

# NASA Exoplanet Archive: How-To Guide

The NASA Exoplanet Archive holds a database of information for exoplanets. Note that this does not (currently) include atmospheric data, but it does include bulk properties such as mass and radius which we will need to model atmospheres.

You can access the NEA website here: <https://exoplanetarchive.ipac.caltech.edu/>

## Looking up individual planets:

To look up an individual planet, you can type its name in the search box (under “Explore the Archive”), and details of that planet will appear in a new tab (pop-ups need to be enabled in your browser).

Here is what comes up for the sub-Neptune GJ 1214 b:

The screenshot shows a web browser displaying the details for the exoplanet GJ 1214 b. The URL in the address bar is [exoplanetarchive.ipac.caltech.edu/overview/GJ%201214%20b#planet\\_GJ-1214-b\\_collapsible](https://exoplanetarchive.ipac.caltech.edu/overview/GJ%201214%20b#planet_GJ-1214-b_collapsible). The main content area is titled "GJ 1214 | 0.20  $R_{\oplus}$ , 3026.00  $K$ ". Below this, there are tabs for Overview, Notes (3), Parameters, Ancillary (1), Nearby Data, Bibliography (34), Legend, and Expand All. The "Parameters" tab is active. The data is presented in two main sections: "ARCHITECTURE" and "DISCOVERY DATA".

**ARCHITECTURE**

- GJ 1214
- ★ GJ 1214
- ↳ GJ 1214 b

**DISCOVERY DATA**

Host	Planet	Orbital Separation	Planet Size	Method	Year	Reference	Disposition
GJ 1214	↳ GJ 1214 b	1.58 d	2.73 $R_{\oplus}$	Transit	2009	Charbonneau et al. 2009	Confirmed Planet

**Exoplanet Archive Notes (3)**

- ★ GJ 1214 Stellar Parameters (18 Solutions)
- ↳ GJ 1214 b Planetary Parameters (20 Solutions)

**STATUS**  
Confirmed Planet

**DETECTED BY**  
Orbital Brightness Modulation, Radial Velocity, Transit

**TOOLS**

- Planetary Systems
- Transit Prediction Service
- Transit
- Atmospheric Spectroscopy

**Source**

Source	Mahajan et al. 2024	Schlafly et al. 2024	Yalçınkaya et al. 2024	Kokori et al. 2023	Kokori et al. 2020
$P$ (days)	1.580404531 ± 0.000000018	1.580404311 ± 0.000000079	1.580404418 ± 0.000000058	1.580404571 ± 0.000000042	1.58040454 ± 0.000000042
$a$ (au)	0.01505 ± 0.00011	---	---	---	---
$R_p$ ( $R_{\oplus}$ )	2.733 ± 0.031	---	---	---	---
$R_p$ ( $R_{Jup}$ )	0.2438 ± 0.0029	---	---	---	---
$M_p$ ( $M_{\oplus}$ )	8.41 ± 0.35	---	---	---	---
$M_p$ ( $M_{Jup}$ )	0.0265 ± 0.0011	---	---	---	---

A few notes:

- For each planet in the system (and the star, we'll look at that later on), information is structured in columns. Each column corresponds to a different publication, which may have used different observations and/or reanalysed old observations to derive the planetary parameters. Ideally, the papers will agree... but sometimes they don't!
- The paper shown in the left-most column is the one ‘preferred’ by the archive.
- Each row in the table corresponds to a different property, e.g. GJ 1214 b's radius is 2.733 Earth radii, or 0.2438 Jupiter radii.

## Looking up and filtering all exoplanets

When selecting a sample of targets, it will be useful to start with the full list of known exoplanets and filter them to narrow down a suitable target list.

You can download this data as a csv file and read it using Excel and/or Python. To do this, go to the NASA Exoplanet Archive homepage and select the “Data” tab at the top of the page. From the menu that appears, click on “Planetary Systems Composite Data” (in the left-hand column).

This will open a table view of all the exoplanets in the database. To select which columns you want to see, you can use the “select columns” button at the top. For example, useful values may include the planet’s radius, mass, semi-major axis and transit duration, and the host star’s effective temperature, radius distance and V/J/Ks magnitudes. Here’s what the table looks like:

The screenshot shows a web browser displaying the NASA Exoplanet Archive. The URL is [exoplanetarchive.ipac.caltech.edu/cgi-bin/TblView/nph-TblView?app=ExoTbls&config=PSCompPars](http://exoplanetarchive.ipac.caltech.edu/cgi-bin/TblView/nph-TblView?app=ExoTbls&config=PSCompPars). The page title is "NASA EXOPLANET ARCHIVE" and "NASA EXOPLANET SCIENCE INSTITUTE". The top navigation bar includes links for Home, About Us, Data, Tools, Support, and Login. Below the navigation is a "Select Columns" dropdown and a "Download Table" button. A warning message states: "Data may not be self-consistent if drawn from multiple sources, including calculations. (Learn more)". The main content is a table titled "Planetary Systems Composite Data". The table has 16 columns: Planet Name, Orbit Semi-Major Axis [au], Planet Radius [Earth Radius], Planet Mass or Mass\*min() [Earth Mass], Transit Duration [hours], Stellar Effective Temperature [K], Stellar Radius [Solar Radius], Distance [pc], V (Johnson) Magnitude, J (2MASS) Magnitude, and Ks (2MASS) Magnitude. The table lists numerous exoplanets, each with a checkbox in the first column. The data includes various parameters such as orbital period, stellar properties, and absolute magnitudes.

	Planet Name	Orbit Semi-Major Axis [au]	Planet Radius [Earth Radius]	Planet Mass or Mass*min() [Earth Mass]	Transit Duration [hours]	Stellar Effective Temperature [K]	Stellar Radius [Solar Radius]	Distance [pc]	V (Johnson) Magnitude	J (2MASS) Magnitude	Ks (2MASS) Magnitude
<input checked="" type="checkbox"/>	11 Com b	1.178±0.000	12.2	4914.9 <sup>+39.1</sup> <sub>-39.7</sub>	4874	13.76 <sup>+2.85</sup> <sub>-2.45</sub>	93.1846±1.9238	4.72307±0.02300	2.943±0.334	2.282±0.346	
<input checked="" type="checkbox"/>	11 UMi b	1.53±0.07	12.3	4685±795	4213±46	29.79±2.84	125.3210±1.9765	5.013±0.005	2.876±0.230	1.939±0.270	
<input checked="" type="checkbox"/>	14 And b	0.775±0.000	13.1	1131 <sup>+36</sup> <sub>-39</sub>	4888	11.55 <sup>+1.12</sup> <sub>-0.51</sub>	75.4392±0.7140	5.23133±0.02300	3.019±0.180	2.331±0.240	
<input checked="" type="checkbox"/>	14 Her b	2.774 <sup>+0.189</sup> <sub>-0.120</sub>	12.6	2559 <sup>+119</sup> <sub>-281</sub>	5338±25	0.93±0.01	17.9323±0.0073	6.61935±0.02300	5.158±0.029	4.714±0.016	
<input checked="" type="checkbox"/>	16 Cyg B b	1.66±0.03	13.5	566±25	5750±8	1.13±0.01	21.1397 <sup>+0.0116</sup> <sub>-0.0111</sub>	6.215±0.016	4.993±0.037	4.651±0.016	
<input checked="" type="checkbox"/>	17 Sco b	1.45±0.02	12.9	1373 <sup>+48</sup> <sub>-38</sub>	4157 <sup>+11</sup> <sub>-10</sub>	25.92 <sup>+0.78</sup> <sub>-0.74</sub>	124.953±2.598	5.22606±0.02300	2.943±0.270	2.094±0.244	
<input checked="" type="checkbox"/>	18 Del b	2.476±0.002	12.5	2926 <sup>+51</sup> <sub>-24</sub>	4980	8.80 <sup>+0.61</sup> <sub>-0.40</sub>	76.2220±0.6217	5.51048±0.02300	4.032±0.236	3.366±0.204	
<input checked="" type="checkbox"/>	1RXS J160929.1-210524 b	330	18.647	3000±300	4060 <sup>+300</sup> <sub>-200</sub>	1.313160 <sup>+0.1780</sup> <sub>-0.102</sub>	139.135 <sup>+1.332</sup> <sub>-1.307</sub>	12.618±0.069	9.820±0.027	8.916±0.021	
<input checked="" type="checkbox"/>	2 Boo b	0.194±0.000	13.9	281 <sup>+11</sup> <sub>-14</sub>	4816	12.19 <sup>+1.45</sup> <sub>-1.28</sub>	95.9863±0.6368	5.590±0.001	3.845±0.240	3.159±0.280	
<input checked="" type="checkbox"/>	24 Sex b	1.333 <sup>+0.004</sup> <sub>-0.009</sub>	13.4	632.46 <sup>+82.83</sup> <sub>-101.77</sub>	5098±44	4.9±0.08	72.0691 <sup>+0.6884</sup> <sub>-0.6728</sub>	6.4535±0.0230	5.292±0.338	4.285±0.016	
<input checked="" type="checkbox"/>	24 Sex c	2.08 <sup>+0.05</sup> <sub>-0.02</sub>	13.9	273.32 <sup>+111.24</sup> <sub>-69.92</sub>	5098±44	4.9±0.08	72.0691 <sup>+0.6884</sup> <sub>-0.6728</sub>	6.4535±0.0230	5.292±0.338	4.285±0.016	
<input checked="" type="checkbox"/>	2M0437 b	118.0±1.3	13	1271±318	3100±100	0.84±0.11	128.484 <sup>+1.174</sup> <sub>-1.174</sub>	16.186±1.133	11.298±0.020	10.386±0.018	
<input checked="" type="checkbox"/>	2MASS J01033563-5515561 AB b	84	12.3	4132±318			47.2±3.1	15.788±0.275	10.162±0.023	9.237001±0.0220	
<input checked="" type="checkbox"/>	2MASS J01225093-2439505 b	52±6	11	7786.5±794.5	3530±50	0.3664500±0.33.8281 <sup>+0.0864</sup> <sub>-0.0860</sub>	14.244±0.074	10.084±0.028	9.198±0.026		
<input checked="" type="checkbox"/>	2MASS J02192210-3925225 b	16.1±0.3	4418±350	3064±76	0.281±0.013	40.089644165350	11.381±0.026	10.404±0.025			
<input checked="" type="checkbox"/>	2MASS J0249-0557 c	1950±200	12.4	3687 <sup>+143</sup> <sub>-318</sub>	2859.0±157.0	0.315959±0.0	66.0613 <sup>+0.4543</sup> <sub>-0.4482</sub>	18.3±0.2	11.963±0.027	11.055±0.021	
<input checked="" type="checkbox"/>	2MASS J03590986+2009361 b	572±7	12.2	5721±318	2943.0±157.0	0.2897760±0.0	117.435 <sup>+2.320</sup> <sub>-2.233</sub>	13.479±0.033	12.533±0.028		
<input checked="" type="checkbox"/>	2MASS J04414489+2301513 b	15.0	12.6	2383.6±794.5	2936.0±182.0	0.2319160±0.0	120.423986969314	14.419±0.026	13.161±0.025		
<input checked="" type="checkbox"/>	2MASS J11011926-7732383 b	266±8	11.9	8899 <sup>+3178</sup> <sub>-2225</sub>				13.096±0.033	11.632±0.026		
<input checked="" type="checkbox"/>	2MASS J11550485-7919108 b	587±2	12.1	6357±318	3021.0±157.0	0.6004550±0.0	100.862 <sup>+0.603</sup> <sub>-0.596</sub>	16.957±0.309	11.216±0.022	10.079±0.021	
<input checked="" type="checkbox"/>	2MASS J12073346-3932539 b	55	12.9	1589±636	2825.0±157.0	0.218870±0.0	64.3080 <sup>+0.6569</sup> <sub>-0.6440</sub>	20.15±0.19	12.995±0.026	11.945±0.026	

Note that for each planet in this table, the data can be drawn from multiple papers and are not necessarily consistent (e.g. the mass and the radius could each come from a different paper). At this stage this is fine, but when finalising JWST targets it's good practice to check where these numbers have come from and whether they seem reliable.

To download the data from your chosen columns, hover over the “Download Table” button at the top, and click “Download Table” from the menu which appears. I recommend sticking to the default CSV format. Note that the downloaded file contains several header lines which you'll need to deal with if reading in with Python.