Django Unchained:

Adapting Exoplanet Models to Create User-Friendly Web Tools

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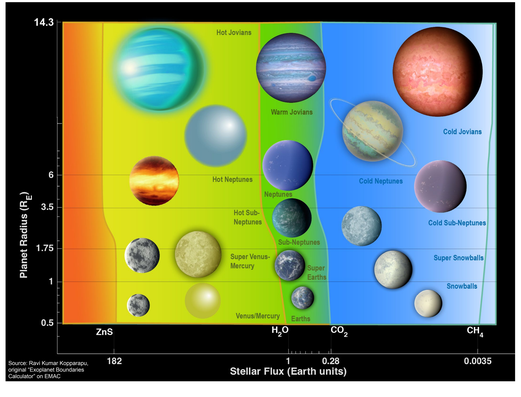
CODE 693:
Planetary
Systems Lab

What are exoplanets?

Exoplanets are planets orbiting any of the other billions of stars in the universe. Most of the exoplanets we know of today have been discovered by the Kepler Space Observatory, detecting transits, in which a star dims as planets pass in front. Some exoplanets have oceans, some are ice balls, and some may even harbor life...



What can these models reveal?

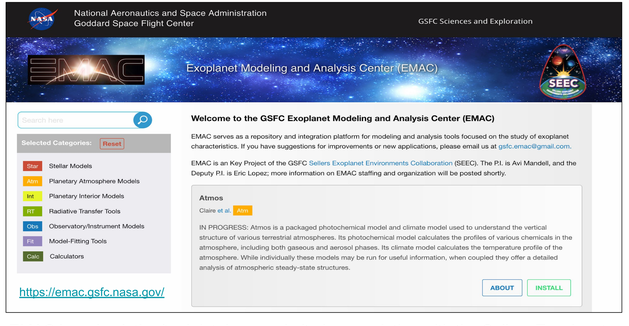
- Basic information about an exoplanet and its star can render models that give a glimpse into its chemistry, physics, and history.
- Spectral data can potentially show which chemicals dominate the exoplanet's atmosphere, as well as the composition of its core.
- Together, these factors can determine the "Habitable Zone" of an extrasolar planetary system, highlighting the possibility of life.

References:

Fortney, J., et al. 2010, ApJ, 709, 1396-1406
Kopparapu, R., et al. 2018, ApJ, 856, 122
Lopez, E. & Fortney, J. 2014, The Astrophysical Journal, 792, 1
Mandell, A., et al. 2013, ApJ, 779, 128
Sing, D., et al. 2016, Nature, 529, 59-71

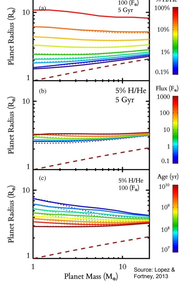
Documentation: Python, Plotly, Django, Foundation-6, HTML/CSS, JavaScript, jQuery, Sublime Text Editor, Anaconda-Navigator

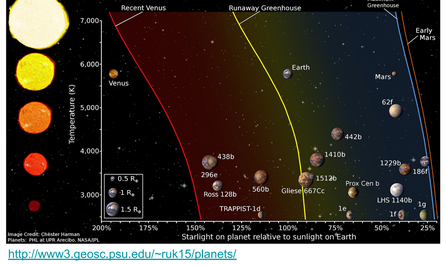
Exoplanet Modeling and Analysis Center (EMAC)



https://emac.gsfc.nasa.gov/

EMAC is a simulation/tool database website in association with the Sellers Exoplanet Environments Collaboration (SEEC).
It includes a variety of exoplanet modeling tools, organized and color-coded by scientific purpose.
Open source code is also provided for each application, as well as information about the scientific origins and developers.





http://www3.geosc.psu.edu/~ruk15/planets/

Acknowledgements:

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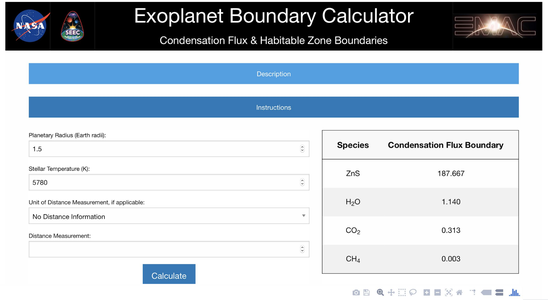
Django Web Framework

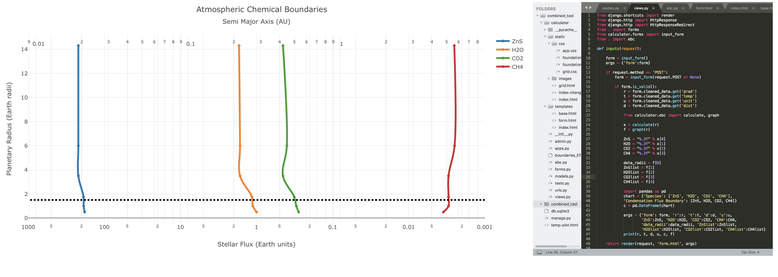
Django is an interactive web framework, primarily used to create blogs and other updatable websites.

- Optimized for Python
- Dynamic model databases
- User-input forms
- Intuitive organization

Procedure:

- Create a project (website)
- Create an app (forms)
- Incorporate functional code (calculators)
- Display tool url paths/views (HTML)

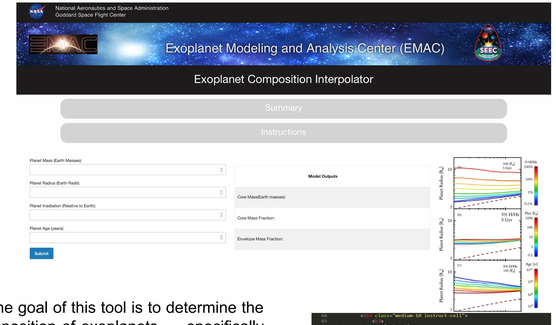




This tool shows the condensation boundaries of various exoplanet atmosphere chemistries. The calculator generates a table and an interactive plot based on the form inputs.
Model developer: Ravi Kopparapu
Tool developer: Tobias E.

Next Steps:

- Incorporating Habitable Zone calculator boundaries
- Adding data to further incorporate stellar temperature variable



The goal of this tool is to determine the composition of exoplanets — specifically the core mass of the planet.

The Python script interpolates over many grids to determine the core mass based off of the input of the planet mass, radius, Irradiation and age.

Next Step:

- Add more design features to make more user-friendly

Model Developer: Eric Lopez
Tool Developer: Cassie W.

Foundation-6 Design Framework

Foundation-6 is a responsive front-end framework used to design and control spacing of website elements.

XY Grid:

- Provides horizontal and vertical alignment of grids to store text, images, graphs, forms, etc.
- Cells are divided into 12 sections
- Margins, padding, & containers prevent busyness/clutter

Styling/CSS:

- Used to create the "look and feel" of the website
- Changes spacing, colors, fonts, etc.

Parallel structure throughout EMAC:

Creating a consistent design template with Django and Foundation-6 allows for the efficient development and implementation of many more tools in the future.

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