Data Imaging and Visualization Analysis
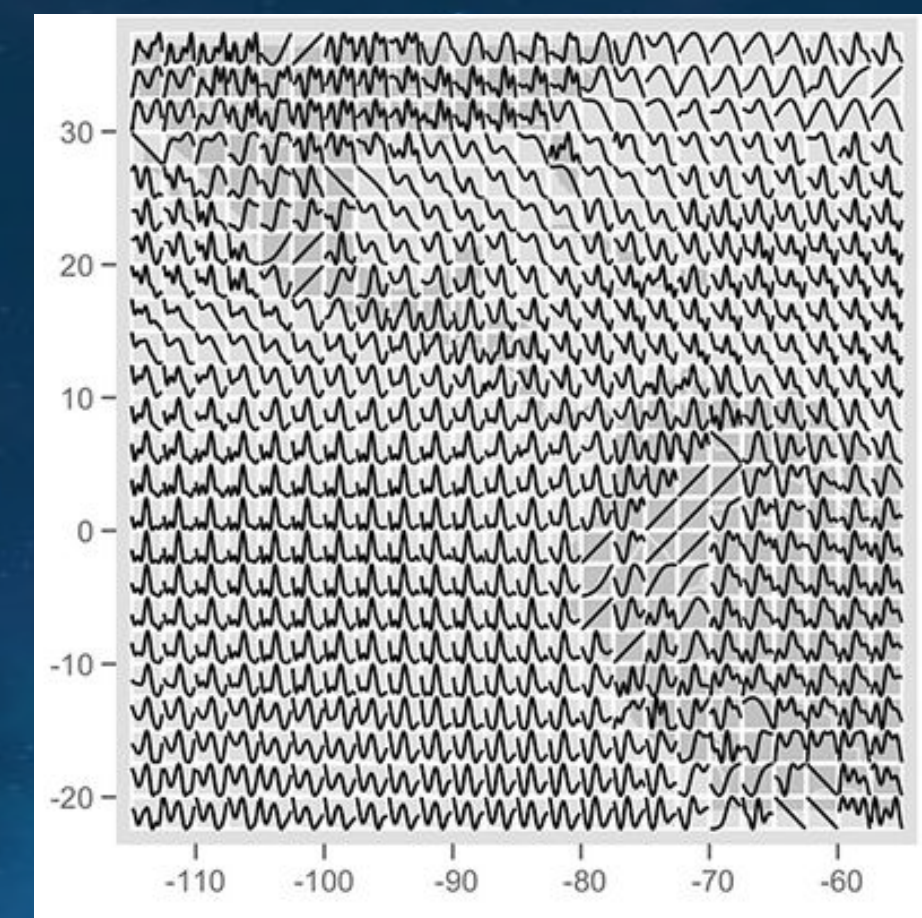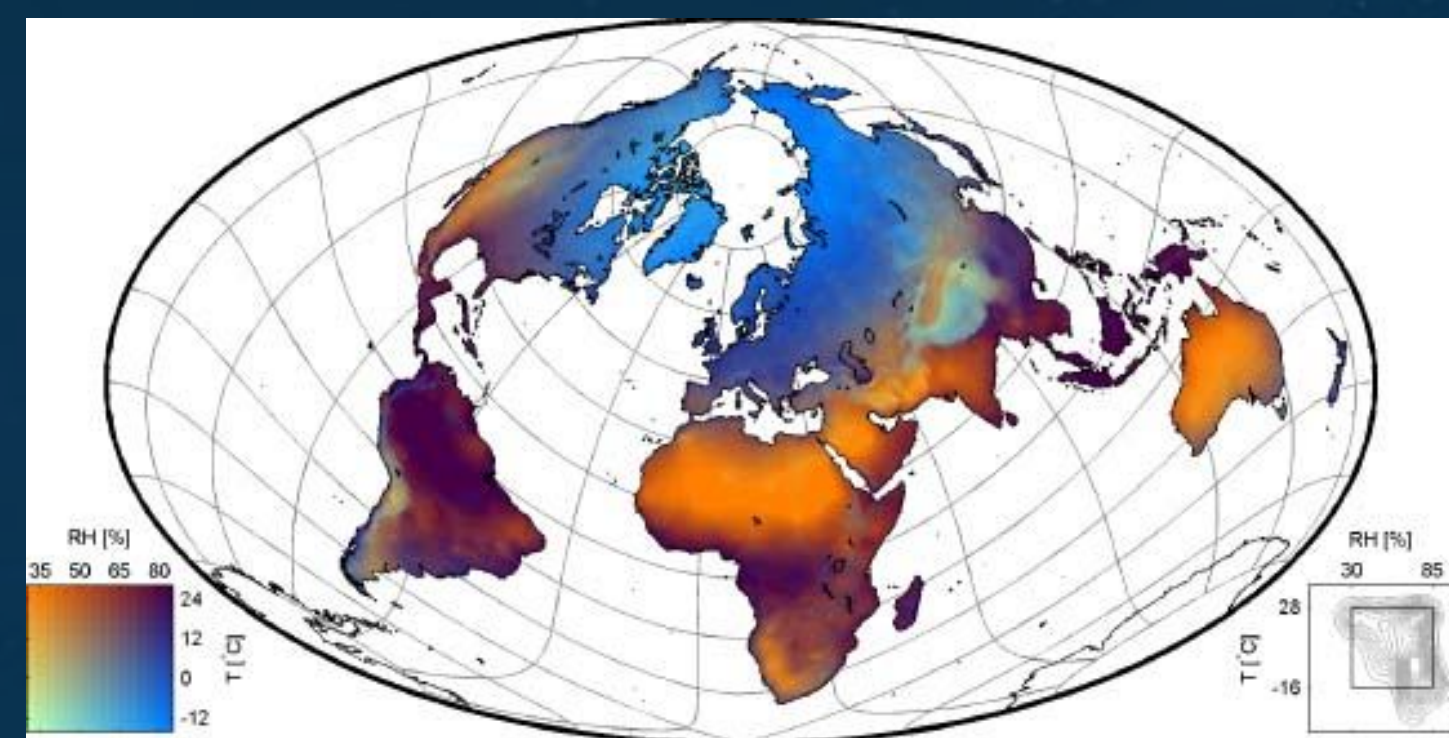
Teddy Corrales, Erin Estes, Kevin Ho, Austin Hom, Mughil Muthupari, Justin Pan, Justin Shen

Mentor: Dr. Stephen Penny   Librarian: Dr. Kelley O'Neal

UNIVERSITY OF MARYLAND
HONORS COLLEGE

GEMSTONE
Honors College
University of Maryland

Research Problem

- Over the last few decades, vast quantities of climate/weather data have been generated by satellite networks and high resolution models
- Little effort has been spent to develop effective climate visualization tools for this growing volume
- Today, climate scientists often still use software with basic plotting capabilities and limited interactivity (see below)

Research Questions

- In terms of computation time, feature selection, and storage, how can we most effectively design and create a VR climate data visualization tool?
- What are the most user-friendly, aesthetically pleasing, and informative ways for scientists and the general public to visualize climate data through VR?

Hypothesis

- The use of VR to visualize climate data will create a more immersive, intuitive, and comprehensive experience for users and allow them to draw more meaningful conclusions from data than previous data visualization tools.

Current Progress

Digitally Uniform

VS

Perceptually Uniform

- Global view of NetCDF binary weather data
- Close-up case study of Chesapeake Bay, to be combined with topography
- Perceptually uniform color scales
- Leap Motion controller uses infrared hand tracking to allow interaction without a controller

Our Technology

Unreal Engine 4

Oculus Rift & Leap Motion

Acer Predator Helios Laptop

Data Collection

1st Focus Group	2nd Focus Group	3rd Focus Group
Who 5 UMD graphics experts	**Who** 30 UMD students broken into 5 groups of 6	**Who** 10 industry climate experts
Feedback Aesthetics and UI	**Feedback** Usability	**Feedback** Mechanics of climate visualization

Additionally, we will collect data from individual surveys to compare our product to a traditional visualization. We will invite research experts and new participants from the general product to try our product and collect data from them based on a target survey.

Future Goals

- Animate vector fields (such as wind)
- Visualize interactions between different data sets (such as atmosphere and ocean)
- Improve interactivity through cutting edge interface and Leap Motion controller
- Plot volumetric atmosphere data and display topography in 3D

References

Website