

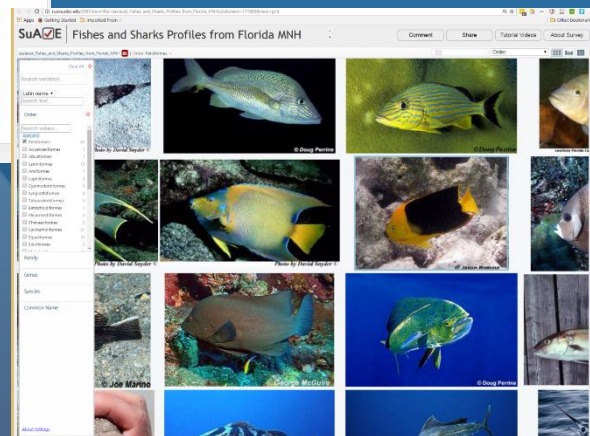
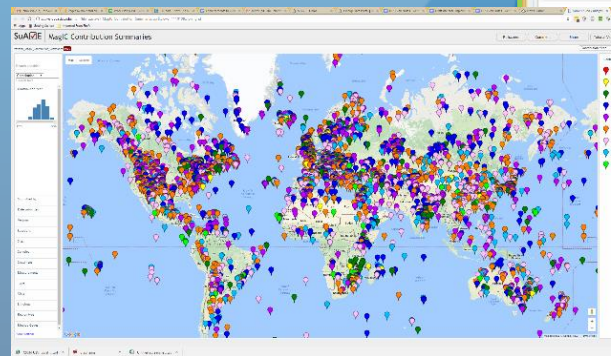
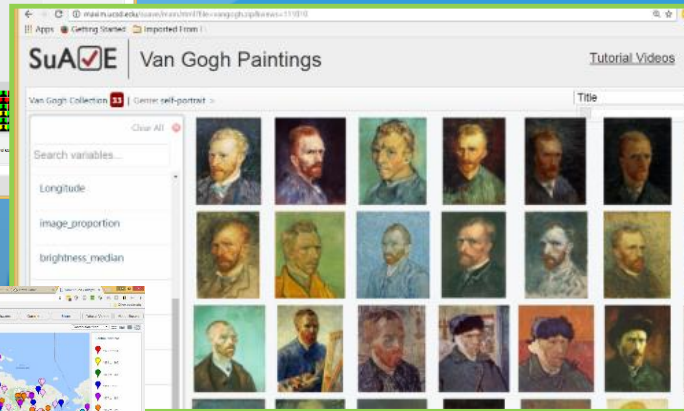
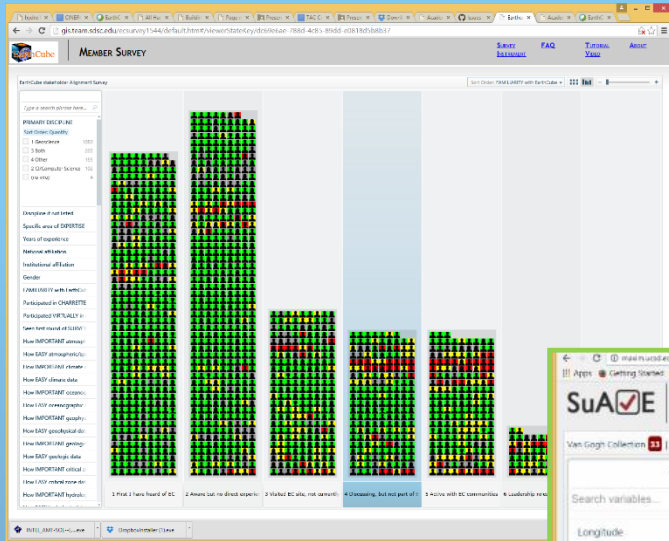
# SuA<sup>✓</sup>OE

<http://suave.sdsc.edu>

## *Survey Analysis via Visual Exploration*

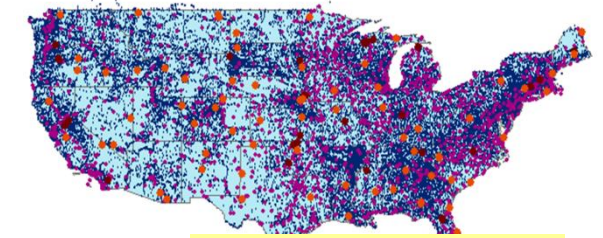
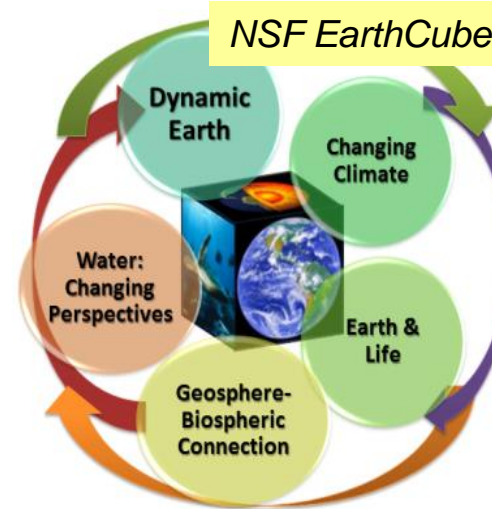
a new online system for  
visual analysis of surveys  
and image collections

Ilya Zaslavsky  
San Diego  
Supercomputer Center  
UCSD



# SDSC Spatial Information Systems Lab

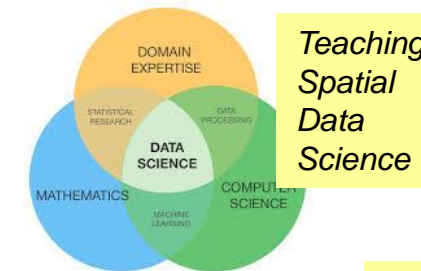
- Spatial data integration
- Interoperability and data standards
- GIS and Geospatial Databases
- Information discovery across distributed sources
- Online analysis systems
- Survey data analysis



Hydrologic Information System  
(largest in the world)

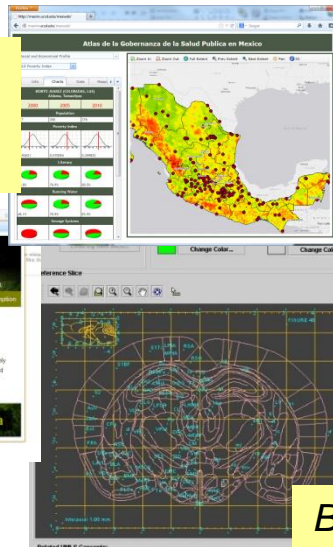


OGC®  
Open Geospatial Consortium, Inc.

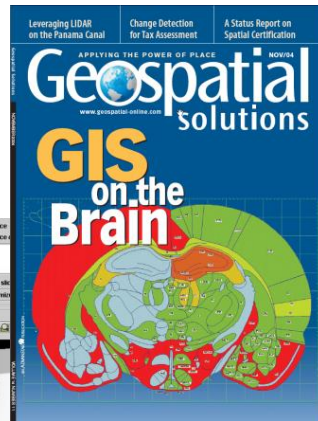


Teaching Spatial Data Science

Mexico Health Atlas

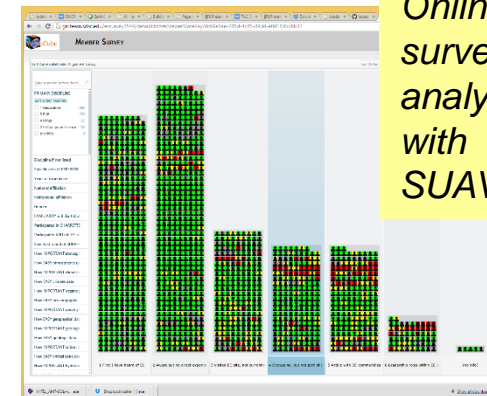


Ecosystem Services Dashboard



Brain data integration

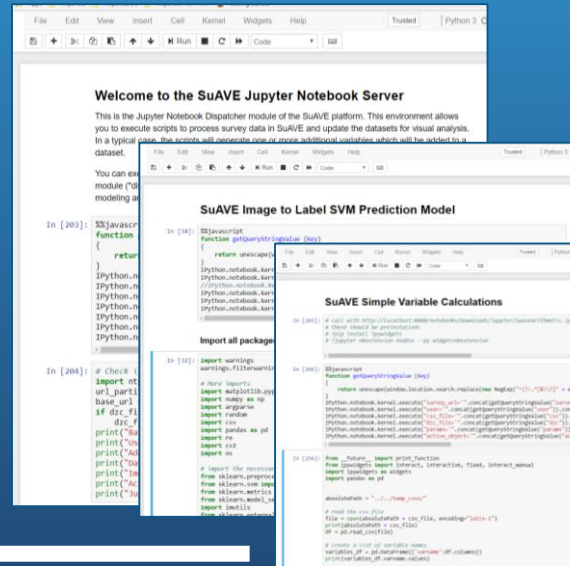
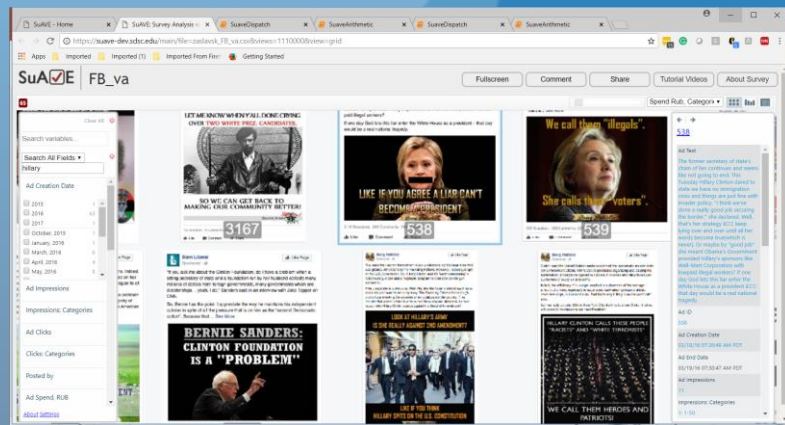
Online survey analysis with SUAVE



Critical Zone Observatories



# A Data Science Gateway for Analysis of Surveys and Image Collections in Education and Research



*From Visual  
Data  
Exploration  
to Analysis with  
Jupyter  
Notebooks*

FILEMESSAGE

Ignore

Junk

Delete

Reply

Reply All

Forward

More

Meeting

Create an appoi...

Team Email

Create New

archive\_2009 -...

Done

To Manager

Reply & Delete

Move

Rules

OneNote

Actions

Mark Unread

Categorize

Follow Up

Translate


Find

Related

Select

Zoom

Zoom



Tue 10/31/2017 6:30 PM

SuAVE <wordpress@besuave.azurewebsites.net>

Lotion

To Zaslavsky, Ilya

Follow up.

Start by Thursday, November 2, 2017.

Due by Thursday, November 2, 2017.

Site

Name

Email

Subject


Message


Sent from (ip address):

Date/Time:

Sent from (referer):


<http://suave.sdsc.edu>





Lotion

Years ago I found your Cucumber Melon lotion and it was the best smelling lotion I've ever had. I can't find it anymore. Do you still make it and if you do where can I find it in Dallas Texas? Thank you.

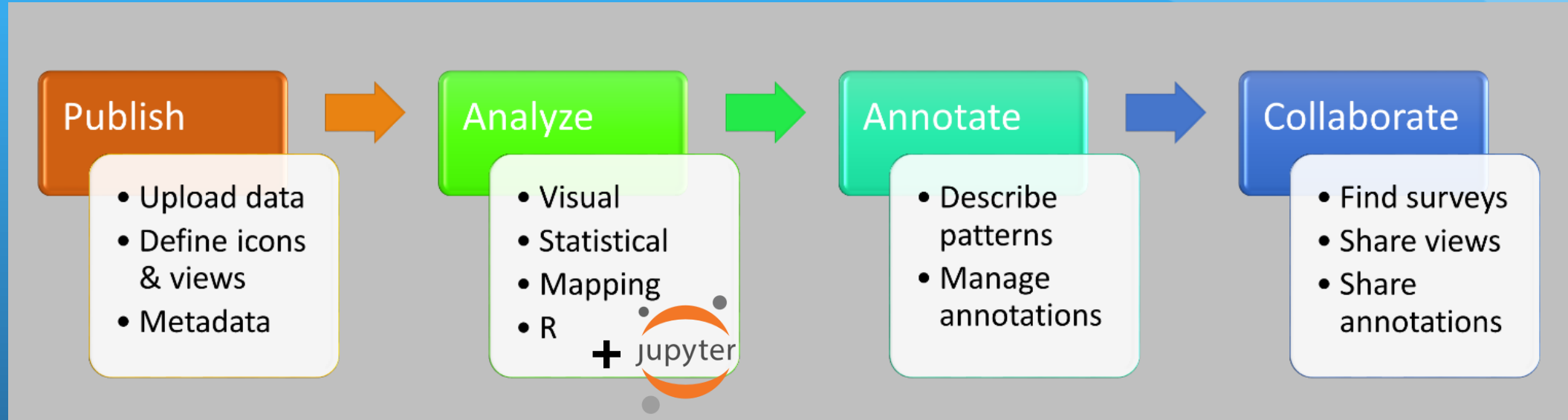


October 31, 2017 6:30 pm

<http://suave.sdsc.edu/contact/>

Mozilla/5.0 (iPhone; CPU iPhone OS 11\_0 like Mac OS X) AppleWebKit/604.1.28

# SuAVE Capabilities

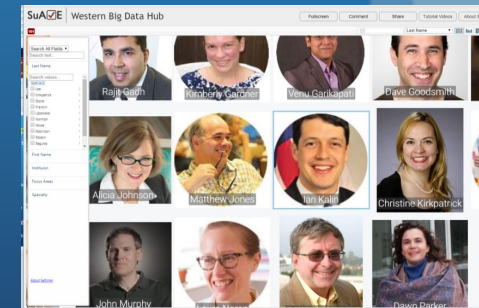
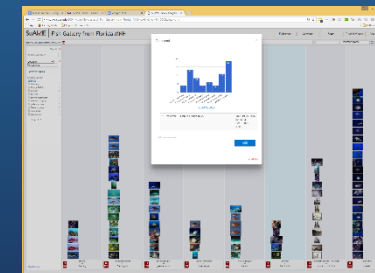
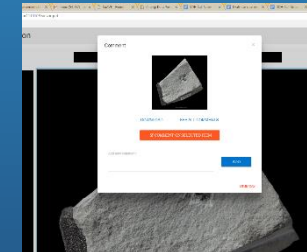
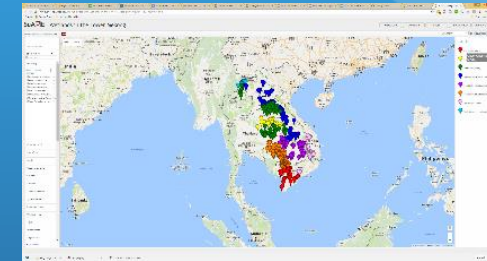
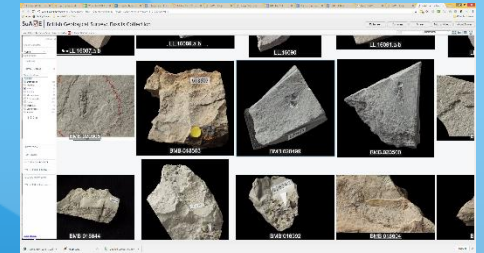
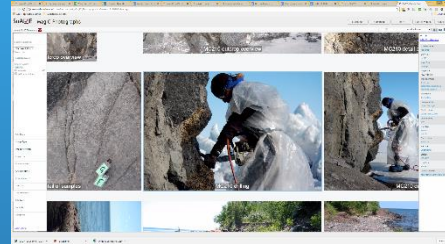


## Applications in:

Public Opinion Surveys • Biology and Ecology • Health Informatics • Library Collections • Geosciences • Visual Arts • Humanities • Archaeology • Urban Planning • Organization Management • Portfolio Analysis

# Types of Applications:

1. Publishing image collections (researchers, museums, libraries)
2. Data discovery
3. Exploratory analysis:
  - Combined visual, statistical and cartographic analysis
4. Data curation
5. Reproducible sharing of data and findings
6. Community building and crowdsourcing
7. Teaching research methods



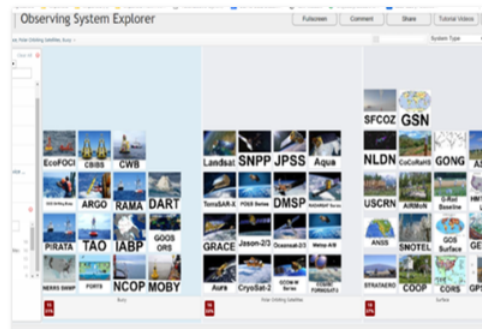


# DEMO 1: SuAVE in the Geosciences

(<http://suave.sdsc.edu/suave-for-geosciences/>)

## SuAVE for Environmental Science and the Geosciences

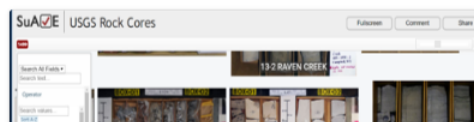
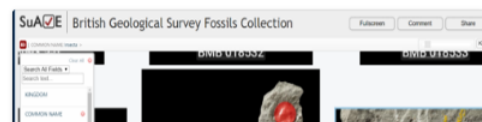
We have published several camera trap and biodiversity image collections in SuAVE. Below you will find examples from iDigBio and the Florida Museum of Natural History, iNaturalist, the TEAM project, as well as several collections related to analysis of coral reef dynamics, which are explored in EarthCube CINERGI and Data Discovery hub projects. A range of questions can be addressed by exploring these collections, such as factors of coral reef dynamics, species abundance, activity of different species by time of day and temperature.



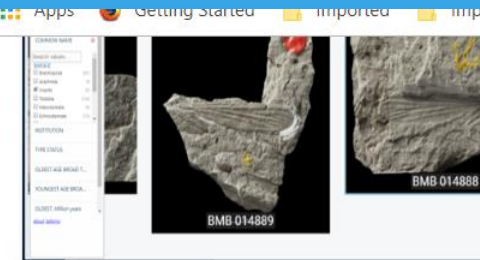
[Observing System Explorer](#), from NOAA. This joint work with NOAA presents observation systems in operation, both government and commercial. You can explore systems of different types by mission service area, topics, measured variables, etc. The application was used in a joint demo with NOAA at the 2017 GEO Summit.



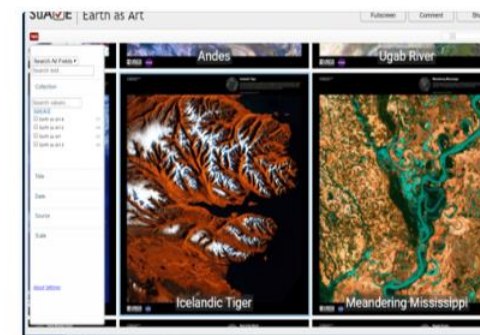
[the Ambient Air Quality Database](#), by country and city, assembled by the World Health Organization. It is available at <http://www.who.int/airpollution/data/cities/en/>



[suave-dev.sdsc.edu/main/file=zaslavsk\\_Observing\\_System\\_Explorer.csv&views=111000&view=grid](http://suave-dev.sdsc.edu/main/file=zaslavsk_Observing_System_Explorer.csv&views=111000&view=grid)



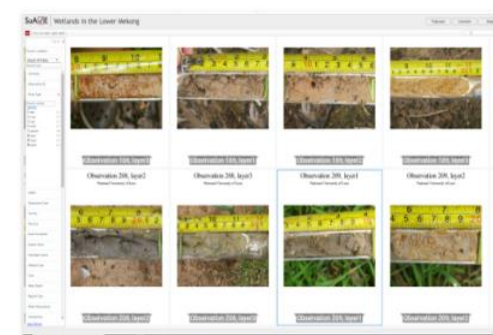
[The Macrofossils Collection from the British Geological Survey](#). This collection integrates data from several museums. It received the 2015 International Data Rescue Award in the Geosciences.



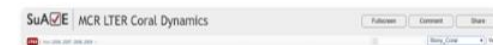
[Earth as Art](#). This collection of stunning remote sensing images has been assembled at the [USGS EROS data center](#). It shows images from several missions. The Earth as Art collections 1-4 are included here.



[Rock Cores Collection](#) from the the US Geological Survey's National Geological and Geophysical Data Preservation (NGGDP) program.



[Soil samples from wetlands in the Lower Mekong](#). The wetland surveys in the Lower Mekong were conducted under the aegis of Lower Mekong Initiative's (LMI) Wetland University Network (WUN). Data assembled by the Crane Foundation.



# Earth As Art: USGS Remote Sensing Gallery

USGS Home Contact USGS Search USGS

Earth Resources Observation and Science (EROS) Center

Home Find Data Science Remote Sensing Publications About Us Image Gallery Video Library

## Earth As Art 4

Earth as Art 4 (EAA4) comprises 37 stunning images captured by Landsat 8, the newest Landsat Program satellite.

Landsat satellites acquire detailed views of the Earth's surface that scientists use to determine how our planet's landscapes are changing over time. In addition to their scientific value, however, many Landsat images are simply lovely to look at.

[Exhibit Guide](#)

[View Images](#)

Earth as Art 4 Earth as Art 3 Earth as Art 2 Earth as Art Image of the Week Landsat State Mosaics States - NED Shaded Relief

Accessibility FOIA Privacy Policies and Notices Download Adobe Reader®

U.S. Department of the Interior | U.S. Geological Survey

URL: <https://eros.usgs.gov/imagegallery/>

Page Contact Information: [custserv@usgs.gov](mailto:custserv@usgs.gov)

Page Last Modified: January 16, 2013 at 12:14 PM



SuAIE Earth as Art

Fullscreen Comment Share Tutorial Videos About Survey

Collection: Earth as Art 4

Search variables...

Collection

Search values...

Sort: A-Z

Earth as Art 4	37
Earth as Art 2	44
Earth as Art	42
Earth as Art 3	40

Title

Date

Source

Scale

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[waziristan\\_hi.jpg.zip](#)

[van\\_gogh\\_from.jpg.zip](#)

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[the\\_dardzha\\_m.jpg.zip](#)

[spilled\\_paint.jpg.zip](#)

[Show all](#)

**Wind Power**

A bold point stroke on a busy purple canvas is actually part of the Dasht-e Lut Desert in southeastern Iran. The linear features are kaluts, huge rocky formations shaped by wind erosion. The streamlined forms vary in size, but some kaluts stretch more than 100 km.

[More](#)

Collection

Earth as Art 4

Title

Wind Power

Date

6/12/2014

Source

Landsat 8

Download URL

<http://earthexplorer.usgs.gov/download/AS-WIND-POWER-JPG/WWW>

Image URL

<https://earthexplorer.usgs.gov/download/AS-WIND-POWER-JPG/STANDARD/WWW>

**Australian Iron Ore**

**Wind Power**

**Sloppy Paint**

**Faults**

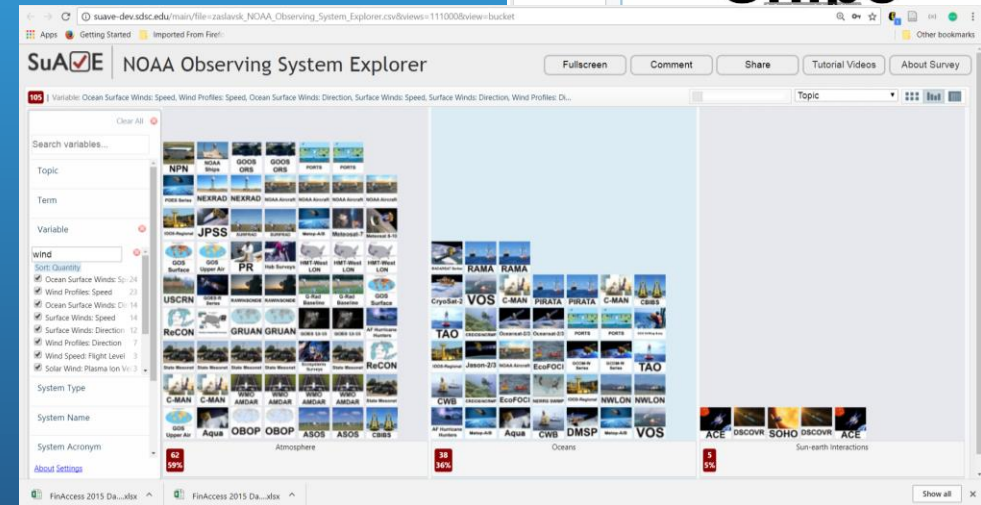
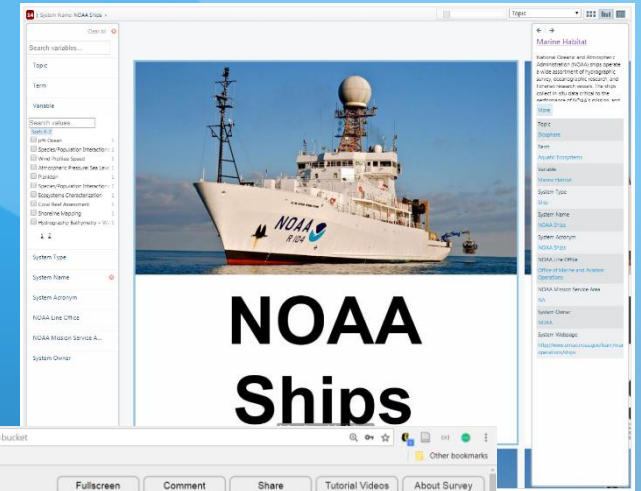
**Cellular Ice**

**Cloud Light**

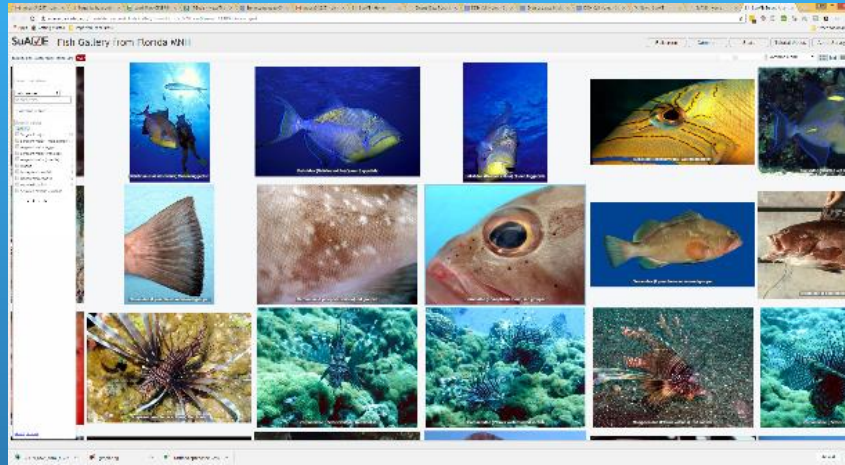


# Observing Systems Explorer (NOAA)

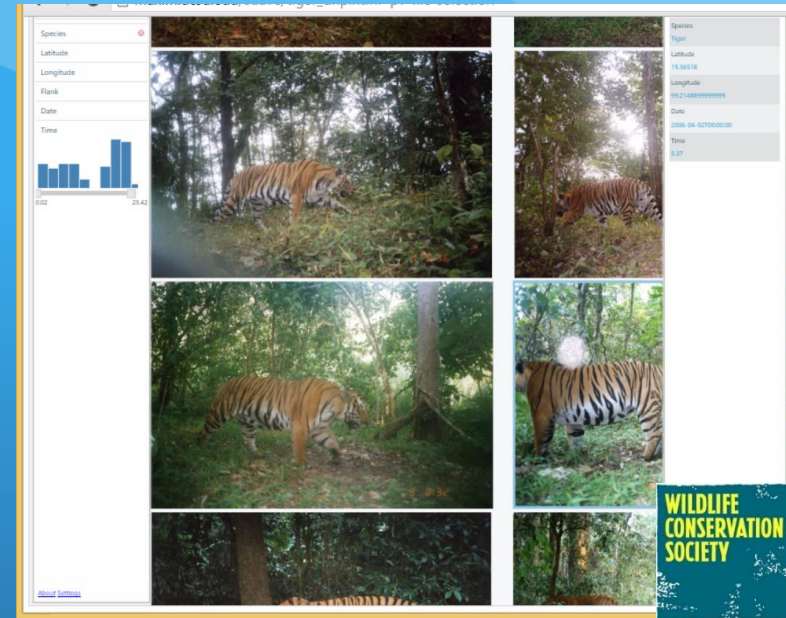
- Types of observational data:
- satellite and aircraft-based systems
- surface and ocean-based systems, both moving and stationary.
- platforms, sensing elements, measured environmental parameters, and other characteristics, links to system websites



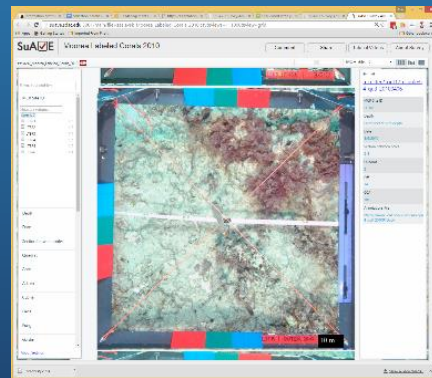
# Biodiversity and Ecology



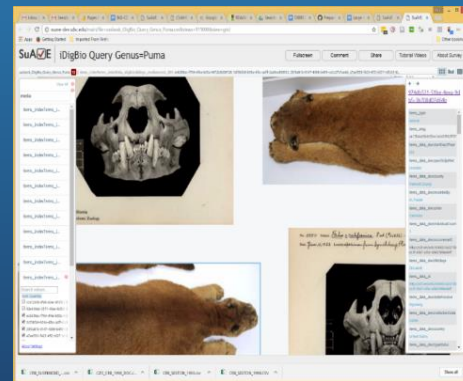
## Florida MNH fish gallery



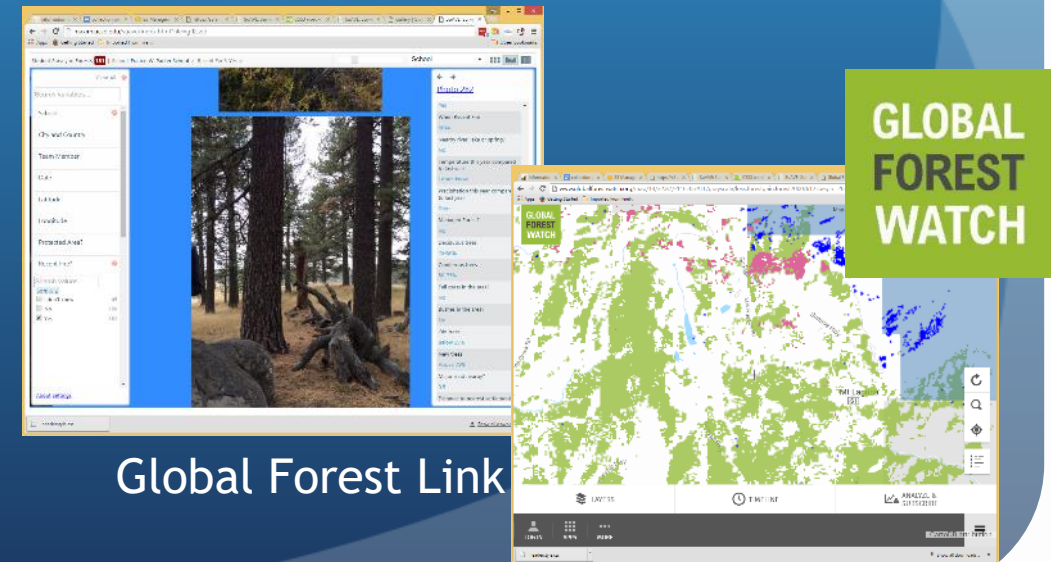
## Camera Trap Images



# Coral Reefs



iDigBio: genus: puma



# Global Forest Link



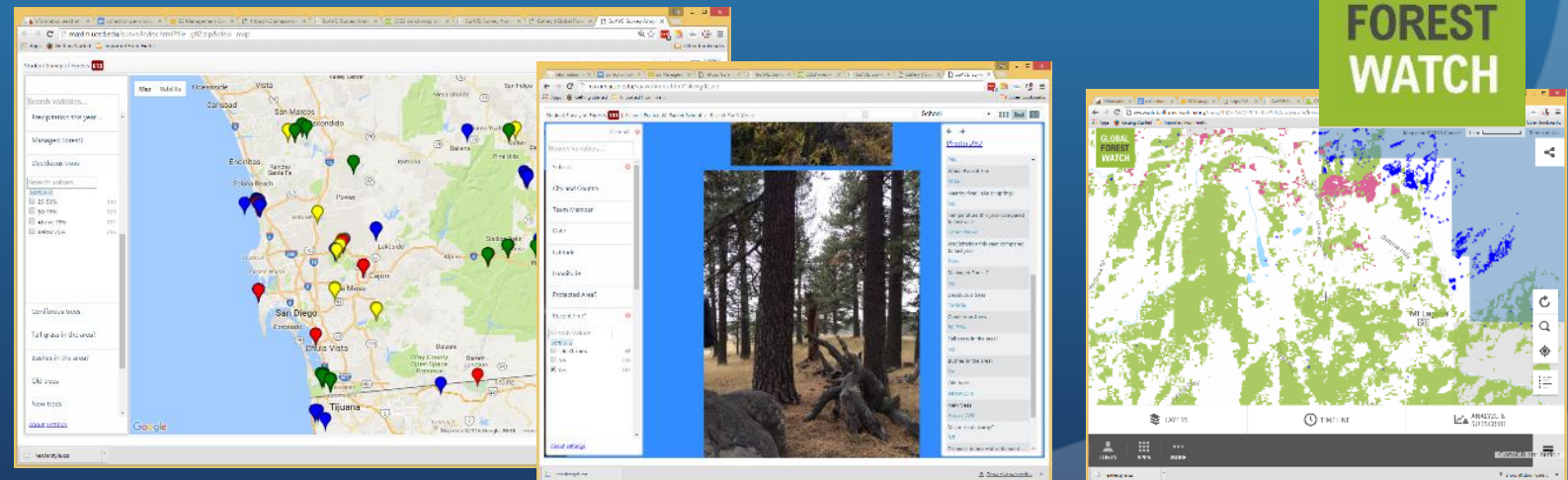
# SuAVE as a teaching tool

- Used by UCSD Sociology in Research Methods classes; in ‘Urban GIS’ class, in ‘Spatial data science’ class, many invited lectures
- Thinking in terms of distributions as opposed to averages; Comparing conditional distributions; Exploring outliers and deviant cases
- Assessment:

*“I really liked using SuAVE. I think the visualization portion of it was extremely useful and I learned a lot from using it. In addition, it was very user friendly and easy to navigate.”*

*“It was cool to see how you can find specific information about one respondent. The way to categorize respondents and understand odd findings was interesting because you would sometimes expect opposite.”*

- High schools:
  - Used in environmental science classes, through the Global Forest Link project





# Global Forest Link

<http://globalforestlink.com>

## Training & Tutorials



**Global Forest Link**

About Team Participants Experts Tutorials Gallery Store



### 3. How to collect images

You are in a forest with a camera – this is how you can help!

[Start Tutorial](#)

**GLOBAL FOREST WATCH**

### 4. What is Global Forest Watch?

Learn about Global Forest Watch and why we use it.

[Start Tutorial](#)



### 5. How does satellite imaging work?

You can get amazing photos from space. But how do you know what they show?

[Start Tutorial](#)

## Data Collection

Global Forest Link 2019

**Photo Information Form**

1. Your Name: \_\_\_\_\_
2. Your Email Address: \_\_\_\_\_
3. Your School: \_\_\_\_\_
4. Photo File Name: \_\_\_\_\_
5. Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ (MM/DD/YYYY)
6. Time: \_\_\_\_:\_\_\_\_ (HH:MM) (24 Hour Time)
7. Where was your photo taken? (Decimal coordinates)  
Latitude: \_\_\_\_\_ Longitude: \_\_\_\_\_
8. Was this a protected area? (Circle one)  
Yes No I don't know
9. Has there been a recent fire?  
Yes No I don't know
10. If yes, write the year when the fire occurred: (YYYY)
11. Is there a nearby river, lake, or spring?  
Yes No I don't know
12. What was the average temperature like this year, compared to previous years?  
Warmer Normal Colder I don't know



## Sharing Stories



Nature life in one shot

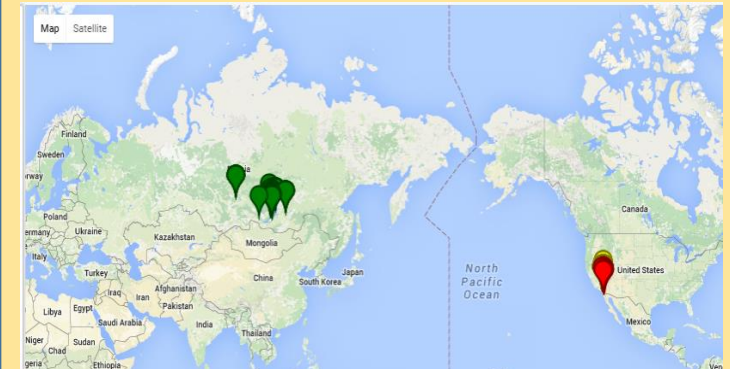


Essay for the GlobalForestLink project

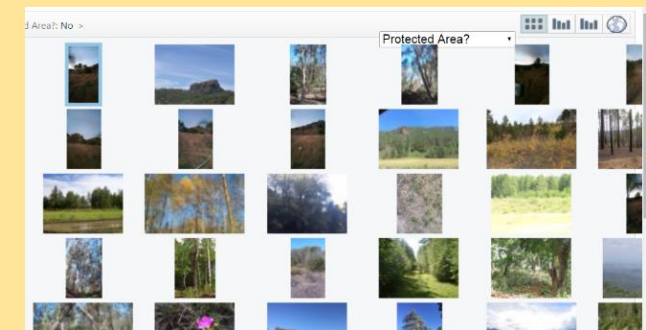


The forest around Mandrik

## Collaborative Analysis



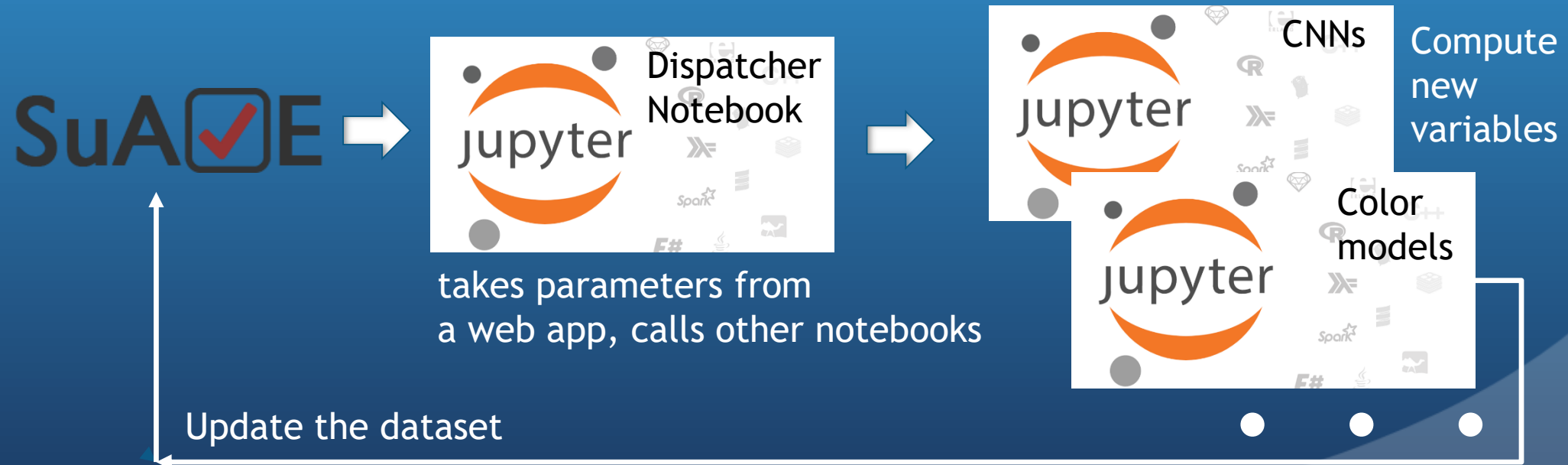
**SuA**  **E** Survey Analysis via Visual Exploration





## DEMO 2: Data Science Gateway

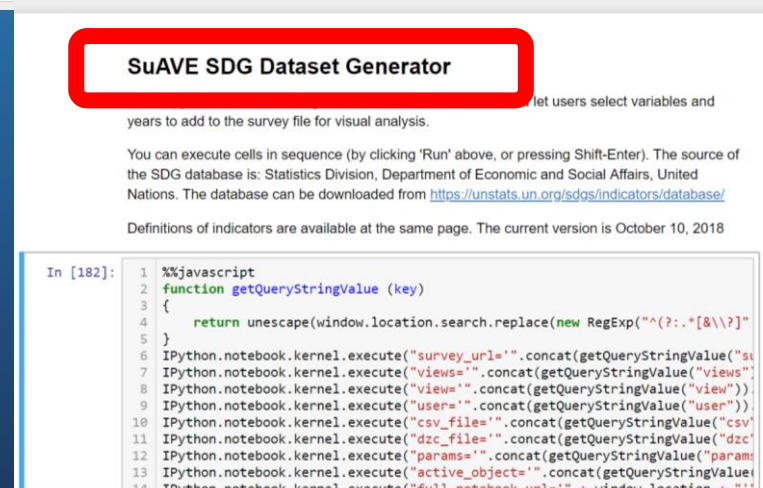
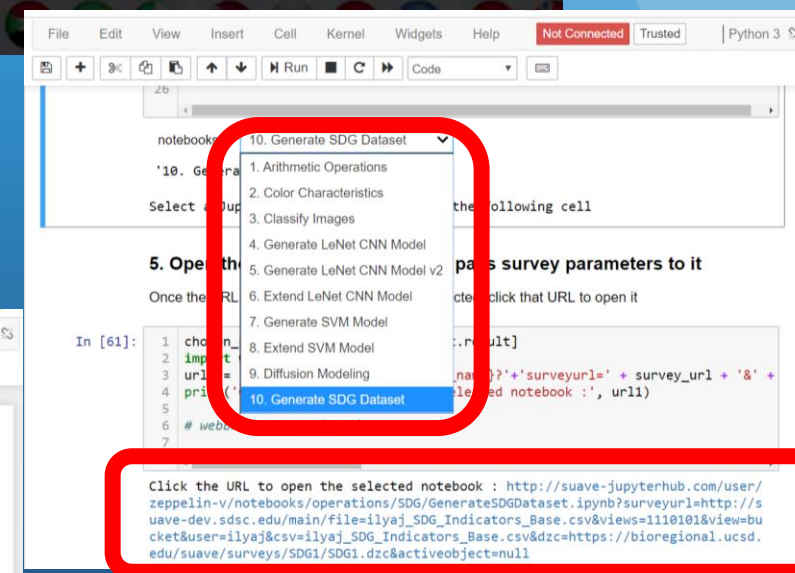
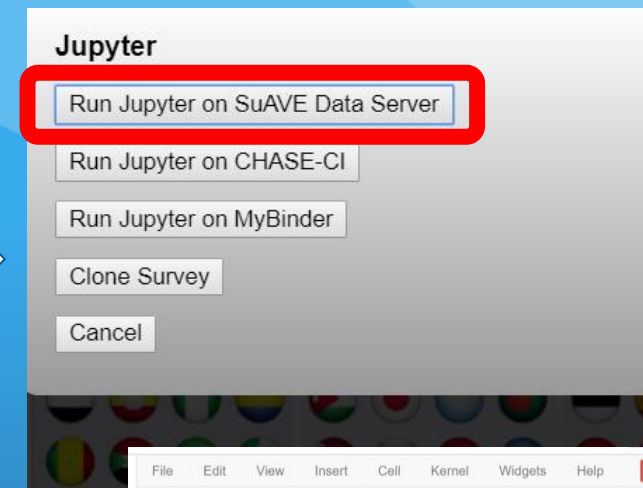
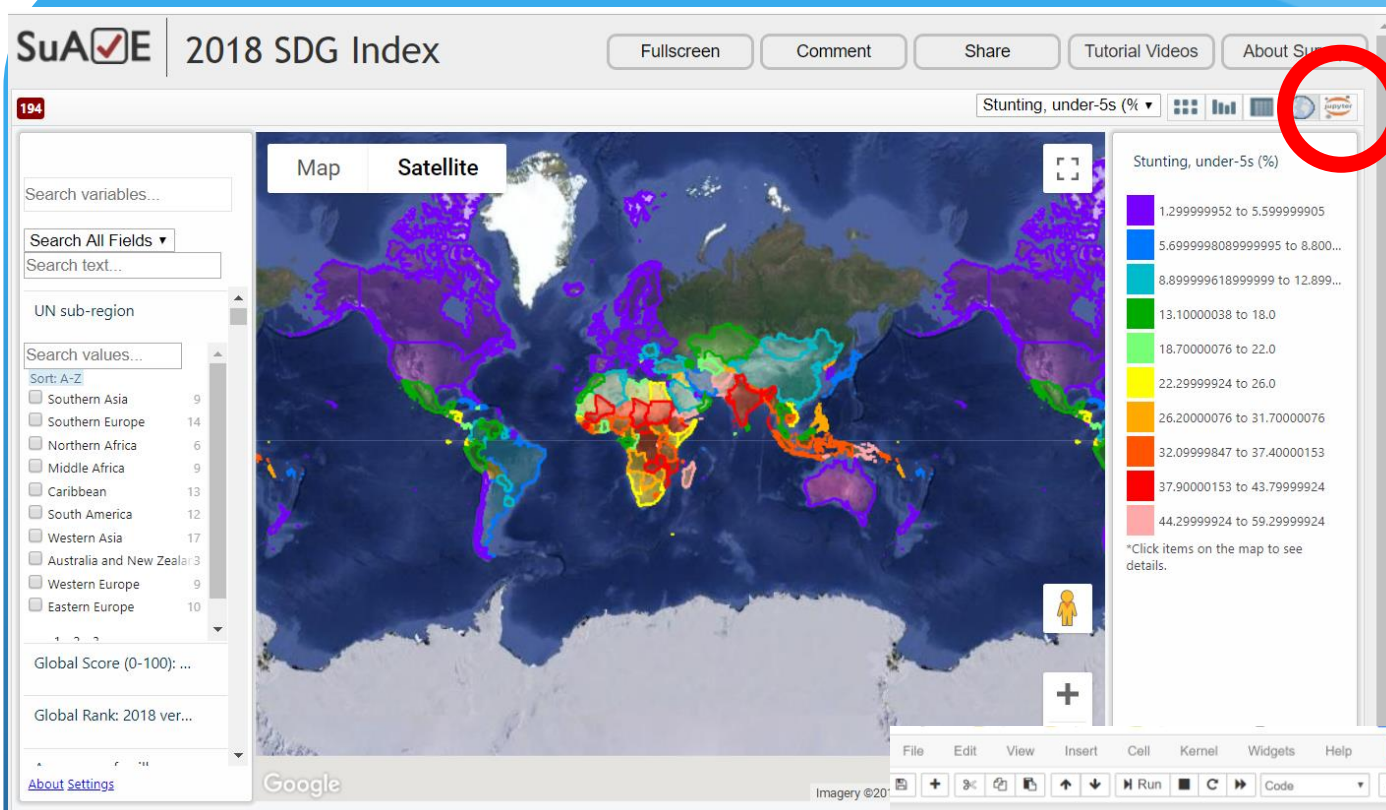
- Dispatcher notebook: takes parameters from a web app, and calls other notebooks
- Image analysis, statistical models, predictive analytics: launching from the Dispatcher and generating new variables into SuAVE (class IDs, concept labels, model residuals, color models, etc.)



# Some examples

- Picasso paintings: [https://suave-dev.sdsc.edu/main/file=public\\_Picasso\\_Paintings.csv&views=1110101&view=grid](https://suave-dev.sdsc.edu/main/file=public_Picasso_Paintings.csv&views=1110101&view=grid)
  - With colors: [https://suave-dev.sdsc.edu/main/file=public\\_Picasso\\_with\\_colors.csv&views=1110101&view=grid](https://suave-dev.sdsc.edu/main/file=public_Picasso_with_colors.csv&views=1110101&view=grid)
  - With concepts: [http://suave-dev.sdsc.edu/main/file=public\\_picaconc2.csv&views=1110101&view=grid](http://suave-dev.sdsc.edu/main/file=public_picaconc2.csv&views=1110101&view=grid)
- Facebook Ads from Russia: [http://suave-dev.sdsc.edu/main/file=ilyaj\\_Facebook\\_Ads\\_from\\_IRA\\_Russia.csv&views=1110001&view=grid](http://suave-dev.sdsc.edu/main/file=ilyaj_Facebook_Ads_from_IRA_Russia.csv&views=1110001&view=grid)
- Taxonomic Identification: [http://suave-dev.sdsc.edu/main/file=ilyaj\\_Butterfly\\_images\\_25\\_32\\_60\\_25\\_32\\_100\\_clone\\_.csv&views=1110001&view=grid](http://suave-dev.sdsc.edu/main/file=ilyaj_Butterfly_images_25_32_60_25_32_100_clone_.csv&views=1110001&view=grid)





Select indicators and years

The screenshot displays the SuAVE EarthCube Organizational Landscape interface. The top section features a grid of various organizational logos and icons. Below this is a map of North America with several blue location markers. The bottom section displays a 'RDA Groups' interface with a grid of colored circles representing different groups. The interface includes search bars, filters, and navigation buttons.

# DEMO 3:

## Data Management:

### Inventories, portfolios, crowdsourcing, visual curation

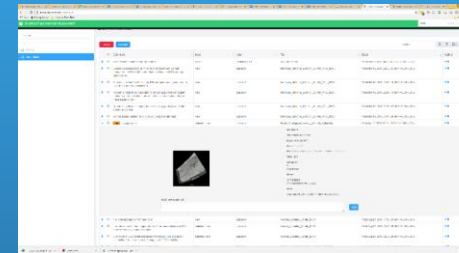
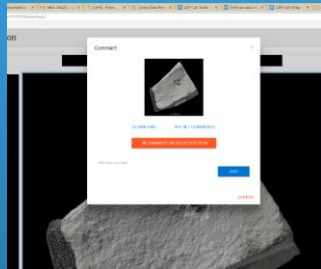
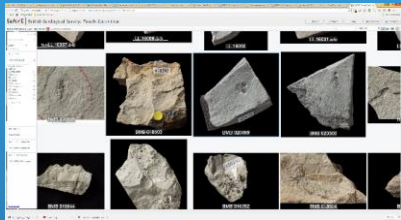
<http://suave.sdsc.edu>  
<http://suave2.sdsc.edu>

Spreadsheet

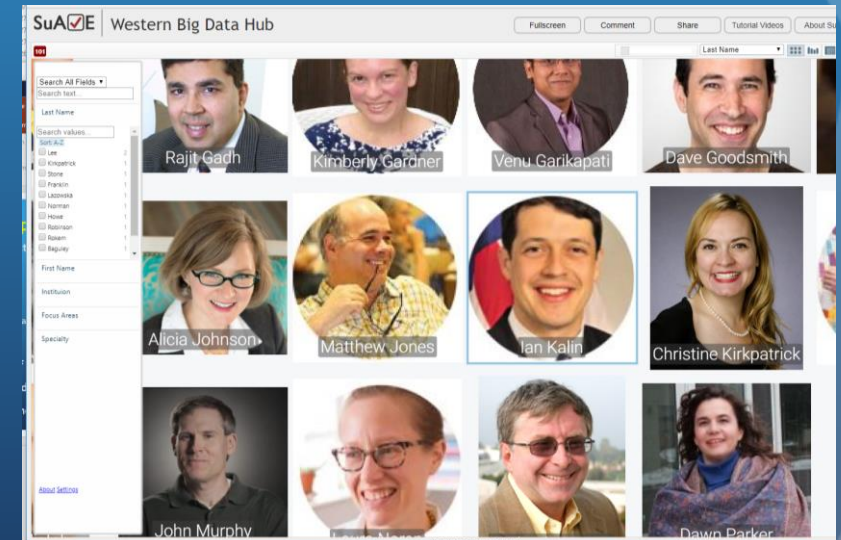


# SuAVE v2: Distributed Visual Data Curation and Crowdsourcing

- Initially: ability to annotate distributions and items, and share them



- New version:
  - The author can define an editing form
  - Keep a record of changes, and rollback
  - Users can add and edit records (either controlled list of entries, or open)
  - The author can authorize users (eg curators) to make changes to specific records







# DEMO 4: How to publish a survey

<http://suave.sdsc.edu> → My Surveys → create an account

- Create “New Survey”
  - Upload a CSV file, give survey a name.
  - Edit a survey: define views to include, icons, dynamic text over items, etc.
  - Add survey metadata, make public (or not)
  - To share your survey - just copy the survey URL
- Manage surveys:
  - Personal survey gallery: <http://suave-dev.sdsc.edu/gallery/<username>>
- To add your own images: generate image tiles, then paste the link into survey definition window
- See <http://suave.sdsc.edu/tutorials> and the handout for step-by-step instructions.
- <http://suave2.sdsc.edu> is new: supports publishing from google sheets, image folders, etc.

Demo file

# Towards an easy-to-use on-demand *data science gateway*

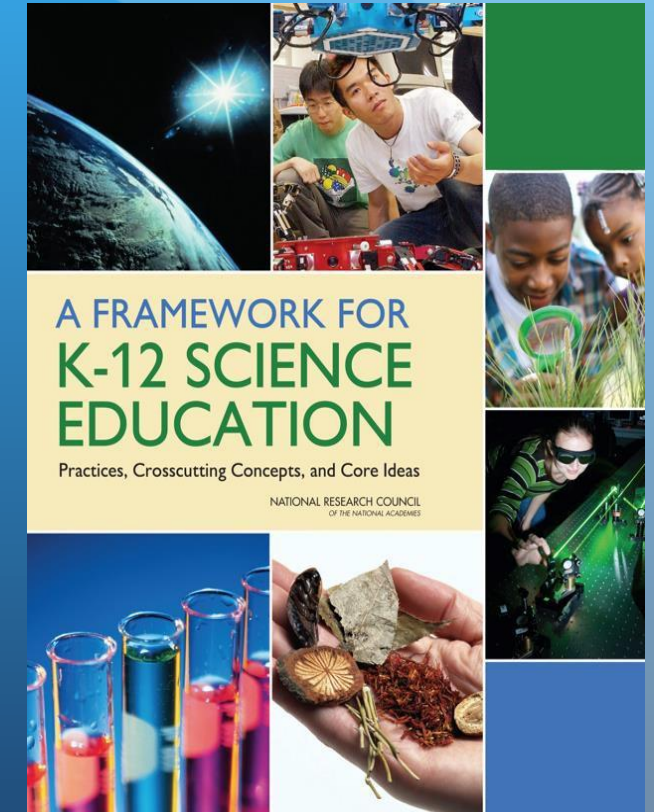
- SuAVE provides a user-friendly platform for exploring data visually, statistically, cartographically
- SuAVE integration with Jupyter notebooks creates a gateway to advanced data science tools: imputation of values, simulation, AI and machine learning, statistics, computations with data from multiple sources – *accessible to students at any level*
- The mechanism is transparent and re-usable, and accessible to both developers and the general public
- Students can share their data and findings as annotated SuAVE views

# SuAVE in data science curriculum?

- Big data analytics is abstract; abstraction is a key element of computational thinking. For 7-12 students it is critical to show both general patterns in data and specific cases, and make transition between them easy.
- SuAVE supports inquiry-based learning: students can find patterns in data, share findings with peers.

## Earth and Human Activity [ESS3-2, ESS3-3]

- Analyze and interpret data on natural hazards...
- Analyze geoscience data and the results from global climate models to make an evidence-based forecast...
- Apply scientific principles to design constructing explanations and solutions supported by multiple sources of evidence...
- Apply scientific principles to design an object, tool, process or system...





# Discussion: Classroom Activities

- Explore and annotate surveys and collections
  - Teacher publishes a survey, students create annotations and digital stories, share their insights; teachers evaluate and comment on annotations
- Students create and analyze their own data
  - Students build a database together (crowdsourced mode), and share analysis
  - Students conduct questionnaire surveys
- Integration with data science tools in Jupyter notebooks - with increasing engagement and understanding as students learn spatial data science
  - From observing notebooks and running them cell-by-cell using UI widgets
  - To making simple code modifications
  - To developing notebooks for projects suggested by the teacher
  - To creating independent team projects