



Summer 2026

## SIParCS Project 4 –

***Data Pathfinders: A GDEX UX/UI Intern Quest.  
Redesigning the Scientific Data Journey.***

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## About Project

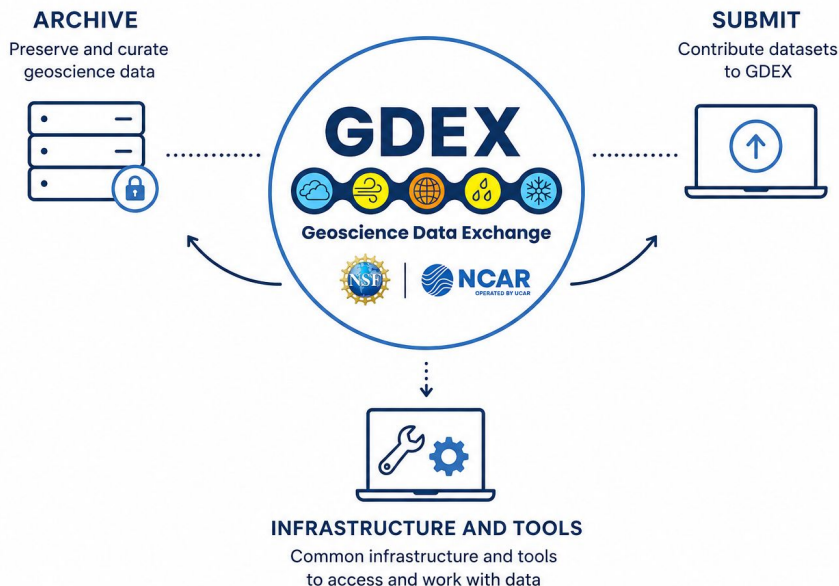
The GDEX Data Pathfinders project aims to improve the scientific discovery of GDEX data and services by identifying user friction points and translating them into evidence-based design improvements.

# GDEX Overview

# What is GDEX?



**GDEX (Geoscience Data Exchange)** is a web data portal that supports atmospheric, ocean and related Earth System Science **Research** at NSF NCAR and US Universities with community reference datasets co-located with community accessible compute services.



[gdex.ucar.edu](https://gdex.ucar.edu)

# Problem Context



**Have you ever been frustrated navigating the GDEX Webpage or any website?**

- The objective of this project is to investigate potential UI/UX problems with the GDEX site and make improvements based on testing feedback
- The Project focused on home page and search page



# Usability Testing

# GDEX Usability Testing



## Purpose

The primary goal of this effort is to evaluate GDEX usability to identify user behaviors and specific interface friction points and develop actionable milestones to improve the GDEX user experience.



## Method

Moderated usability testing using a task completion method with **10 NSF CISL SIParCS Interns**

## Intended Observations

- Starting points and navigation choices
- Confusion, hesitation, and backtracking
- Ability to locate relevant information



# User Analysis and Ranking



The user analysis is to get insights into the user's friction points and transform the interview findings into a structured, evidence-based prioritization roadmap for the GDEX redesign

## Prioritization Framework

**Priority Score =**

$$\begin{aligned} & (\text{Severity} \times 30\%) + (\text{Frequency} \times 25\%) + \\ & (\text{Task Criticality} \times 20\%) + (\text{Persistence} \times \\ & 15\%) + (\text{FAIR Relevance} \times 10\%) \end{aligned}$$

## Reference Frameworks

Standards used to define, rate, and prioritize the usability findings

### ISO / NIST Usability Definition

Can users **efficiently** and **effectively** achieve specific goals.

### Nielsen Norman Group Severity Rating

**Frequency**, **severity/impact**, and **persistence** of the usability problem.

### Nielsen's Usability Heuristics

**System visibility**, **user control**, **real-world language matching**, and **access to help**.

### FAIR Scientific Data Principles

Issues affecting the ability to **discover**, **access**, and **reuse** scientific datasets and formats (like Zarr and NetCDF).

# Findings From Usability Testing

## Users Affected by Pain Point

### File-level access are unclear (Zarr/AI ready datasets)

Search and filters feel disconnected or unclear

Notebook examples and notebook download actions are unclear

Filters are hard to find, too long, or overwhelming

Homepage CTAs and search pathways are unclear

Location filtering is difficult

Data access guidance is unclear

Metrics, By the Numbers, and popular datasets are valuable

Filters reset or do not persist when search changes

AI Ready Datasets are useful and attention-grabbing

### DOI/citation information is not visible enough

### Get Started and Support links are not prominent enough

0 2 4 6 8 10  
Users Affected

# Findings to Design Decision



| Top 5 Critical Findings                                                                                                                           | Design Decision                                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| <b>1</b> AI-ready and Zarr datasets were difficult to discover, limiting access to analysis-ready data formats.                                   | Make formats and AI-ready data more visible        |
| <b>2</b> Usage metrics and <b>3</b> popular datasets were buried in a separate metrics page, reducing visibility of useful, high-value resources. | Surface high-value dataset signals earlier         |
| <b>4</b> Search filters were overcrowded and hard to navigate, making it difficult for users to narrow results efficiently.                       | Simplify and organize filters                      |
| <b>4</b> Location search filtering was unclear, making it challenging to find datasets for regions, states, or other geographic areas.            | Improve location based search by cascading filters |
| <b>5</b> Important dataset information was difficult to locate, including DOI, formats, and access options                                        | Create standardized dataset information cards      |

# **GDEX REDESIGN AND CODE DEVELOPMENT**

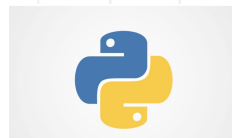
## Design-to-development work

- Designed New UI prototype in Figma based on findings
- Structured redesigns around the existing GDEX Django and Bootstrap environment.
- Developed responsive layouts for homepage and search experiences.

## Technologies Used



Bootstrap



## Data for Scalable, Collaborative Science

The **Geoscience Data Exchange (GDEX)** serves as NSF NCAR's trusted platform for sharing and stewarding Earth System Science data and model output. Designed to accelerate discovery and collaboration, GDEX ensures that scientific data are accessible, interoperable, and preserved for the global research community.

Built for researchers, GDEX increases visibility and discoverability while enabling collaboration across labs, institutions, and disciplines. By unifying datasets into a single, reliable platform, GDEX allows users to run analytics at scale with NSF NCAR's world-class [High Performance Computing services](#), empowering scalable and collaborative science made accessible to US researchers through a range of [allocations opportunities](#).

### Search for Data

Data keyword search or dataset number

AI Ready Datasets Zarr Format Datasets



#### Explore All Datasets

Browse our dataset collections by category, location, or time



#### API

Search GDEX datasets and submit data subset requests



#### Deposit Data

Request to deposit data in GDEX



#### JupyterLab

Access and process GDEX data with Jupyter Notebooks and Open OnDemand



#### NSF NCAR Compute

Request an allocation on NSF NCAR Community Compute Services



#### By the Numbers

Key metrics and statistics about GDEX usage, including lists of popular and AI-Ready datasets

## GDEX. The system of record for Earth System Science

GDEX is NSF NCAR's trusted platform for discovering, sharing, preserving, and analyzing Earth System Science data.

### Search for Datasets

Search by keyword or dataset number

Search

### Explore specialized datasets



AI-ready datasets  
Dataset prepared for AI/ML Workflow



Zarr datasets  
Cloud-optimized array data

1

### What You Can Do With GDEX



#### Explore All Datasets

Browse our dataset collections by category, location, or time

Browse dataset →



#### Jupyter Lab

Access and process GDEX data with Jupyter Notebooks and Open OnDemand

Open JupyterLab →



#### Deposit Your Data

Request to deposit data in GDEX

Deposit Data →



#### GDEX API

Search GDEX datasets and submit data subset requests with the GDEX API client

View API docs →



#### Access NSF NCAR Compute

Request an allocation on NSF NCAR Community Compute Services

Request Compute Access →



#### GDEX Metrics

Key metrics and statistics about GDEX usage, including lists of popular and AI-ready datasets

Get GDEX metrics →

### Explore Popular Datasets

View all datasets →



#14  
LIT Thermosphere  
Control of Ion Outflow  
Results  
4.0K USERS  
4.1K DOWNLOADS



#15  
NCEP GDAS/2NL  
Global Surface Flux  
Grids  
4.0K USERS  
4.1K DOWNLOADS



#1  
ERA5 Reanalysis (0.25  
Degree Latitude-  
Longitude Grid)  
107.0K USERS  
10.4 PK DOWNLOADS

2

### GDEX By the Metrics

1,659  
TOTAL DATASETS

4,088  
TOTAL CITATIONS

651,039  
UNIQUE IPI

25.00 PB  
DATA DOWNLOADED

18.85 PB  
SIZE OF GDEX

96,717  
DOCUMENTED PROJECTS

3



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**Search GDEX**

## **GDEX.** The system of record for Earth System Science

GDEX is NSF NCAR's trusted platform for  
discovering, sharing, preserving, and analyzing  
Earth System Science data.

### Search for Datasets

search by keyword or dataset number

**Search**

### Explore specialized datasets



**AI-ready datasets**

Dataset prepared for AI/ML Workflow



**Zarr datasets**

Cloud-optimized array data

## Search GDEX

Search and discover datasets in GDEX by entering a keyword search below, then filter by the facets in the menu on the left. Click [here](#) to view the full list of all datasets in GDEX.

GDEX search and discovery is powered by [Globus Search](#) and the [Django Globus Portal Framework](#).

Start your search here

From 
 To

Aerosols 10  
 Agriculture 1  
 Air Quality 1  
 Altitude 1  
 Atmosphere 100  
 Atmosphere/surface Interactions 2  
 Atmospheric Chemistry 1  
 Atmospheric Electricity 1  
 Atmospheric Pressure 1  
 Atmospheric Radiation 1  
 Atmospheric Temperature 1  
 Atmospheric Water Vapor 1  
 Atmospheric Wides 1

24 Hour Maximum Temperature 1  
 24 Hour Minimum Temperature 1  
 24 Hour Precipitation Amount 1  
 Absorption 1  
 Accumulative Convective Precipitation 1  
 Aerosol Backscatter 1  
 Aerosol Extinction 1  
 Aerosol Optical Depth/thickness 1  
 Aerosol Particle Properties 1  
 Aerosol Size Distribution 1

### ICARUS Chamber Experiment: Caltech Atmospheric Chamber\_20130414\_ISOPRENE/CYCLOHEXANE\_Ozone\_No Seed\_Dry

#### Description:

Goals: This experiment was performed to study product formation from stabilized Criegee intermediates in the Isoprene + ozone under dry conditions with cyclohexane as an OH scavenger Summary: Different isoprene to ozone ratio than I30406 and I30407 experiments. The initial rate was 3.8E8 molec/cm3/s. Organization: Caltech Atmospheric Chamber Lab Affiliation: California Institute of Technology, Pasadena, CA Chamber: Near/Far Bag 2012-2015 (Tran) Experiment Category: Gas phase chemical reaction O...

Dataset ID: d789504

[proprietary\\_ASCII](#)

### Sadler's Monthly Central Pacific Nephanalyses, February 1965 to February 1978

#### Description:

This dataset contains monthly nephanalyses of average daily cloud cover for the central Pacific Ocean. The data are on a 2.5-degree grid covering the Pacific from 30S latitude to 57.5N, and from 105E longitude to 282.5E. The analyses were provided by James Sadler of the University of Hawaii.

Dataset ID: d672005

[proprietary\\_binary](#)

## Search GDEX

Search GDEX by keyword, variable, project, instrument, or dataset ID. Use the filters on the left to narrow results and quickly find the data you need.

search your datasets here

Last 1 year  
 Last 5 years  
 Last 10 years  
 Last 25 years

YYYY-MM-DD - YYYY-MM-DD

From  To

☐ Agricultural Lands 1  
☒ Air Temperature 17  
☐ Albedo 1  
☐ Alpine/tundra 1  
☐ Atmospheric Pressure 1  
☐ Measurements 2  
[see 70 more...](#)

CONTINENT / REGION

17 datasets found


**Daily Meteorological Data for U.S. Cooperative Stations from NCDC TD3200**

DOI: 10.5065/80MM-R576

| Dataset ID | Temporal Range    | Data Format |
|------------|-------------------|-------------|
| d510000    | 01-1854 - 08-2011 | NCDC_TD3200 |


**NCDC TD3505 Integrated Surface Hourly Data**

DOI: N/A

| Dataset ID | Temporal Range    | Data Format |
|------------|-------------------|-------------|
| d463003    | 01-1901 - 12-2011 | NCDC_ISD    |


**Extended Edited Synoptic Cloud Reports Archive (EECRA) from Ships and Land Stations Over the Globe**

DOI: 10.5065/VA78-8E98

| Dataset ID | Temporal Range    | Data Format |
|------------|-------------------|-------------|
| d292002    | 01-1952 - 12-2008 | ASCII       |


**NCEP ADP Eta (NAM) Subset Surface Observations**

DOI: N/A

| Dataset ID | Temporal Range    | Data Format |
|------------|-------------------|-------------|
| d461001    | 12-2000 - 11-2010 | WMO_BUF     |


**NCDC TD3210 U.S. First Order Summary of Day**

DOI: 10.5065/H0J8-V485

| Dataset ID | Temporal Range | Data Format |
|------------|----------------|-------------|
|            |                |             |



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Search

Search GDEX

# Search GDEX

Search GDEX by keyword, variable, project, instrument, or dataset ID. Use the filters on the left to narrow results and quickly find the data you need.

search your datasets here



## Filters

[clear all](#)

### Time Range ▾

- ☐ Last 1 year
- ☐ Last 5 years
- ☐ Last 10 years
- ☐ Last 25 years

Custom Temporal Range

YYYY-MM-DD

–

YYYY-MM-DD

From

To

[Apply Range](#)

[Keyword](#) ▸

[Variables](#) ▸

[Platform](#) ▸

1662 datasets found

SELECTED FILTERS:

[Reset Search](#)



**ICARUS Chamber Experiment: Caltech Atmospheric Chamber\_20130414\_ISOPRENE/CYCLOHEXANE\_Ozone\_No Seed\_Dry** [↗](#)

DOI: 10.5065/2r0k-z317 [📄](#)

Dataset ID

d789504

Temporal Range

04-2013 – 04-2013

Data Format

ASCII

[Access Data](#)



**Sadler's Monthly Central Pacific Nephanalyses, February 1965 to February 1978** [↗](#)

DOI: 10.5065/SSNK-PX20 [📄](#)

Dataset ID

d672005

Temporal Range

02-1965 – 02-1978

Data Format

Binary

[Access Data](#)



# Web Testing

## What was evaluated?

Representative user tasks were performed on the redesigned homepage and search page to assess clarity, discoverability, and navigation confidence

- ❖ Participants reaction clustered by theme – In their own words

### AFFIRMATIONS

12 positive mentions · 4 themes

#### Search & navigation

4

*"Most striking feature"*

*"Easy to follow how you find datasets"*

#### Filters

4

*"Easy to find" · "easy to use"*

*Continent→state cascade: "makes it really simple!"*

#### Dataset discovery

3

*"Eye-catching" · "really interesting" · "sweet"*

#### Visual / layout

1

*"Nice"*

### IMPROVEMENTS

4 issues raised · 3 themes

#### Text / label clarity

2

**About title:** *"not an approachable title for the layperson"*

**API tab:** *"makes it sound like I should be browsing the datasets but... that's not what the webpage is"*

#### Discoverability

1

**Popular datasets:** *"you have to scroll all the way down to see it → most people will miss it"*

#### Interaction friction

1

**Calendar pop-up:** *"is shaky / the position keeps jittering whenever I press something"*



# Conclusion

This project traced where users struggle in GDEX and turned that evidence into targeted redesigns of the homepage and search experience.

## Key Outcomes

- **Found:** Recurring friction in filters, dataset formats, metadata visibility, and location search
- **Fixed:** Clearer search, usable filters, confident navigation
- **Validated:** Strong positive feedback on the redesigned search, filters, and popular datasets
- **Next:** Surface popular datasets higher; smooth interactions like the calendar picker

## Final Takeaway

- Users are able to navigate easily from homepage to Search Page to find their information

# Summer Lessons and Acknowledgement



## Lessons Learned

- Built and deployed web pages using the Django/Wagtail Python framework
- Applied usability testing methods to turn user feedback into concrete product improvements
- Strengthened collaboration skills by working closely with my mentors and fellow SIParCS interns
- Relating with people from diverse backgrounds and perspectives

## Acknowledgements

- I thank God for the gift of life to be here
- SIParCS Program and CISL, for the tremendous opportunity to here and work on problems that affect real users
- My mentors — Tom, Leigh, Calie, Riley, and Nick — for their unwavering guidance and support
- The entire SIParCS cohort, and Virginia for their support and for participating in the usability testing
- And thank you all for listening



# Thank You