

## ABSTRACT

The recent paradigm shift toward open data has encouraged the growth of freely-available, web-based data repositories to the point of overwhelming the typical user. Accordingly, the responsibilities of open-data stewardship have expanded to ensuring data is not only available, but also accessible to those who would benefit from its use. New features in the Thematic Real-time Environmental Distributed Data Services (THREDDS) Data Server (TDS) web interface improve the navigability of large data repositories and the discoverability of the data they contain, lowering the barrier-to-entry on data access. Although open data is inherently available to everyone, it can be made accessible to a broader audience by enabling data providers to implement dataset or usage-specific customization on top of a core infrastructure of data interfaces.

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## INTRODUCTION

### Objectives:

1. Improve data discovery and access via the TDS web interface.
2. Support fine-tuned administrative control of TDS to allow for tailoring user interfaces to meet individual goals or specifications.

## BACKGROUND

### THREDDS Data Server (TDS) [1]



- A data server framework that provides access to scientific datasets
- The web interface supports data discovery through navigating metadata catalogs

### Thymeleaf [2]



- A server-side Java-based template engine
- Leverages “natural templates” - Templates look and render as HTML

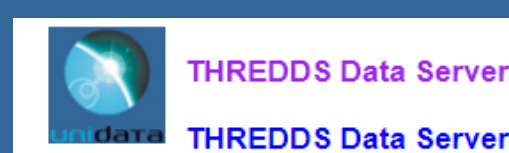


Figure 1: Previous design of the TDS web interface (edited for display)

Catalog  
http://thredds.ucar.edu/thredds/catalog/grib/NCEP/GFS/Global\_Op25deg\_ana/latest.html

Dataset: GFS\_Global\_Op25deg\_ana\_20181219\_1200.grib2

- Data format: GRIB-2
- Data type: GRID
- Harvest: true
- Naming Authority: edu.ucar.unidata
- ID: grib/NCEP/GFS/Global\_Op25deg\_ana/GFS\_Global\_Op25deg\_ana\_20181219\_1200.grib2

Documentation:

- Summary: Single reference time Grib Collection
- NCEP Model Notes
- NCEP Model documentation
- Rights: Freely available
- Reference Time: 2018-12-19T12:00:00Z

Access:

1. OPENDAP: thredds/data/grib/NCEP/GFS/Global\_Op25deg\_ana/GFS\_Global\_Op25deg\_ana\_20181219\_1200.grib2
2. HTTP Server: thredds/data/grib/NCEP/GFS/Global\_Op25deg\_ana/GFS\_Global\_Op25deg\_ana\_20181219\_1200.grib2
3. WCS: thredds/wcs/grib/NCEP/GFS/Global\_Op25deg\_ana/GFS\_Global\_Op25deg\_ana\_20181219\_1200.grib2
4. WMS: thredds/wms/grib/NCEP/GFS/Global\_Op25deg\_ana/GFS\_Global\_Op25deg\_ana\_20181219\_1200.grib2
5. NetcdfSubset: thredds/netcdfsubset/grib/NCEP/GFS/Global\_Op25deg\_ana/GFS\_Global\_Op25deg\_ana\_20181219\_1200.grib2
6. CdMRemote: thredds/cdmremote/grib/NCEP/GFS/Global\_Op25deg\_ana/GFS\_Global\_Op25deg\_ana\_20181219\_1200.grib2
7. NCL: thredds/ncl/grib/NCEP/GFS/Global\_Op25deg\_ana/GFS\_Global\_Op25deg\_ana\_20181219\_1200.grib2
8. UDCC: thredds/udcc/grib/NCEP/GFS/Global\_Op25deg\_ana/GFS\_Global\_Op25deg\_ana\_20181219\_1200.grib2
9. ISO: thredds/iso/grib/NCEP/GFS/Global\_Op25deg\_ana/GFS\_Global\_Op25deg\_ana\_20181219\_1200.grib2

Creators:

- DOC/NOAA/NWS/NCEP
  - email: http://www.ncep.noaa.gov/mail\_liaison.shtml
  - http://www.ncep.noaa.gov
- National Oceanic and Atmospheric Administration (NOAA)/National Weather Service (NWS) National Center for Environmental Prediction (NCEP)

## THE TDS 5.0.0

### 1. Graphical user interface (GUI)

#### What's new:

- The TDS web interface has been updated from the view shown in figure 1 to that in figure 2.

#### Benefit:

- The user-friendly interface improves navigability and encourage exploring catalogs via web interface.

### 2. Contributed stylesheets

#### What's new:

- TDS administrators can now override default style by contributing CSS stylesheets (figure 3).

#### Benefit:

- Reduces the need to build a front end interface external to the built-in TDS web interface.

### 3. Extensible templates

#### What's new:

- TDS leverages portable sections of templated HTML called *fragments*.
- TDS Administrators can override existing fragments, such as *header* or *footer*, and contribute additional content.

#### Benefit:

- The TDS web interface can be modified to show content unique to the publishing organization, target audience, or type of data.

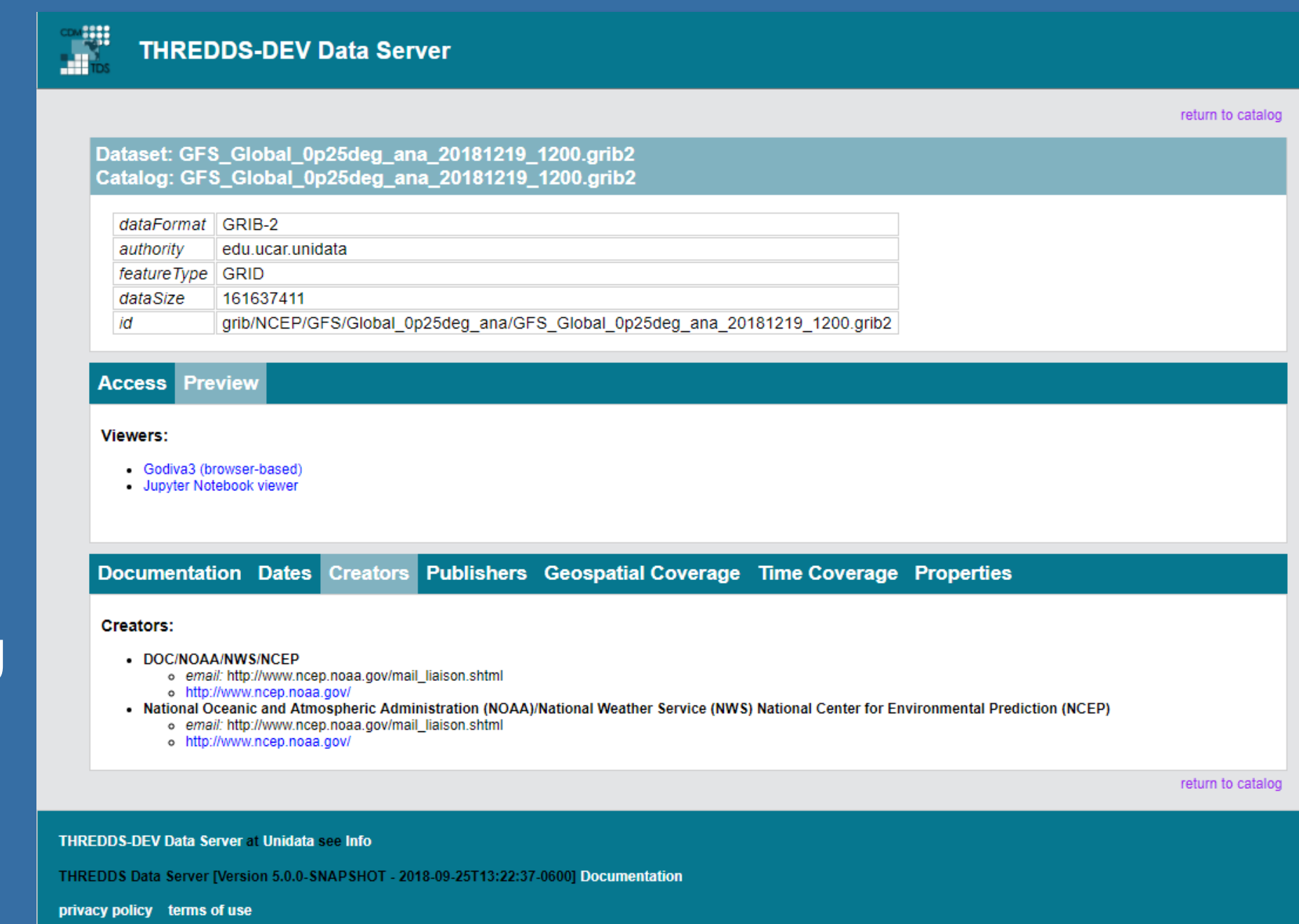


Figure 2: New design of the TDS web interface, including a customized header and footer.

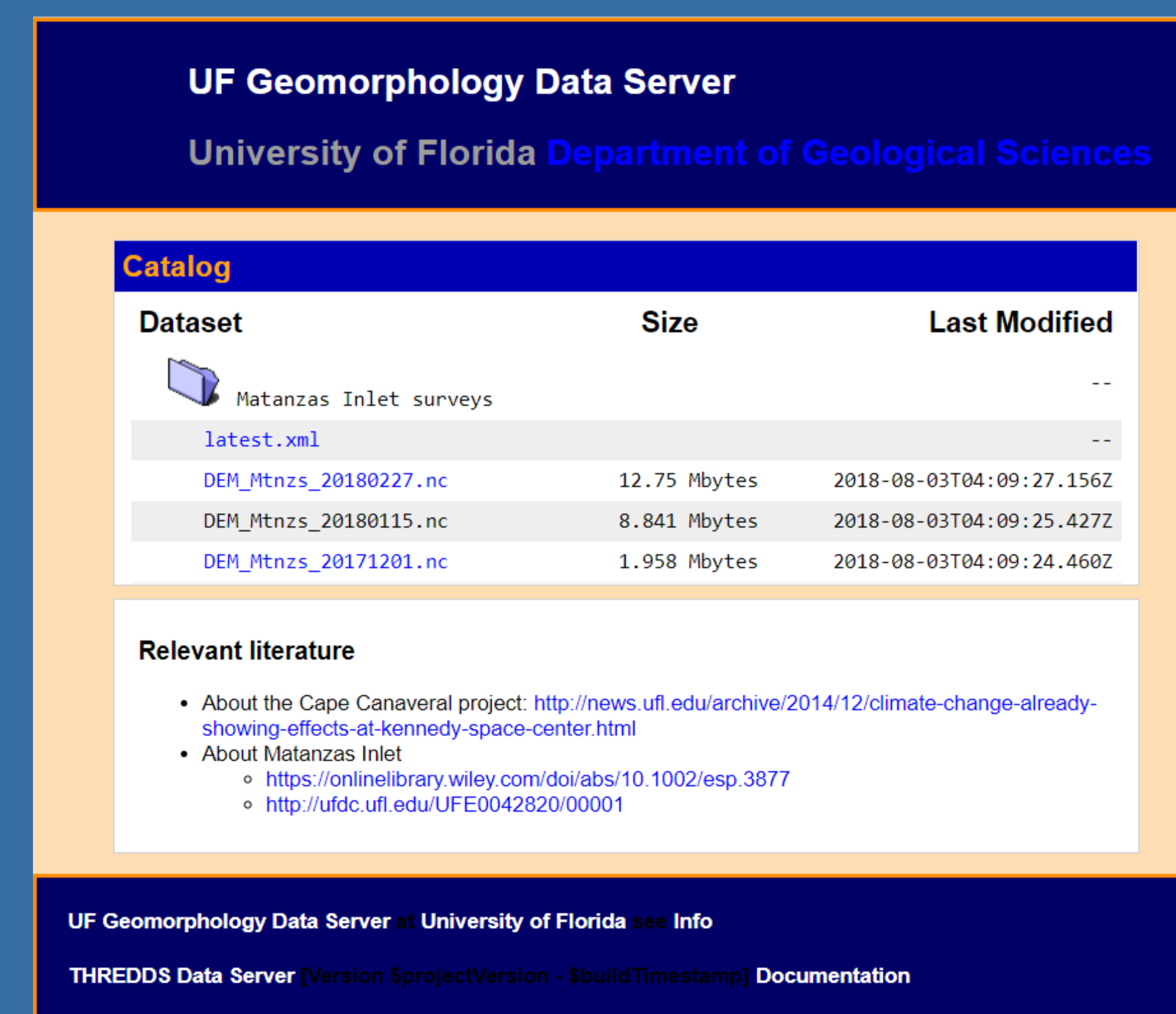
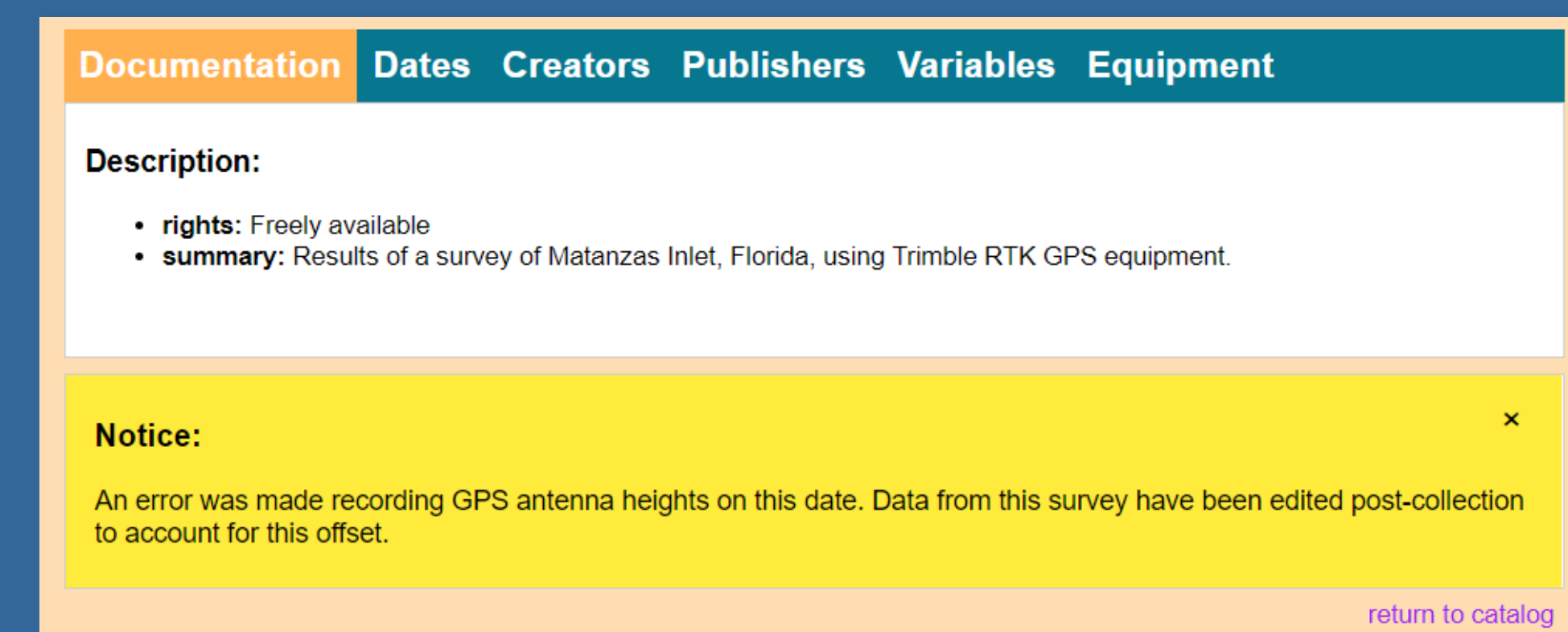


Figure 3: An example of a TDS instance using contributed stylesheets and Thymeleaf fragments.

## APPLICATIONS

- Create descriptive headers and footers for web interface to better represent publishing and funding organizations (figure 2).
- Link datasets and catalogs to related digital artefacts, e.g. “Relevant literature” section shown in figure 3.
- Provide additional information about datasets, collection methods, and analysis, e.g. warning banner in figure 4.
- Customize to best promote discovery and access with fine-scaled resolution.

Figure 4: The yellow warning banner is an example of a contributed template fragment designed to inform the user of any potential concerns using the dataset.



## RESULTS



### 1. Documentation

Follow the QR code (left) to view the full documentation on customizing the TDS.

### 2. Sample

Use the QR code (right) to view a live example of a customized implementation of the TDS.

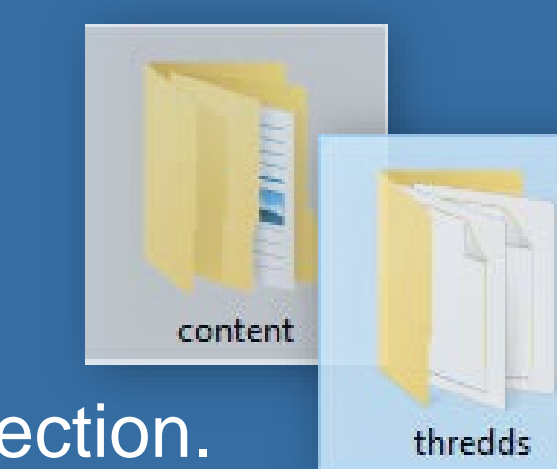


## HOW TO CUSTOMIZE THE TDS

Contributed stylesheets and extensible templates are supplied to the *content* directory of the TDS directory structure (`<tds.content.root.path>/thredds/`)

Documentation:

For more information on customizing the TDS see documentation in the results section.



## REFERENCES

1. Unidata, 2018: THREDDS Data Server 5.0.0 [software]. Boulder, CO: UCAR/Unidata Program Center. (<https://doi.org/10.5065/D6N014KG>)

2. <https://www.thymeleaf.org>. Copyright © The Thymeleaf Team