

# Anatomy of Two Online Teaching Tools Using Free and Open Source Technologies

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## Motivations for Custom Solutions

- Online instructional technologies (e.g. Blackboard, Desire2Learn) distribute course content, administer assessments, host discussion forums, and provide other features for instructors.
- These closed source tools may not have the required capabilities necessary for a novel online supplementary teaching tool, and potential implementation of any capabilities into closed source code is dependent on the company—greatly limiting customization.
- Self-developing online teaching tools provides complete freedom in every aspect of the design, from infrastructure to presentation to the details of features.
- There are numerous technologies available for building an online educational tool from the ground up.
- The use of free and open source technologies can help not only in ability to customize but also in the cost of hosting and maintaining a tool.
- An understanding of web development and relational databases is generally necessary for a custom-built solution, but this can be overcome by consulting online guides or collaborating with others.
- Below is a decomposition of the technologies underlying two teaching tools I have created.

## Basic Infrastructure Components

A few components are necessary when creating a web-based tool. Here is a sampling of solutions for each component.

### 1. Host

- Github: free hosting for static websites.
- Heroku: free limited “hobby hosting” for dynamic sites.
- Self-hosting if resources are available.

### 2. Style

- Bootstrap: CSS styling and Javascript extensions.
- Foundation: CSS styling and Javascript extensions.

### 3. Page Templating

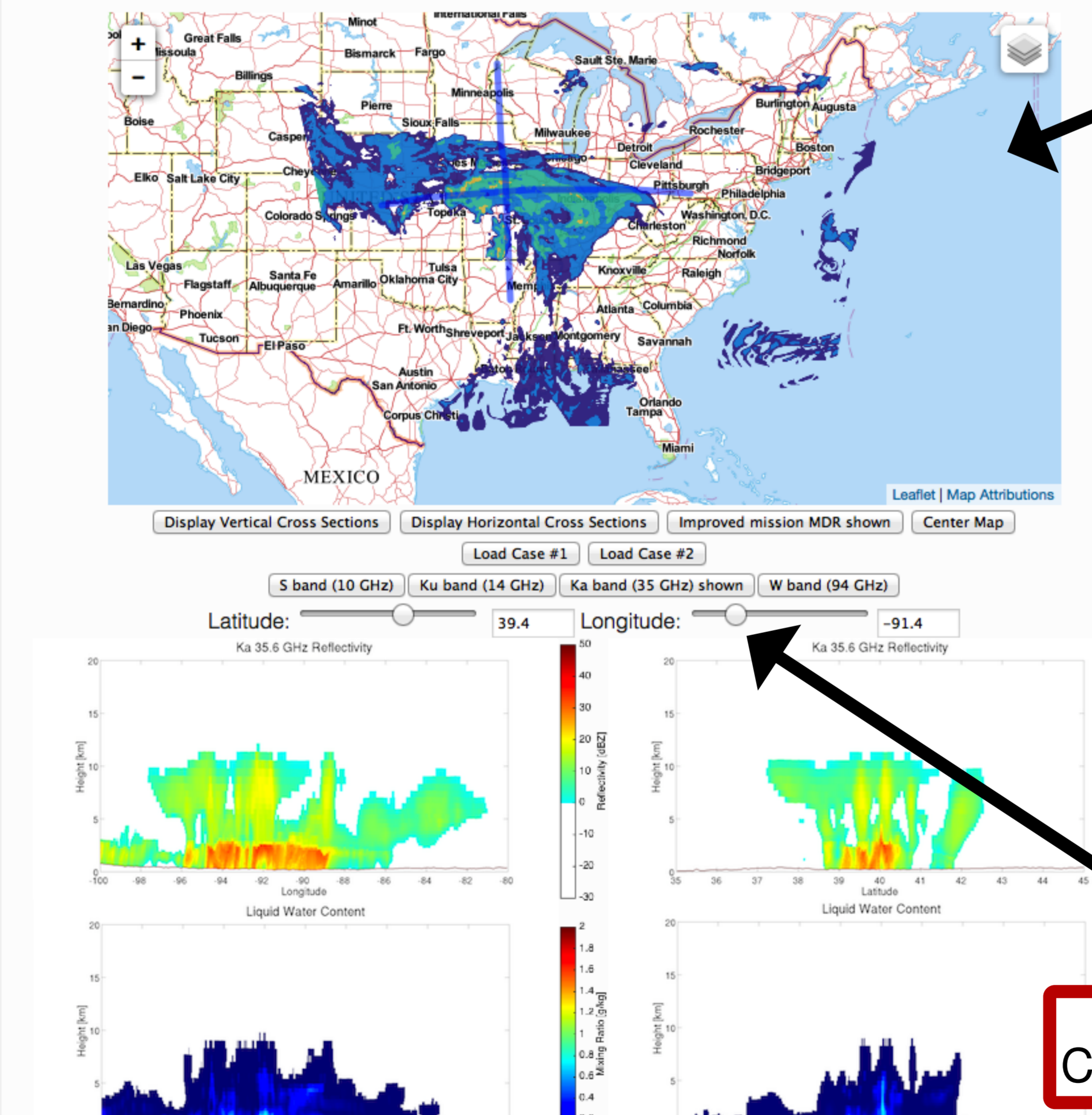
- Jekyll: static site using Markdown and Ruby.
- Pyramid: dynamic site using Python.
- Drupal: dynamic site using HTML and PHP.

### 4. Backend

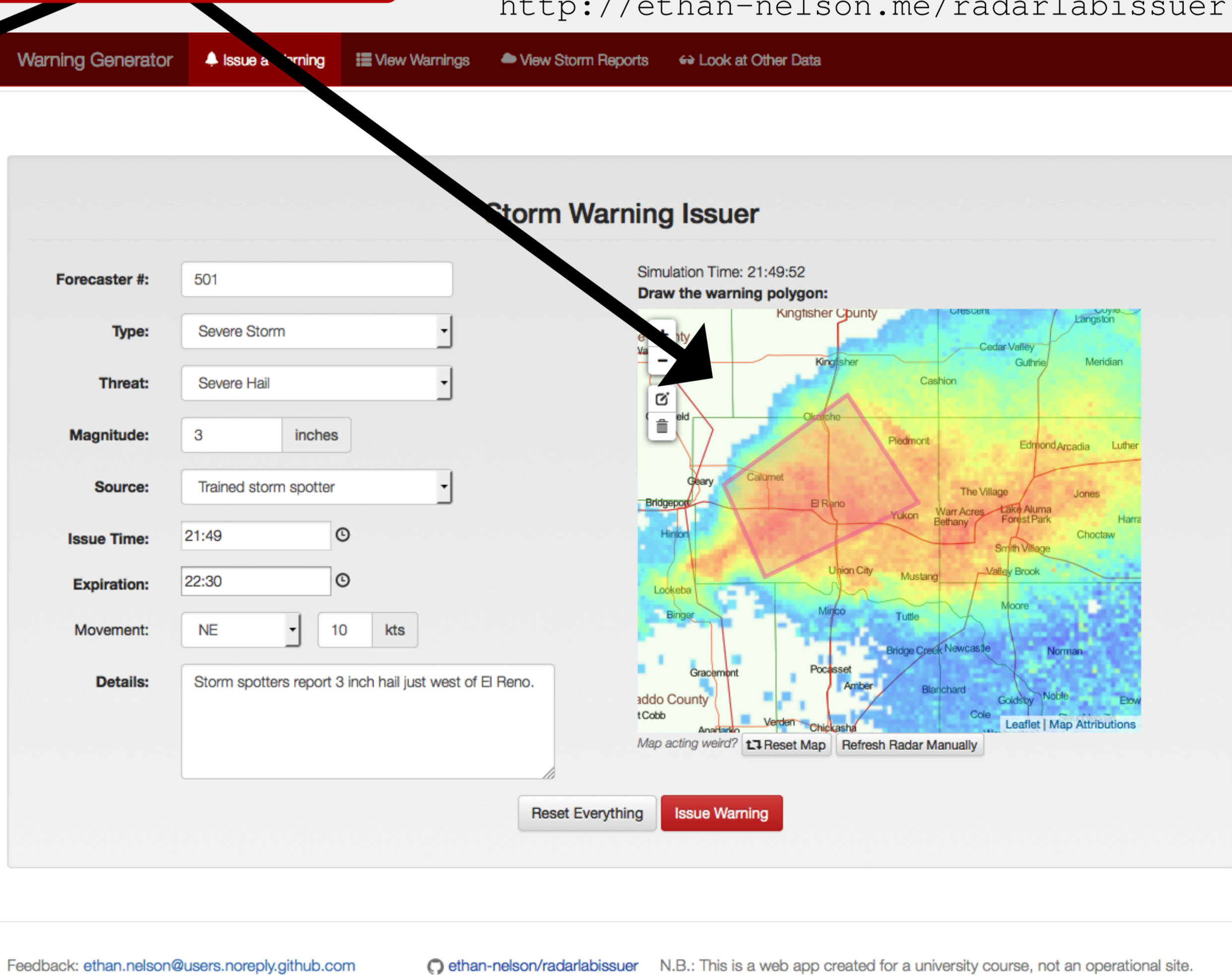
- PostgreSQL: relational database management system.
- MySQL: relational database management system.

Two case studies are presented: first, an interactive tool to explore multiple frequencies of satellite radar observations developed in part under a DELTA internship, and second, a weather warning issuer module for a real-time radar lab exercise.

<http://ethan-nelson.me/radarlabviewer>



<http://ethan-nelson.me/radarlabissuer>



**Slippy Maps**  
Pane: Leaflet  
Tiles: OpenStreetMap  
Layers: Matplotlib

**Cross Sections**  
Control: Custom Javascript

**Weather Warning Site**  
Host: Heroku  
Style: Bootstrap  
Templating: Jekyll  
Backend: PostgreSQL

**Satellite Radar Site**  
Host: GitHub  
Style: Custom CSS  
Templating: Jekyll

Bootstrap <http://getbootstrap.com>  
 Drupal <http://drupal.org>  
 Foundation <http://foundation.zurb.com>  
 Github <http://github.com>

Heroku <http://heroku.com>  
 Jekyll <http://jekyllrb.com>  
 Leaflet <http://leafletjs.com>  
 Matplotlib <http://matplotlib.org>

MySQL <http://mysql.com>  
 OpenStreetMap <http://osm.org>  
 PostgreSQL <http://postgresql.org>  
 Pyramid <http://trypyramid.com>  
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