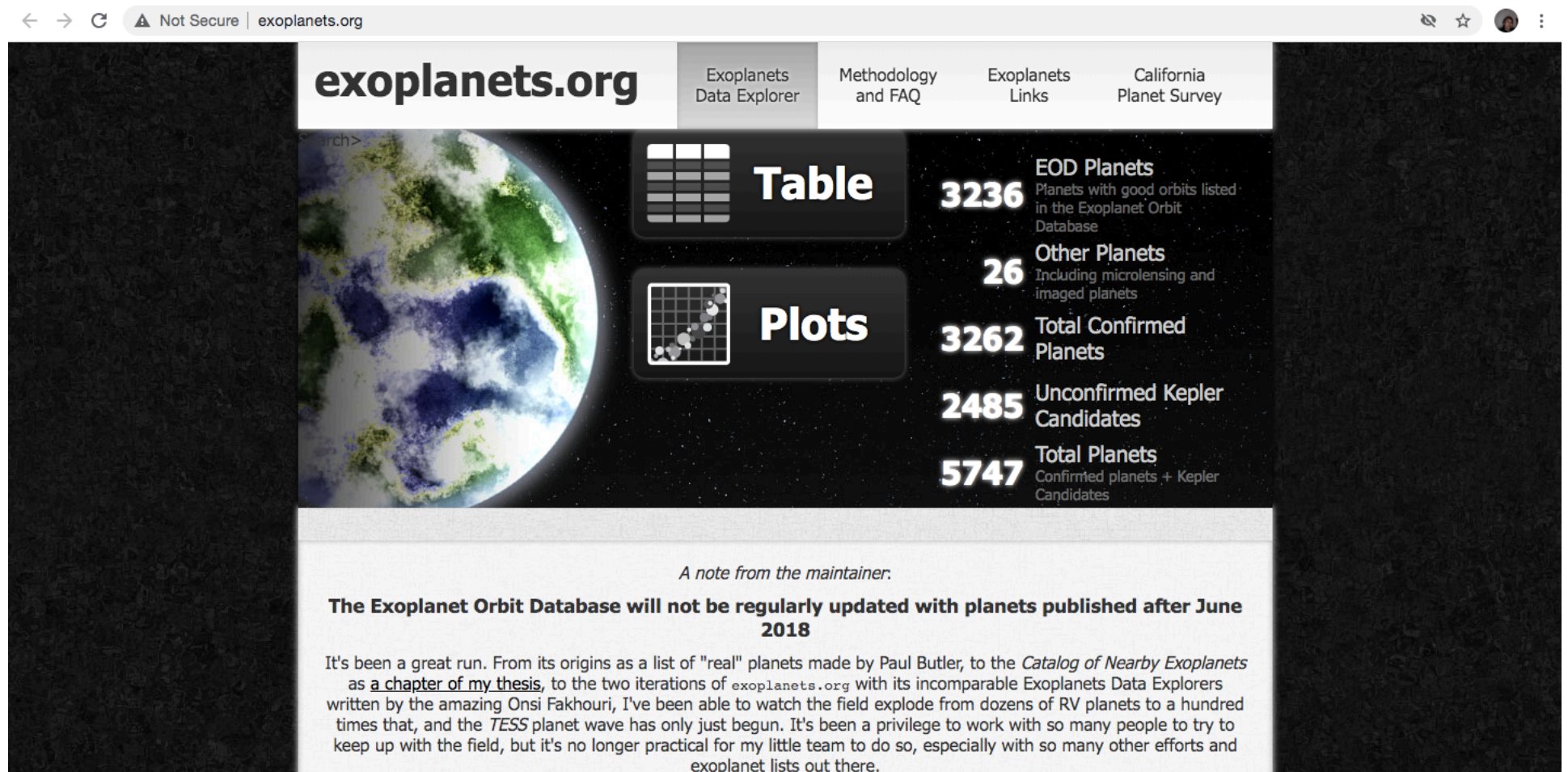


Due: October 26, 2022

Since 1995 more than 5,000 extra-Solar planets have been discovered in more than one-thousand extra-Solar planetary systems. Here, we investigate some things these systems teach us about our Solar System and how planetary systems work in general. To see some properties of extra-Solar planets (e.g., how they are arranged in terms of mass and distances from their stars, their orbital eccentricities, the relation between their orbital periods and their orbital sizes [the semi-major axes of their orbits], ...), go to the Exoplanets website and use their [plotting](#) tool.

Click on the link, plotting tool. The link takes you to:



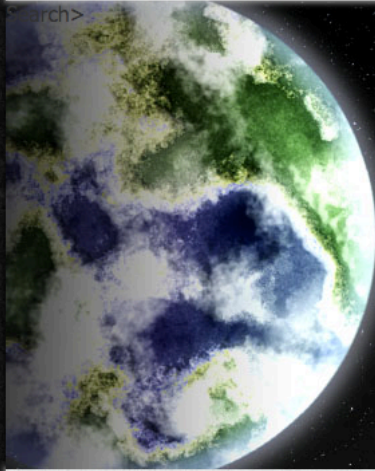
The screenshot shows the homepage of exoplanets.org. The browser address bar displays "Not Secure | exoplanets.org". The website header includes the logo "exoplanets.org" and navigation links: "Exoplanets Data Explorer", "Methodology and FAQ", "Exoplanets Links", and "California Planet Survey". A search bar is visible on the left. The main content area features a large image of Earth and two prominent buttons: "Table" (with a grid icon) and "Plots" (with a scatter plot icon). To the right of these buttons, a list of statistics is displayed:

- 3236** EOD Planets
Planets with good orbits listed in the Exoplanet Orbit Database
- 26** Other Planets
Including microlensing and imaged planets
- 3262** Total Confirmed Planets
- 2485** Unconfirmed Kepler Candidates
- 5747** Total Planets
Confirmed planets + Kepler Candidates

Below the statistics, a note from the maintainer is displayed:

A note from the maintainer:
The Exoplanet Orbit Database will not be regularly updated with planets published after June 2018

It's been a great run. From its origins as a list of "real" planets made by Paul Butler, to the *Catalog of Nearby Exoplanets* as a [chapter of my thesis](#), to the two iterations of [exoplanets.org](#) with its incomparable Exoplanets Data Explorers written by the amazing Onsi Fakhouri, I've been able to watch the field explode from dozens of RV planets to a hundred times that, and the *TESS* planet wave has only just begun. It's been a privilege to work with so many people to try to keep up with the field, but it's no longer practical for my little team to do so, especially with so many other efforts and exoplanet lists out there.



Table



Plots

3236	EOD Planets Planets with good orbits listed in the Exoplanet Orbit Database
26	Other Planets Including microlensing and imaged planets
3262	Total Confirmed Planets
2485	Unconfirmed Kepler Candidates
5747	Total Planets Confirmed planets + Kepler Candidates

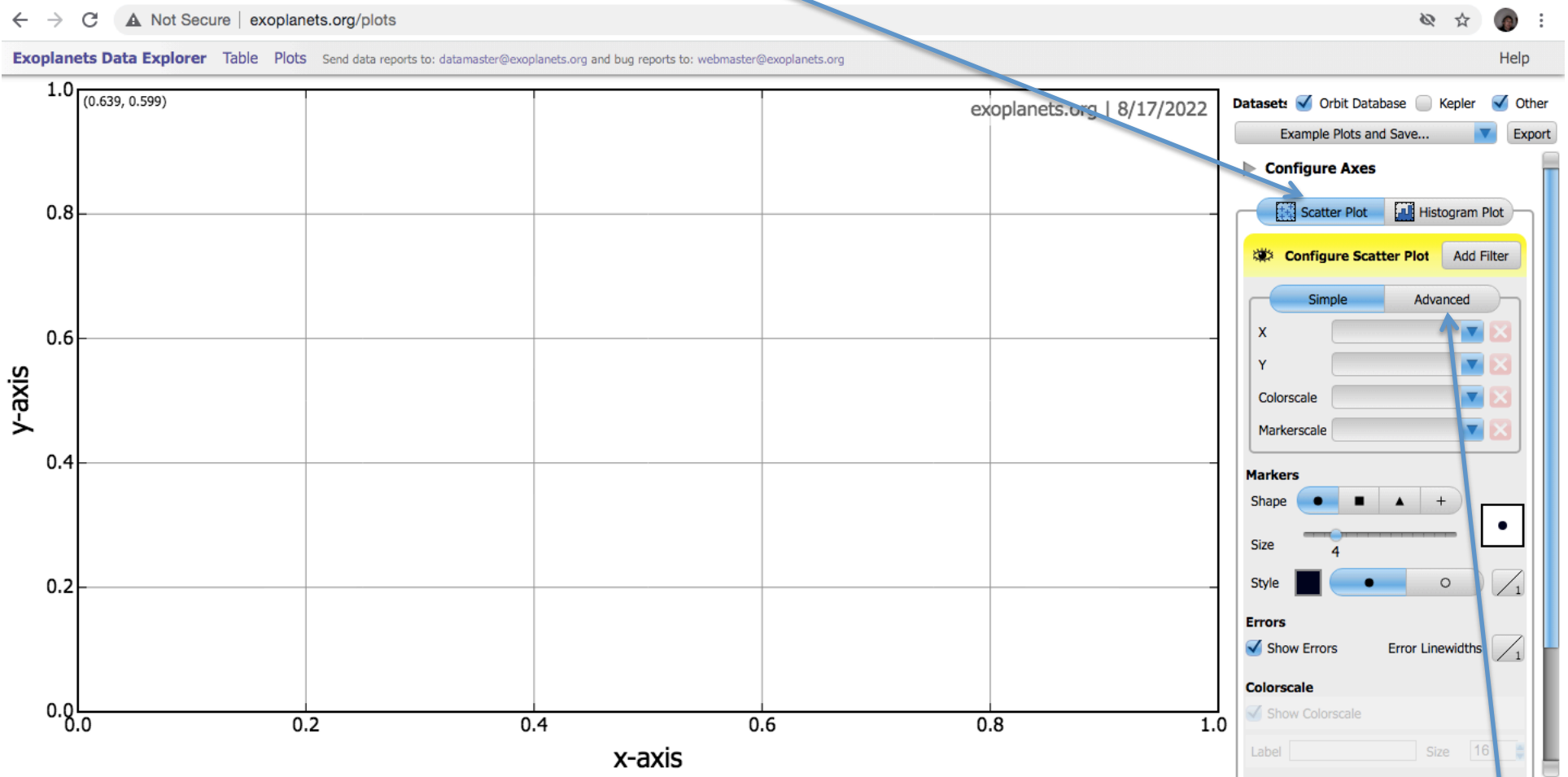
A note from the maintainer.

The Exoplanet Orbit Database will not be regularly updated with planets published after June 2018

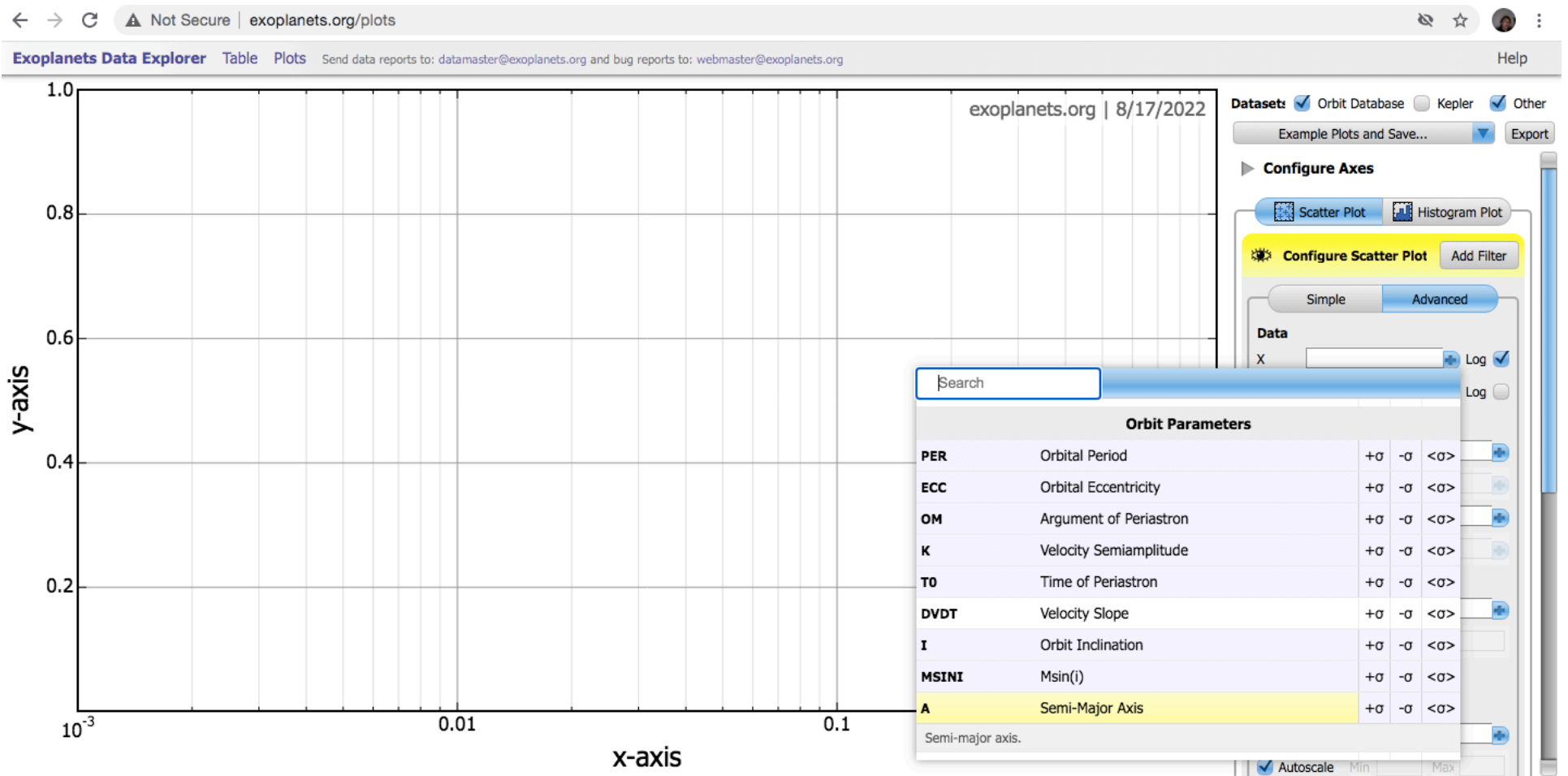
It's been a great run. From its origins as a list of "real" planets made by Paul Butler, to the *Catalog of Nearby Exoplanets* as a [chapter of my thesis](#), to the two iterations of `exoplanets.org` with its incomparable Exoplanets Data Explorers written by the amazing Onsi Fakhouri, I've been able to watch the field explode from dozens of RV planets to a hundred times that, and the *TESS* planet wave has only just begun. It's been a privilege to work with so many people to try to keep up with the field, but it's no longer practical for my little team to do so, especially with so many other efforts and exoplanet lists out there.

1. Click on Plots

1. Plots (make sure you click the Scatter button, not Histogram button), takes you to

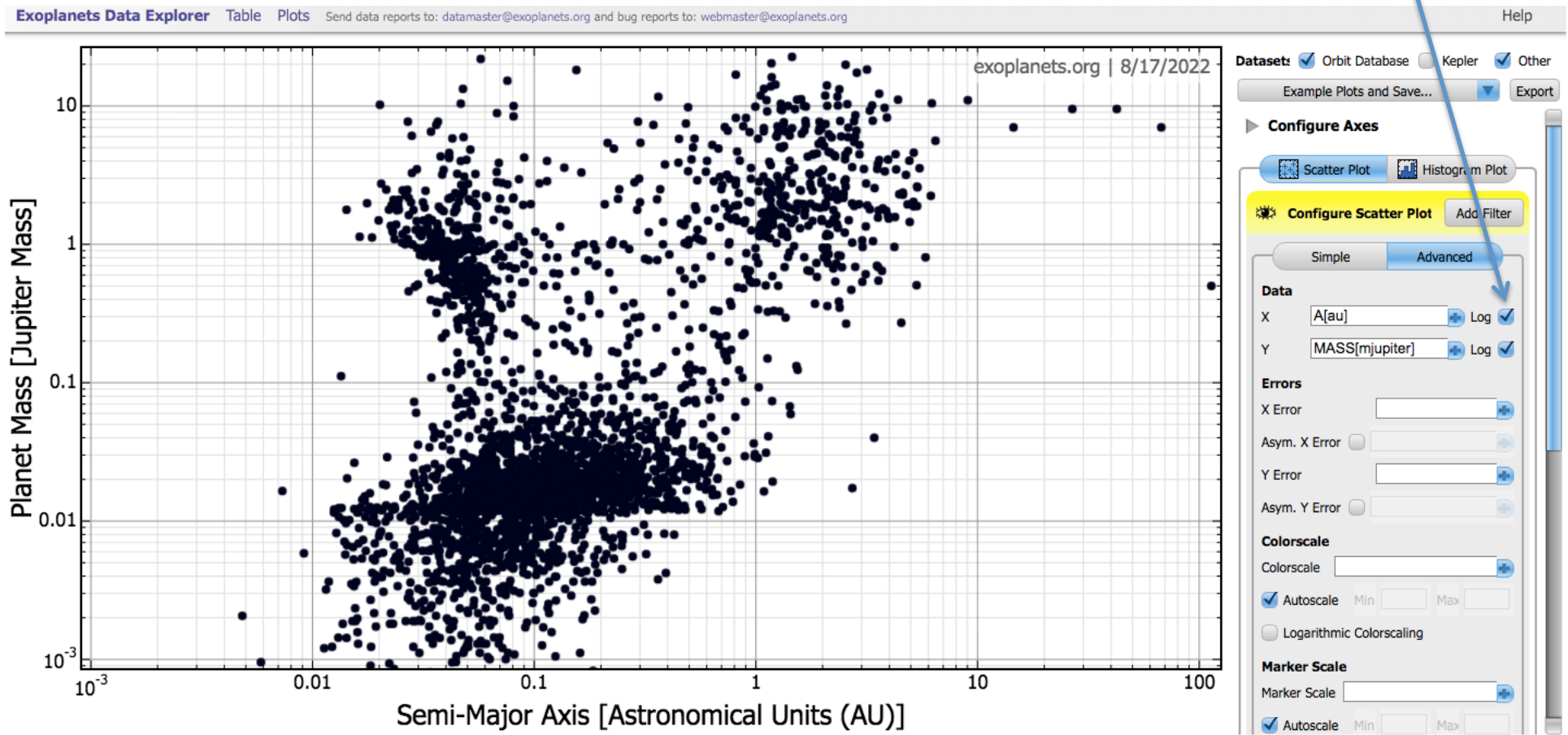


We will first make the planet mass vs semi-major axis plot. Note that on the above, the simple button is highlighted. Click on the Advanced button.



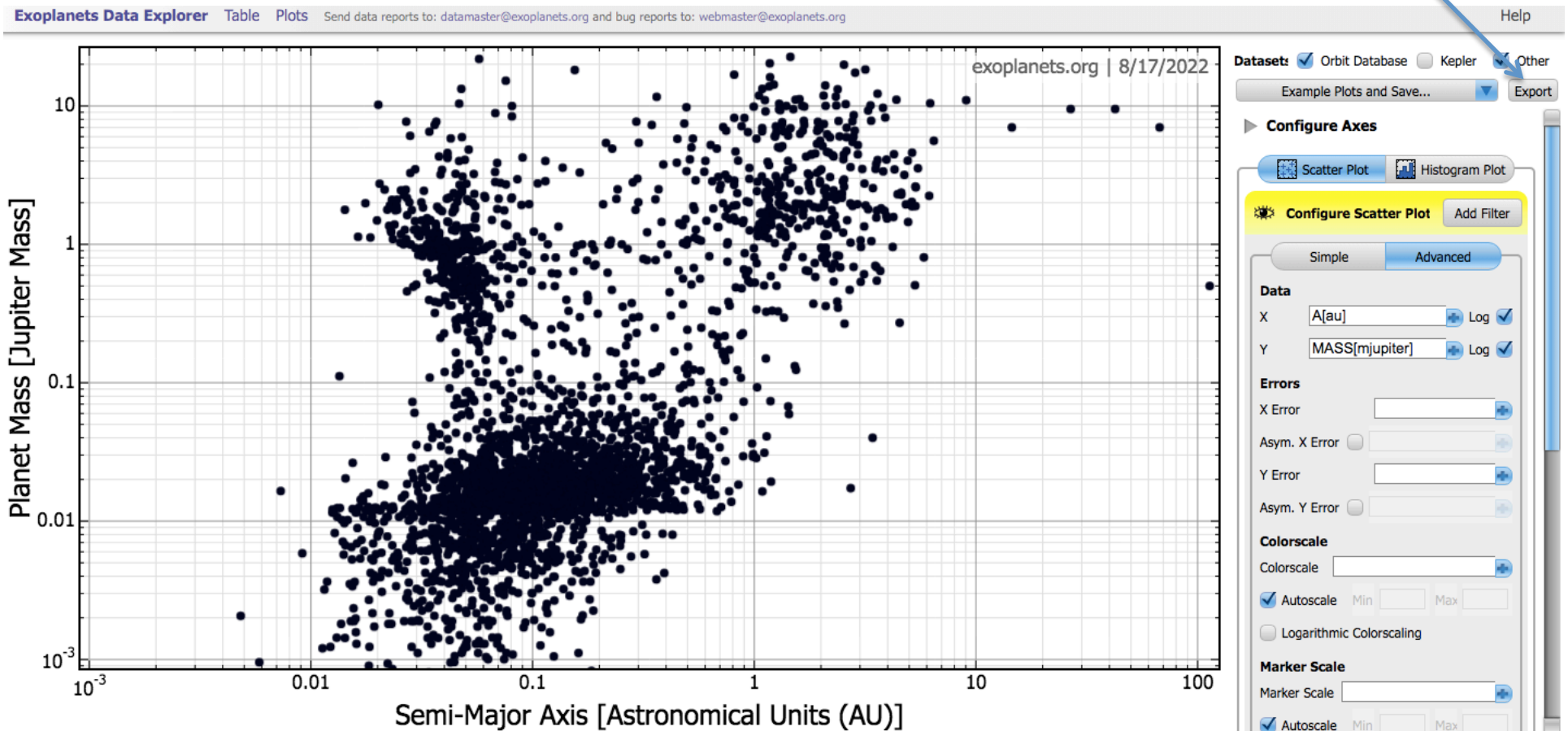
To define x-axis, pull down the menu and find the section **Orbit parameters**. Click on **semi-major axis**. Check the **Log box** next to x-axis box.

To define y-axis, pull down the menu and find the section **Planet Information**. Click on **planet mass**. Check the **Log** box next to y-axis box.



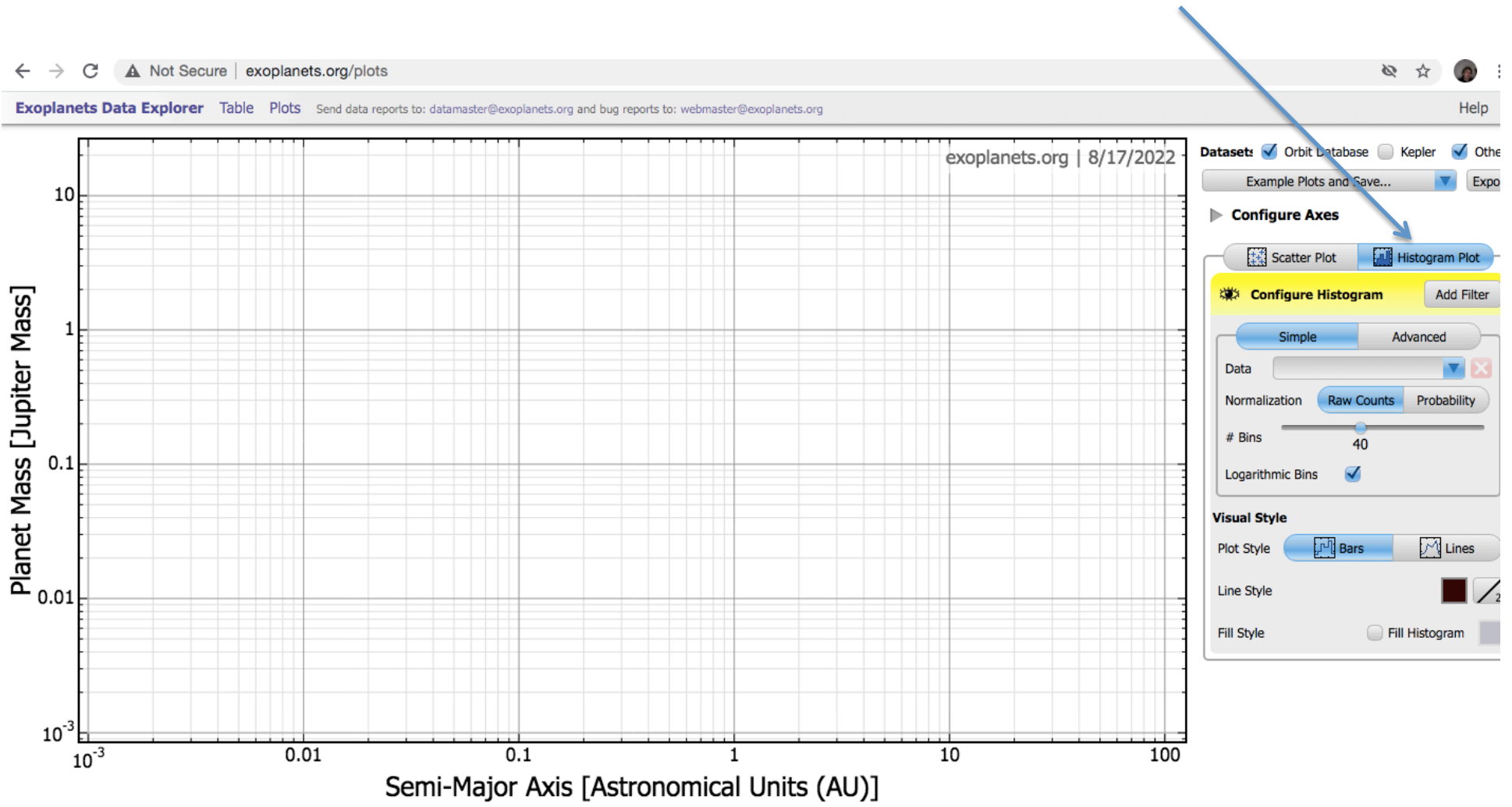
Note that you plot the planet mass in units of the Jupiter (that is, how does the mass compare to that of Jupiter) and you plot the semi-major axis in units of the Astronomical Unit, the average distance of the Earth from the Sun in its orbit..

You can export this plot by clicking on the **EXPORT** button near the upper right hand section of the page. Choose **png**, **pdf** or **svg** for the format of the output.

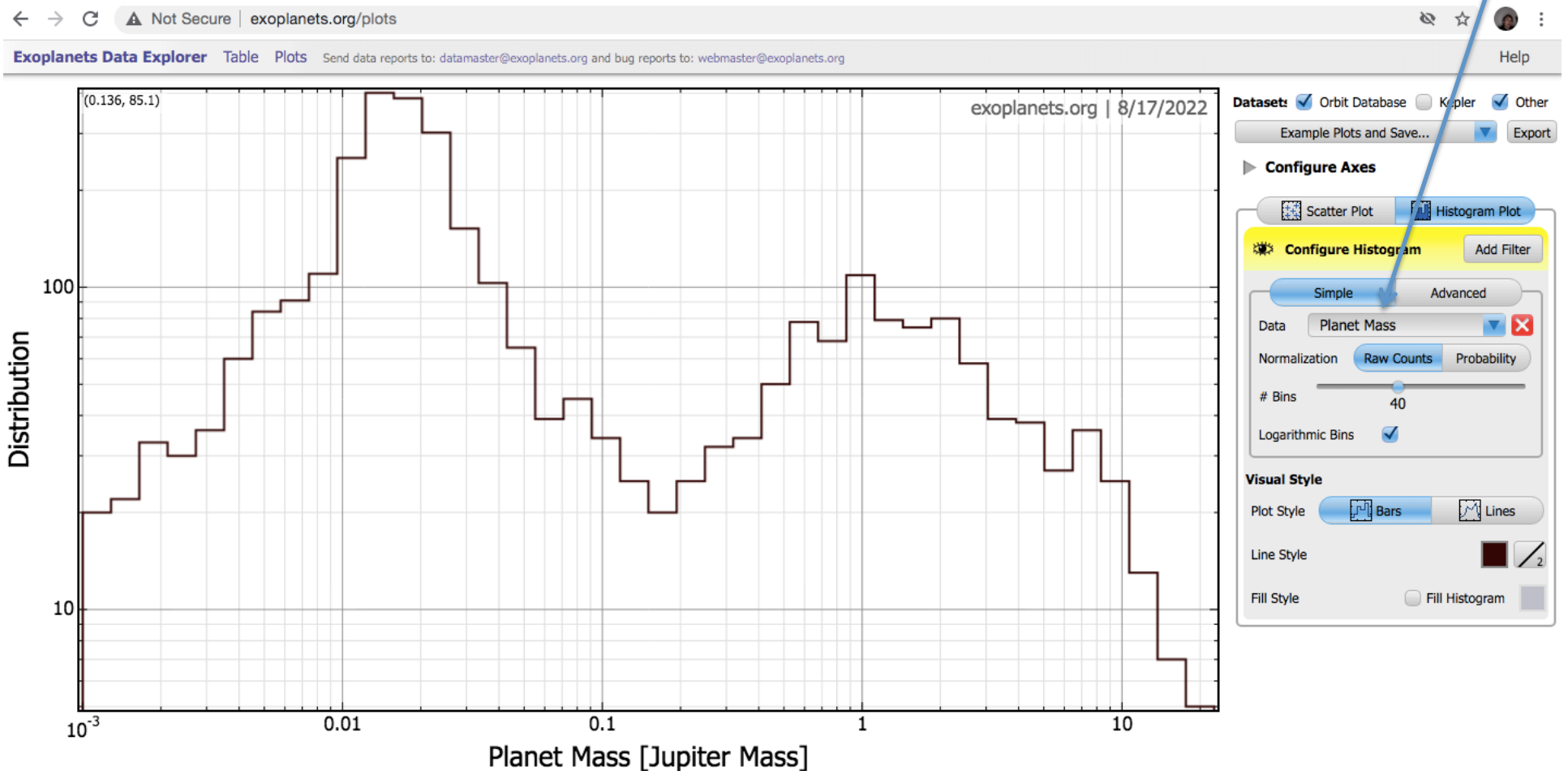


Make the orbital eccentricity vs semi-major axis plot, the planet density vs semi-major axis plot, and the orbital period vs semi-major axis plot in manners similar to that used for the planet mass vs semi-major axis plot.

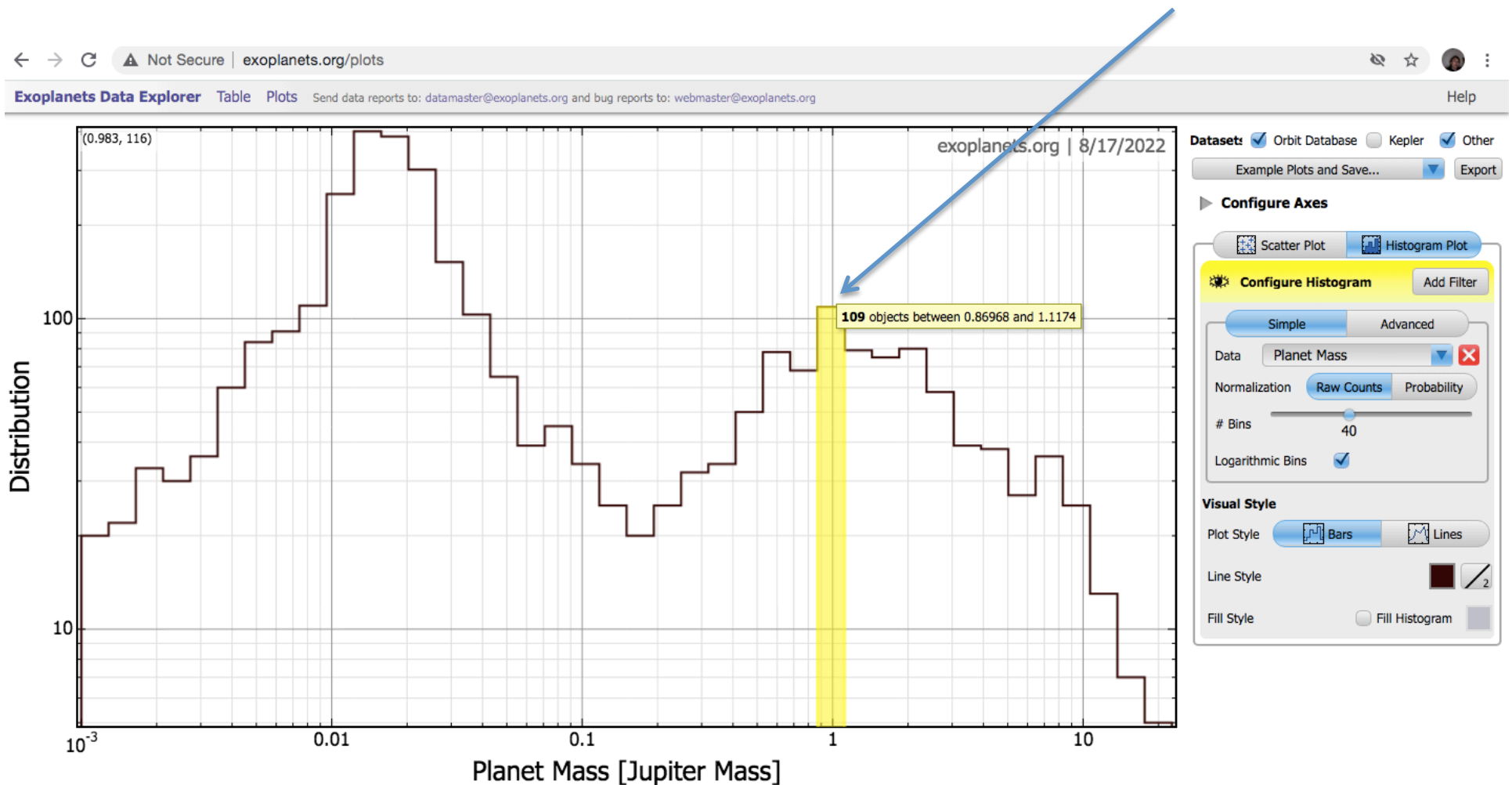
Next make histograms for different data. On the plotting page, click on the **Histogram** button.



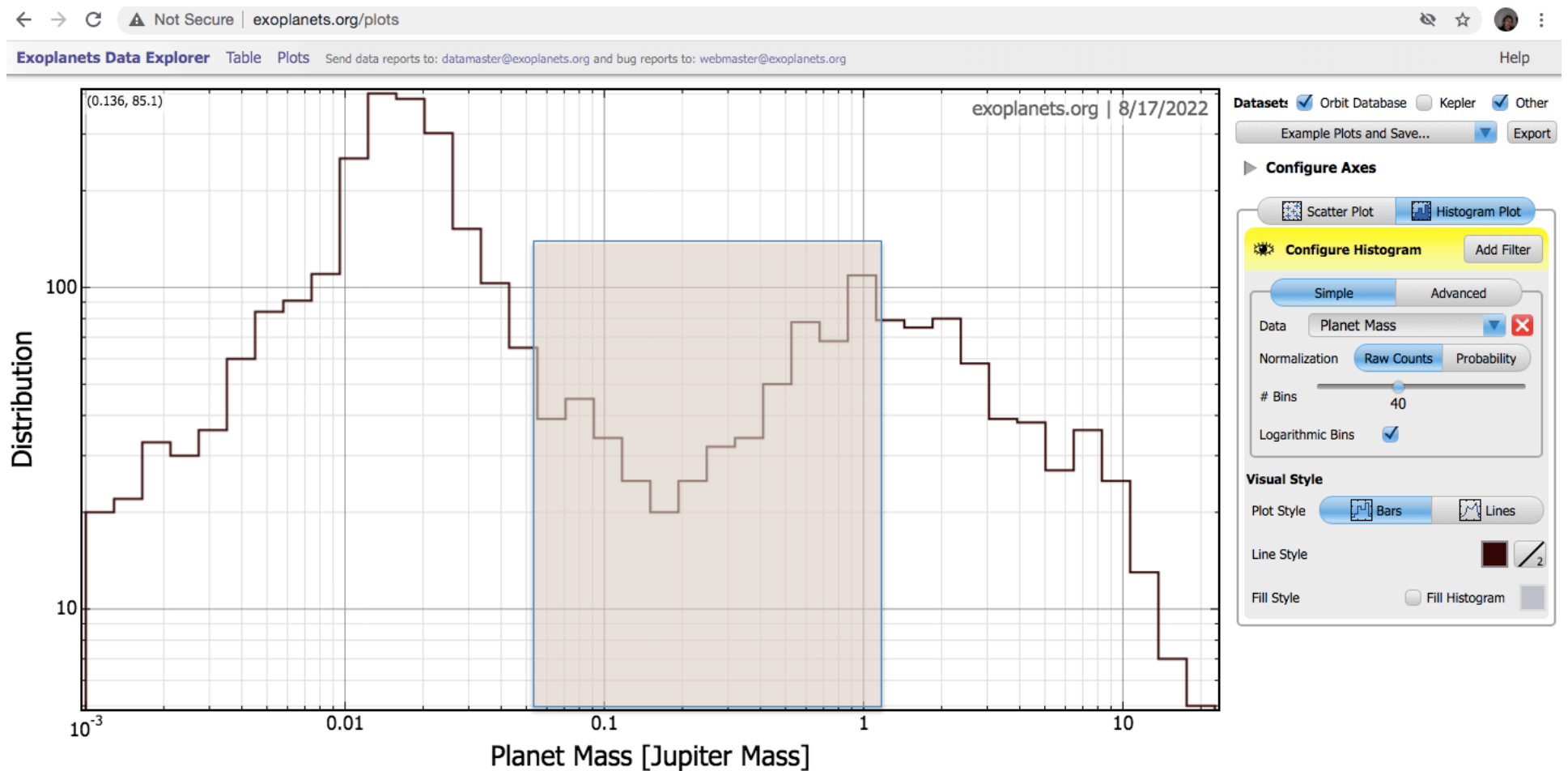
Make a planetary mass **Histogram**. Find planet mass in the pull down Data menu. Make sure you check the **Logarithmic Bin** box. Let's see how many Jovians and Terrestrials there are in the Table.



On the **histogram**, place your cursor on a particular mass. I chose 1 Jupiter mass. Note that the plotter highlights this mass and then tells you how many planets are in the box and the mass range covered by the box.



Conservatively, if we assume that the mass range covered by Jupiter-like planets is the range covered by Uranus to Jupiter, we can count up the Jovians. We could be more aggressive and consider a larger mass range. This would lead to a larger estimate. For your work, state your estimated range (with some justification).



Conservatively, if we assume that the mass range covered by Jupiter-like planets is the range covered by Uranus to Jupiter, we can count up the Jovians. We could be more aggressive and consider a larger mass range. This would lead to a larger estimate. For your work, state your estimated range (with some justification).

