



NASA's Exoplanet Modeling & Analysis Center

Presented by Eric D. Lopez
(NASA Goddard)

*Background Image Credit:
NASA Ames/JPL-Caltech/T. Pyle*

Meet the Team



Eric Lopez
Co-Lead



Dylan Cristy
*Front-End
Developer*



Anmol Desai
*Post-Bac
Researcher*



Joe Renaud
Co-Lead



Mike Moore
*Back-End
Developer*



Celeste Hagee
*Post-Bac
Researcher*



Avi Mandell
*Founder &
Advisor*

*... and many alumni including former post-bacs now
at U. Chicago, U. Kansas; U. Padova; IPAC; & UNLV*

So, what is EMAC?



NASA Goddard's **E**xoplanet **M**odeling and **A**nalysis **C**enter

- Searchable repository for exoplanet science codes and resources
- Networking & support to scientists & model developers
- First stop for finding codes, intermodel comparisons, and model visualization



EMAC and its team are supported by...

NASA Goddard's Sellers' Exoplanet Environments Collaboration

NASA Sciences and Exploration Directorate

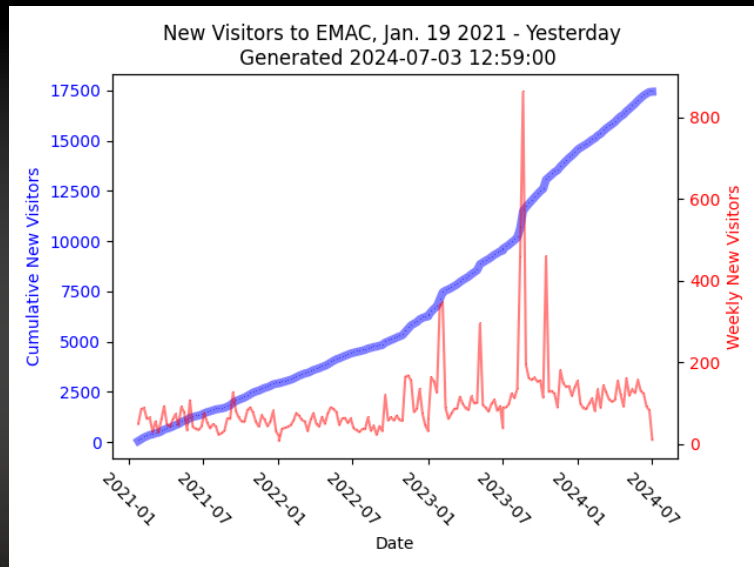
NASA Planetary Science & Astrophysics Divisions

EMAC's Growth

Soft Launched ~2018

100s of weekly new visitors

304 Published Resources!



1st EMAC Developer's Workshop in Spring 2023

>300 Registrants & >40 talks

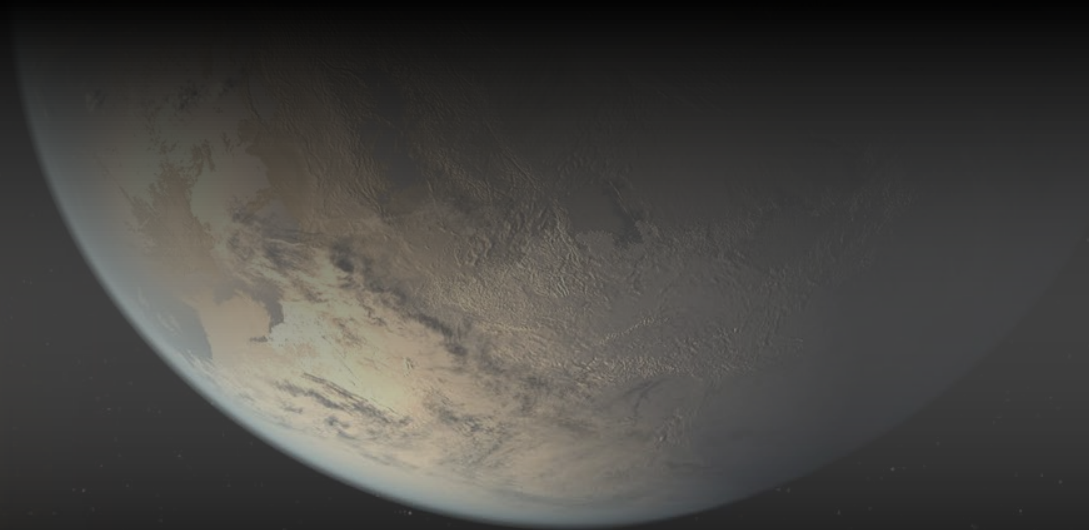
Talks on EMAC's YouTube:

youtube.com/@NASA_EMAC



Live Demo Time!

Because these always go well...



The Demo didn't work :(



Search for Resources



Filters

Reset

Categories	Resource Types	Collections
Star	Stellar Models and Catalogs	▼
Atm	Atmosphere Models	▼
Int	Interior Models	▼
RT	Radiative Transfer Tools	▼
Obs	Observatory/Instrument Models	▼
Fit	Model-Fitting Tools	▼
Data	Data Reduction Tools	▼
Orb	Formation and Dynamics Tools	▼
Pop	Population Simulations and Catalogs	▼
Vis	Data Visualization Tools	▼
Hard	Hardware Control & Optimization	▼
Category Descriptions		▼

TidalPy: Software Toolbox for Estimating Tidal Heating and Dynamics in Solar System Moons and Exoplanets

Joe Renaud

Orb

Int

EMAC 2207-034

TidalPy is an open-source software suite designed to assist researchers in the semi-analytic calculation of tidal dissipation and subsequent orbit-spin evolution for rocky and icy worlds. TidalPy serves as simple to install (cross-platform) and, hopefully, simple to use package that users can pick up and hit the ground running to answer basic questions about tidal dynamics.

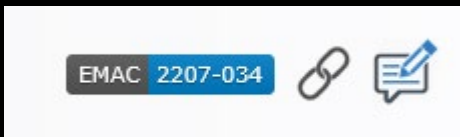
Last updated: Dec. 10, 2021

Code Language(s): Python3

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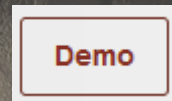
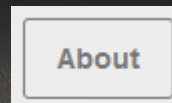
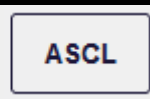
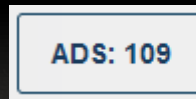
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Search by Category



Filters

Atm Retrieval Codes ✕

Radiative Transfer Tools ✕

Observatory/Instrument Models ✕

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Categories

Resource Types

Collections

Star

Stellar Models and Catalogs

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Atm

Atmosphere Models

▲

☐ 1D Atm Models

☐ 2D/3D Atm Models

☐ Atm Chemistry Models

☐ Atm Escape

☒ Atm Retrieval Codes

☐ Cloud Physics Models

☐ Plan. Magnetosphere Models

Int

Interior Models

▼

RT

Radiative Transfer Tools

▼

Obs

Observatory/Instrument Models

▼

Planetary Spectrum Generator: An Online Tool for Synthesizing Planetary Spectra

Villanueva et al.

Atm

Obs

RT

EMAC 2207-154

The Planetary Spectrum Generator (PSG) is an online tool for synthesizing planetary spectra (atmospheres and surfaces) for a broad range of wavelengths (100 nm to 100 mm, UV/Vis /near-IR/IR/far-IR/THz/sub-mm/Radio) from any observatory (e.g., JWST, ALMA, Keck, SOFIA).

Last updated: Mar. 6, 2020

Code Language(s): N/A

About

Demo

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WebApp

Search by Collections & Types



Planetary Spectrum Generator: An Online Tool for Synthesizing Planetary Spectra

Villanueva et al. Atm Obs RT

EMAC 2207-154



The Planetary Spectrum Generator (PSG) is an online tool for synthesizing planetary spectra (atmospheres and surfaces) for a broad range of wavelengths (100 nm to 100 mm, UV/Vis /near-IR/IR/far-IR/THz/sub-mm/Radio) from any observatory (e.g., JWST, ALMA, Keck, SOFIA).

Last updated: Mar. 6, 2020

Code Language(s): N/A

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Related Resources:

THAI: TRAPPIST Habitable Atmosphere Intercomparison GCM Data Repository

THAI Team (T. Fauchez et al.) Atm RT

EMAC 2207-132



The TRAPPIST Habitable Atmosphere Intercomparison (THAI) project is a model inter-comparison effort between four GCMs: ExoCAM, LMD-G, ROCKE3D and the UM – examining a single interesting test case (TRAPPIST-1e) under several different atmosphere scenarios. The CKAN data repository provides NetCDF files for each case, allowing for examination and intercomparison of results from the different models. Scripts to process the data and plot them are available on our Github repository.

Last updated: Sep. 22, 2022

Code Language(s): N/A

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Cat Catalogs & Databases

D Demo/Tutorial Video

DC Downloadable Code

IMD Input and Model Datasets

ICC Inter-Code Comparisons

JN Jupyter Notebook

RR Resource Repository

WA Web Interface

Filters

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Categories

Resource Types

Collections

CHEO CHEOPS

HWO HabWorlds

HST HST

JW JWST

Kplr Kepler

NEx NExSS

PLAT PLATO

RST Roman

TESS TESS

The HabWorlds Collection

Collection of tools related to simulations and modeling specifically for exoplanet-related data from the Habitable Worlds Observatory

Curators:

- EMAC Team, NASA Goddard

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Resource Submission

This page allows developers to submit their model, tool, or resource for inclusion within EMAC. Use the form below to let us know about your tool, including it's name, a brief description, the developers, what categories the resource falls under, whether you want the resource hosted on EMAC, and any relevant links, images, or credits that you'd like us to include.

After you submit your resource, a member of our team will be in touch to discuss a plan for including it in EMAC.

NOTE: All web-based submissions are expected to conform to [W3C standards](#), must pass the W3C [Markup](#) and [CSS](#) validation services, and must support all major cross-platform browsers (sc. [Chrome](#), [Firefox](#), and [Safari](#)).

Your first name*

Please provide your first name

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Your email*

Please provide an email address at which the EMAC team can contact you

▼ Provide Additional Resource Details (click to expand)

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 - ☐ Stellar Models and Spectra
- ☐ Atmosphere Models
 - ☐ 1D Atm Models
 - ☐ 2D/3D Atm Models
 - ☐ Atm Chemistry Models
 - ☐ Atm Escape
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 - ☐ Cloud Physics Models
 - ☐ Plan. Magnetosphere Models

Developer Tips & Tricks



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Software Best Practices and Challenges

Safe code storage

- In addition to storing your code locally, it should consistently be backed up to a remote repository. Here are some popular options:
 - [Github Docs](#)
 - [Bitbucket Guide](#)
- Stable versions (i.e. releases) of your code can be additionally backed up to a number of static repositories. Not only does this add another layer of protection, but it also helps make the science you use your code for more reproducible. Here are some commonly-used options:
 - [The Astrophysics Source Code Library](#)
 - [zenodo](#)
 - [Software Heritage](#)
- If your code has online documentation (e.g. [Read the Docs](#)), save them with the Internet Archive's [Wayback Machine](#)

Getting your code cited

NASA's EMAC

