



Open Data, Open Source, Open APIs @ NASA

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with substantial contributions from Justin Gosses & Evan ("Taylor") Yates





Open-innovation program

A series of websites acting as the agency-wide clearinghouse for NASA's public data including:

- a. **APIs**
- b. **Code**
- c. **Datasets**

Also home to **datanauts** (engaging the public around NASA data) and former home to **developer.nasa.gov** (agency-wide Enterprise github)

Who is this site for?



Citizen Scientist



Developer



Citizen Activist

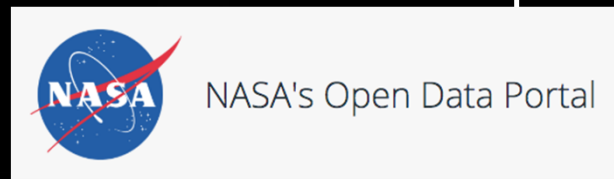


Govvie



Curious

Umbrella Relationship with & benefits from other federal sites



Individuals

Many Others

BENEFITS FROM OTHER FEDERAL SITE

code.gov has extensive API we use

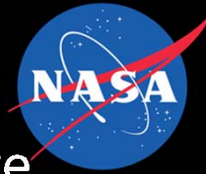
ata.gov investigates data standards and infrastructure alternatives which we take advantages of at NASA

api.data.gov has end-user use-case tracking

analytics.usa.gov helps us count visitor traffic

strategy.data.gov interprets and offers guidance on regulations & laws

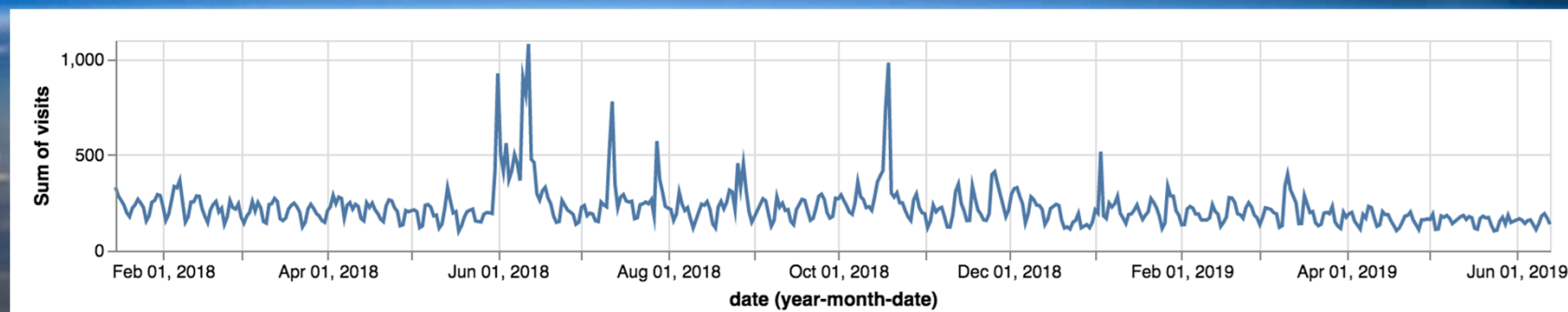
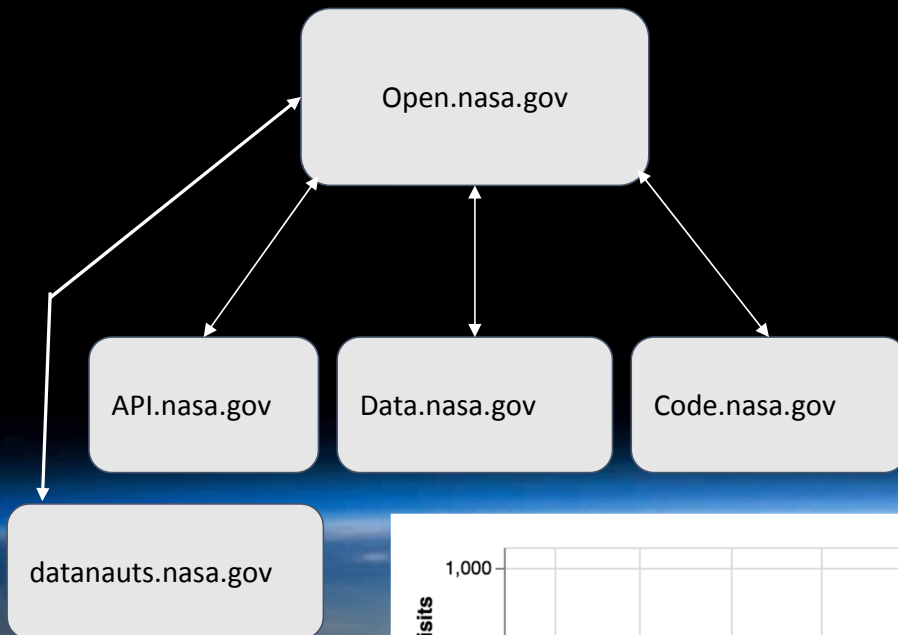
OPEN.nasa.gov



The front-door & overview site
for all the other open-innovation
sites.

Blog + About + News + Links

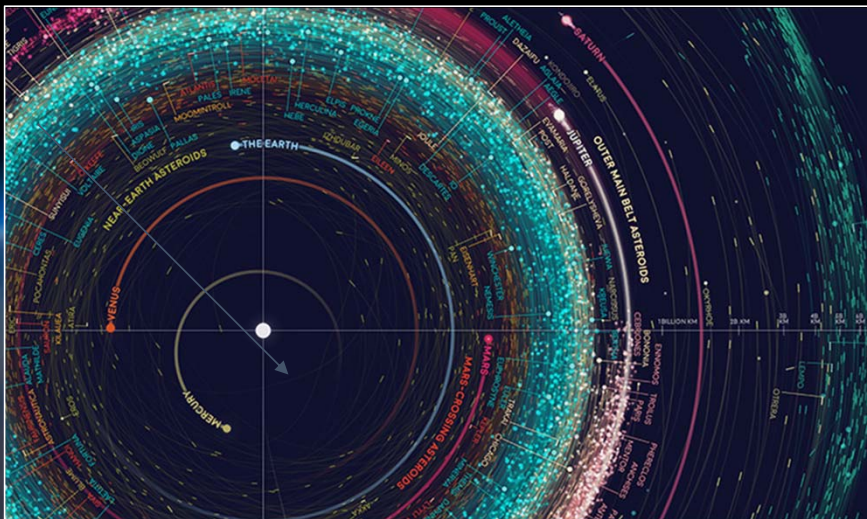
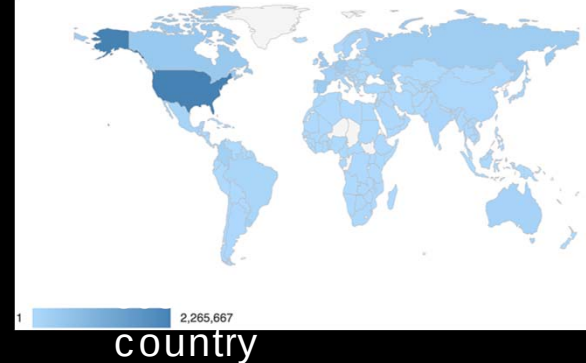
Visits to open.nasa.gov from
analytics.usa.gov's API.



API.nasa.gov (a passthrough service with tracking by api.data.gov)

- **9 Million hits** in May, 2019 (<1% through visitors)
- **55,355 requests** for API keys since 2015.
- **17 APIs:** patents, exoplanets, satellite imagery, hand camera imagery, Mars, etc.

The public uses NASA API's in web applications, data visualizations, and tutorials across the web



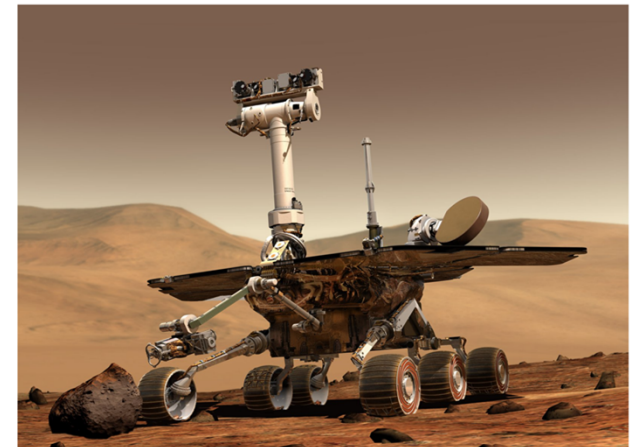
https://github.com/eleanorlutz/asteroids_atlas_of_space/blob/master/readme_figures/asteroids.jpg

Learn how to build an Astronomy Picture of the Day App with the NASA API and React + Redux (Part...



<https://www.freecodecamp.org/news/learn-how-to-build-astronomy-picture-of-the-day-app-with-nasa-api-and-react-redux-part-ii-83f15970d0e3/>

Texting robots on Mars using Python, Flask, NASA APIs and Twilio MMS



<https://www.twilio.com/blog/2017/04/texting-robots-on-mars-using-python-flask-nasa-apis-and-twilio-mms.html>

CODE.nasa.gov

532 open-source projects

Fed from software that has gone through Software Release System run by Office of Chief Engineer

Helps both public & NASA find reusable software

Table shows the open-source projects with the most interaction on GitHub using GSA's pre-built scripts

<https://observablehq.com/d/d2f8833d92e1ea66>

Tags generated by machine-learning model & human-generated tags

Tool For Interactive Plotting, Sonification, and 3D Orbit Display (TIPSOD)

<https://opensource.gsfc.nasa.gov/projects/tipsod/index.php>

NASA Open Source 3.0

TIPSOD is a software application designed for interactive, animated, 4D (space and time) visualization of satellite orbits. The technology is implemented in Java 3D and is an extension to the existing Satellite Situation Center Web (SSCWeb) 2D static orbit graphics. Please visit the following URL for additional information:
<http://opensource.gsfc.nasa.gov/projects/tipsod/index.php>

A.I. generated tags: #java (programming language) #orbital mechanic #display device #software development tool #technology utilization #computer graphic #scientific visualization #graphical user interface #real time operation #satellite orbit

Human generated tags: #Open Source #Data and Image Processing #NASA #GSFC

name	owner	issues	forks	stargazers	watchers	forkCount
"openmct"	"nasa"	"1378"	"663"	"7612"	"273"	"704"
"NASA-3D-Resources"	"nasa"	"15"	"218"	"1582"	"220"	"234"
"earthdata-search"	"nasa"	"9"	"136"	"463"	"58"	"147"
"sunpy"	"sunpy"	"968"	"314"	"423"	"45"	"328"
"WebWorldWind"	"NASAWorldWind"	"506"	"166"	"397"	"58"	"185"
"trick"	"nasa"	"637"	"110"	"387"	"64"	"122"
"worldview"	"nasa-gibs"	"1075"	"103"	"377"	"39"	"109"
"visionworkbench"	"visionworkbench"	"40"	"139"	"342"	"38"	"221"
"WorldWindJava"	"NASAWorldWind"	"109"	"180"	"324"	"82"	"192"
"api-docs"	"nasa"	"89"	"52"	"223"	"45"	"61"
"XPlaneConnect"	"nasa"	"95"	"111"	"215"	"47"	"123"
"StereoPipeline"	"NeoGeographyToolkit"	"224"	"68"	"191"	"41"	"107"
"code-nasa-gov"	"nasa"	"41"	"43"	"189"	"22"	"49"
"Common-Metadata-Repository"	"nasa"	"6"	"46"	"179"	"25"	"50"

Earth Science Data and Information Policy

Since 1994



- **Full and open sharing of Earth science data as soon as such data become available** except where governed by international agreements
- **No period of exclusive access** to NASA Earth science data. Following a post-launch checkout period, all data will be made available to the user community
- **All NASA funded generated standard products** along with the **source code** for algorithm software, **coefficients**, and **ancillary data** used to generate these products are made publically available to the user community
- **All providers** of the Earth science data must include in their agreements **plans for managing the data** to facilitate the implementation of these data principles.
- For details: <https://science.nasa.gov/earth-science/earth-science-data/data-information-policy/>





Earth Science Open Source Policy

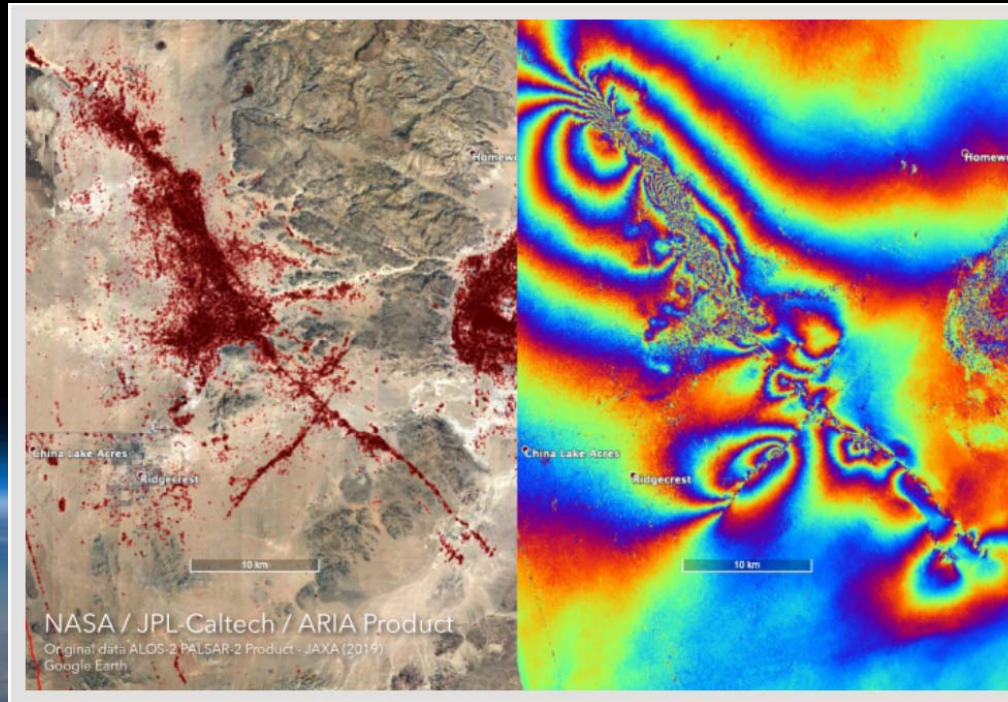
- Core Earth Science Data System software
 - All new projects and existing core software components shall be released as open source (policy enacted fall 2015)
- NASA funded competitive research projects
 - Reviewers may now consider open source software plan as an evaluation criteria.
 - Started with NASA's 2017 Research Announcement (ROSES17) – Section A.1
- Apache 2.0 License + Software Development Plan
 - <https://earthdata.nasa.gov/collaborate/open-data-services-and-software/esds-open-source-policy>

Earthquake Rips through the California Desert: NASA Response provides Science Awareness to Decision Support

July 4th M6.4, July 5th M7.1 and over 80,000 aftershocks

NASA decorrelation map shows surface rupture and disturbance in red

*“Kaleidoscopic satellite image”
LA Times
- providing public awareness on the value of NASA*



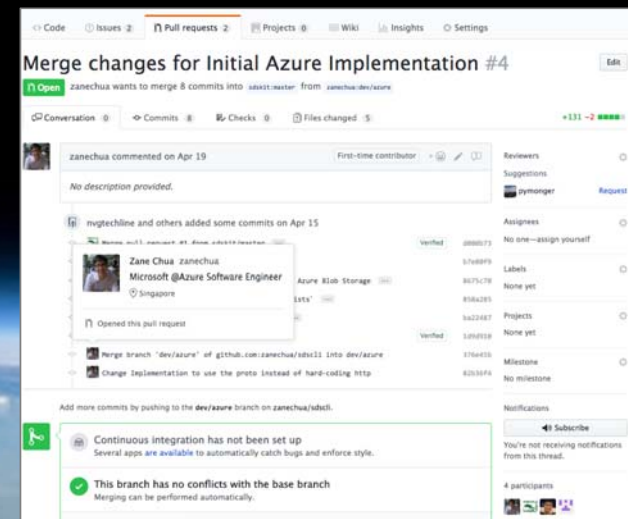
California State Route 178
SW of Trona, following the
M7.1 earthquake.



Imagery shown here was captured here by the ALOS-2 satellite synthetic aperture radar SAR instrument from partners at the Japanese Space Agency and analyzed by JPL's ARIA team to understand the deformation.

ARIA Open Source Updates

- GRFN/HySDS open sourced in year 1
 - <https://github.com/hysds>
- Earth Observatory of Singapore (EOS)
 - *“Conducts fundamental research on earthquakes, volcanic eruptions, tsunamis and climate change in and around Southeast Asia, towards safer and more sustainable societies.”* for Southeast Asia
 - Forked GRFN/HySDS from github
 - Running in AWS Singapore region
- Microsoft Azure porting GRFN/HySDS onto Azure Cloud



NASA's Earth Science Data System in 2018



EOSDIS currently has over **27 Petabytes** of accessible Earth science data

Easy access and discovery of data to over **12,500 unique data products**

... of which 95% of granule searches complete in less than **1 Second**



EOSDIS delivered over **1.6 Billion** data products to over **4.1 Million** users from around the world

33,000 Data Collections in the Common Metadata Repository (CMR)



EOSDIS also delivers near-real-time products in under **3 hours** from observation ...

Over **330,000 users** have registered with EOSDIS to date



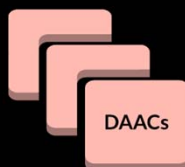
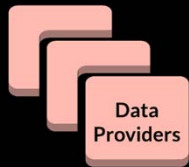
And Over **380 Million** data granules



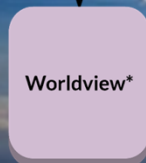
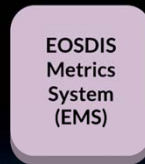
American Customer Satisfaction Index (ACSI) survey scoring **79** from over **4,000** respondents

Open Data, Open Source, Open Services

Free data
download



Open APIs



Extensible
Portal Views

-  EOSDIS Central Tools
 -  Federated Resources
- * Open Source Software

