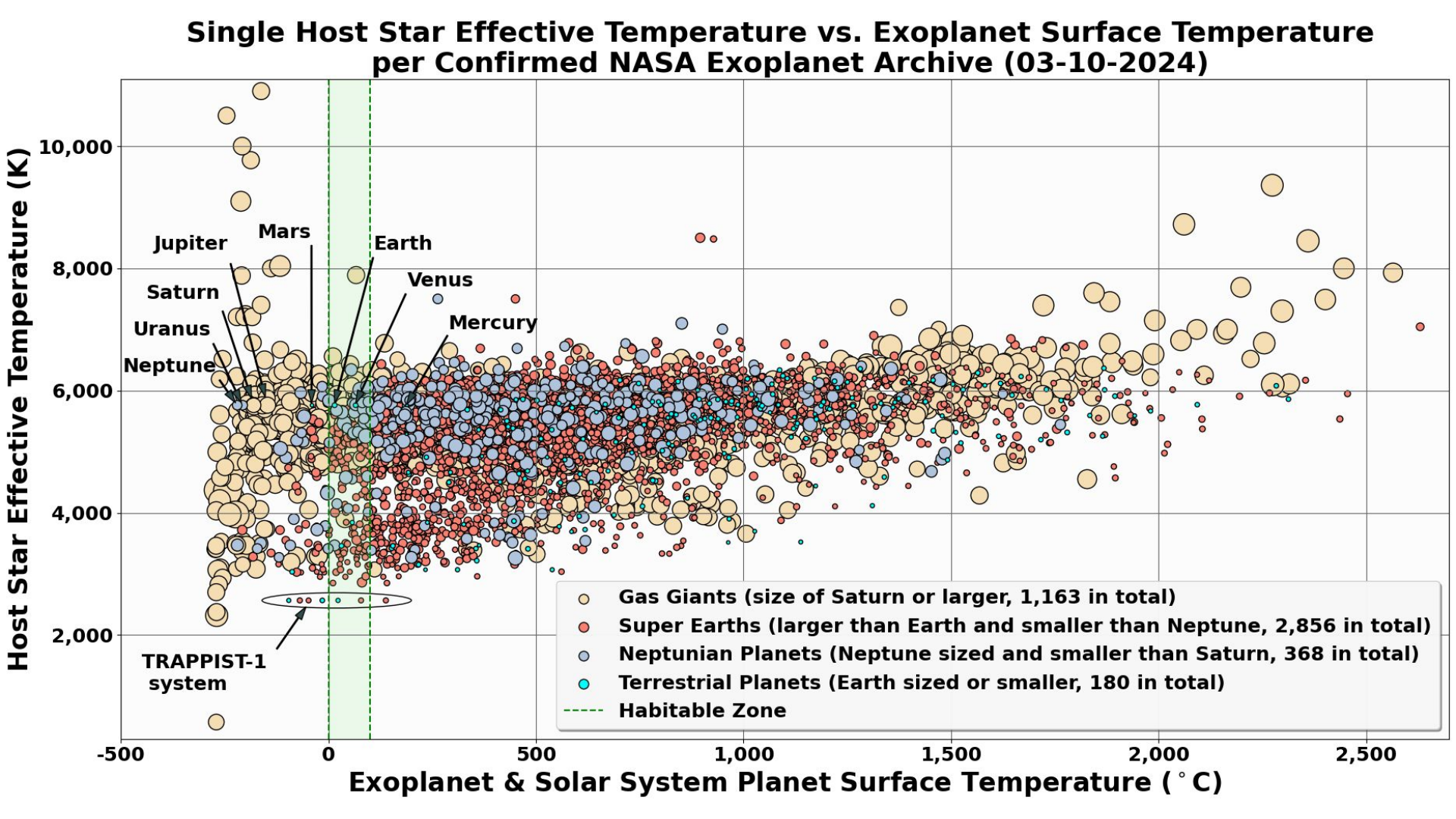
july 31st, 2024

exoplanet classification

this week

- refining the graph
  - removing controversial planets (sources determined the candidate to be a false positive) flagged with pl_controv_flag = 1
    - 5,565 remaining, with 30 removed
- made terrestrial planets more visible
  - changed the render sequence
  - made terrestrial planet color more easily visible
  - increased size of the circles
- highlighted the TRAPPIST-1 system
  - earth-sized exoplanets, all terrestrial in nature
  - 2 of the 7 are in the HZ according to formula, but sources online say 3
- wrote a paragraph about venus being in the habitable zone and potential reasons


Single Host Star Effective Temperature vs. Exoplanet Surface Temperature
per Confirmed NASA Exoplanet Archive (03-10-2024)
Host Star Effective Temperature (K)
10,000
8,000
6,000
4,000
2,000
Jupiter
Mars
Earth
Venus
Saturn
Mercury
Uranus
Neptune
TRAPPIST-1
system
-500
0
500
1,000
1,500
2,000
2,500
Exoplanet & Solar System Planet Surface Temperature (˚C)
Gas Giants (size of Saturn or larger, 1,163 in total)
Super Earths (larger than Earth and smaller than Neptune, 2,856 in total)
Neptunian Planets (Neptune sized and smaller than Saturn, 368 in total)
Terrestrial Planets (Earth sized or smaller, 180 in total)
Habitable Zone

capabilities and improved sensitivity are essential to identifying and studying Earth-like planets in habitable zones of a broader range of stellar types.

This figure also brings attention to assumption limitations introduced earlier in this paper. For the planets in our solar system, surface temperatures calculated through equation (1) are generally aligned with the reference numbers from NASA (NASA) with a 6 ~ 37% difference. However, Venus is an exception as although it is too hot for life, equation (1) flags the planet as within the

habitable zone. The reason for this discrepancy is due to the assumption of standardization of the bulk temperature factor (k = 1.13) to Earth's values when accounting for the atmospheric greenhouse effect. In reality Venus has a very thick atmosphere made up primarily of CO_2 (carbon dioxide), trapping heat. It therefore has a much higher bulk temperature factor (k = 3.17). This assumption limitation is mentioned earlier in section 2.6. The exception of Venus indicates that the atmospheric greenhouse effect varieties might be needed to be further considered to better determine the exoplanet surface temperature.

The TRAPPIST-1 system, consisting of seven rocky, Earth-sized exoplanets orbiting the TRAPPIST-1 ultra-cool dwarf star (with effective temperature 2566 k), has been highlighted in Figure 10 through an oval. Two of these seven exoplanets fall within the habitable zone based on surface temperatures calculated through equation (1).

Single Host Star Effective Temperature vs. Exoplanet Surface Temperature