Visual Analytic Techniques for CO_2 Emissions and Concentrations in the United States

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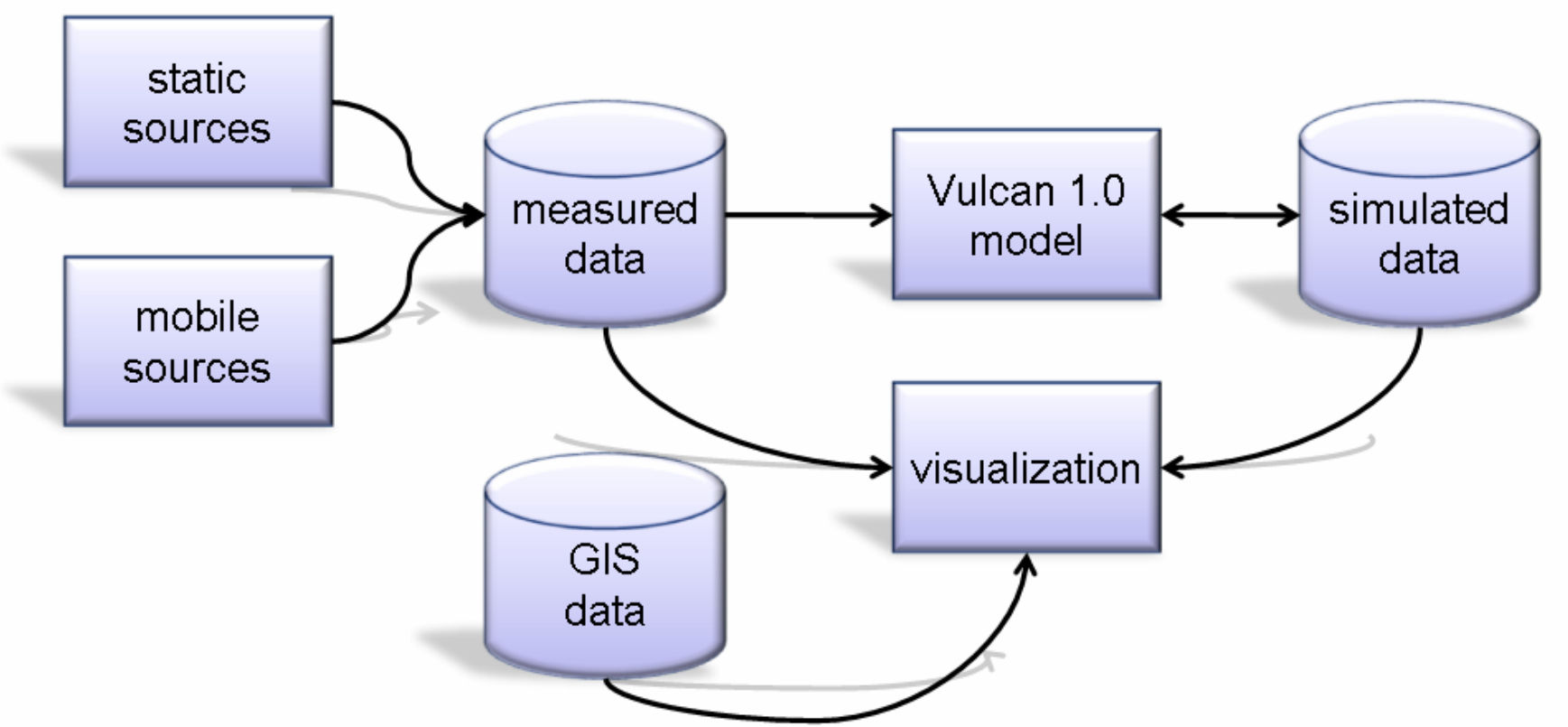
Motivation

- “Climate change has emerged as one of the grand global challenges facing humanity.”
- Gathering data is difficult.
  - Understanding it is ever more so.
- Cannot help with the prevention of pollution until the data is understood.

State

- Vulcan project
- Earth and Atmospheric Sciences
- Three years of data collection

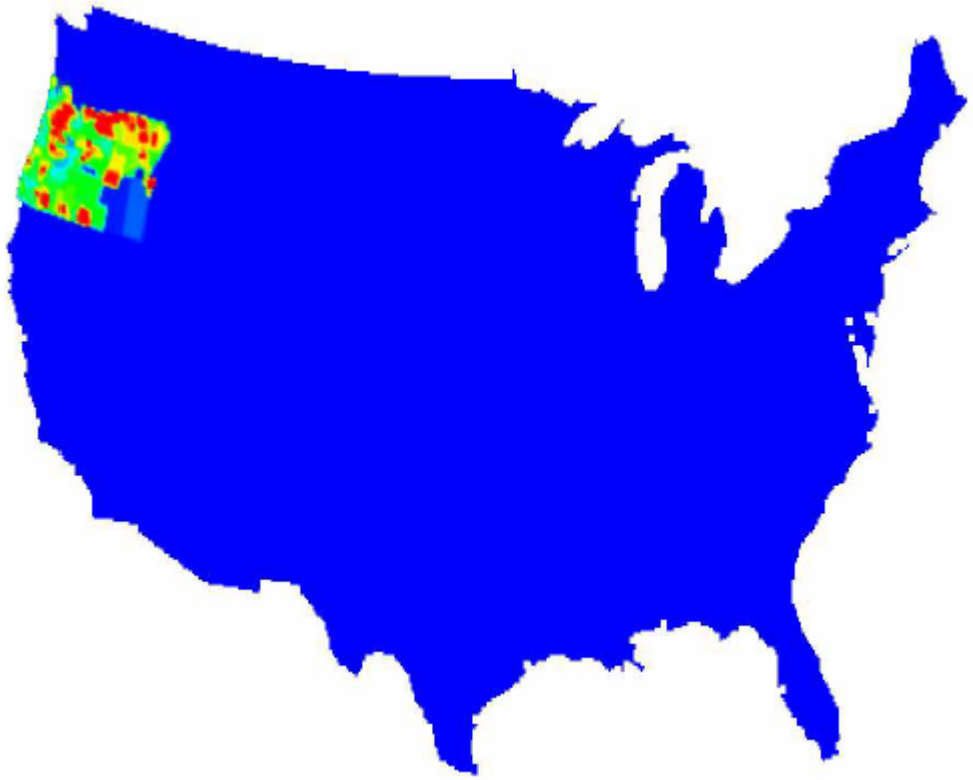
System Outline



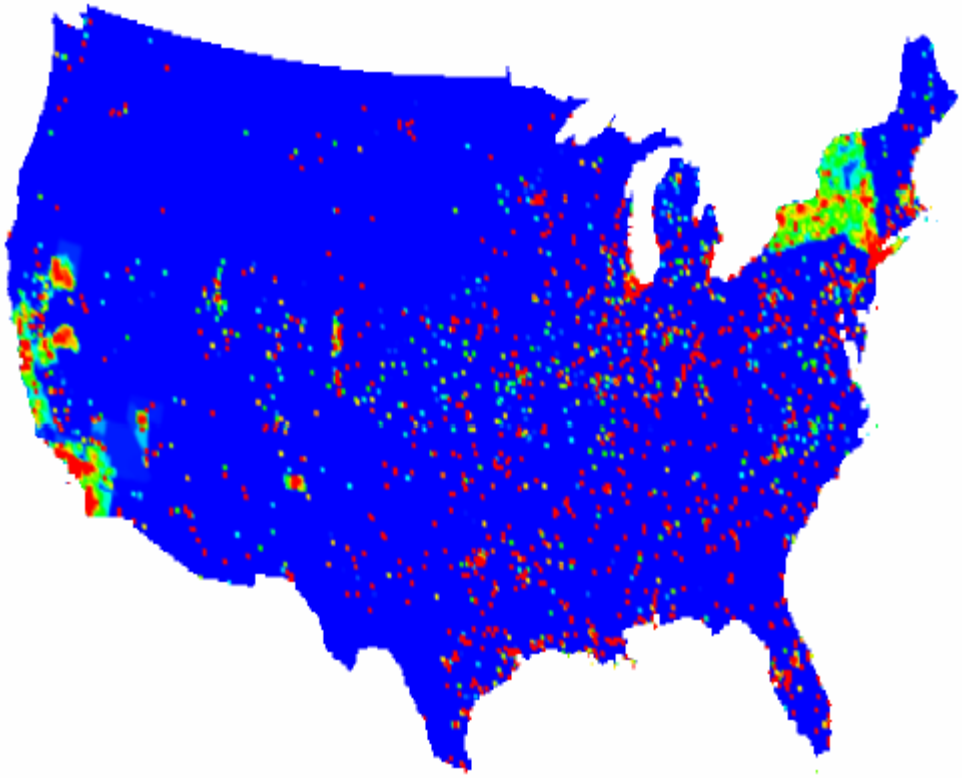
Measuring CO_2 Data

- Static sources
  - Agricultural
  - Residential
  - Commercial
  - Utility
  - Etc.
- Mobil sources
  - Roads

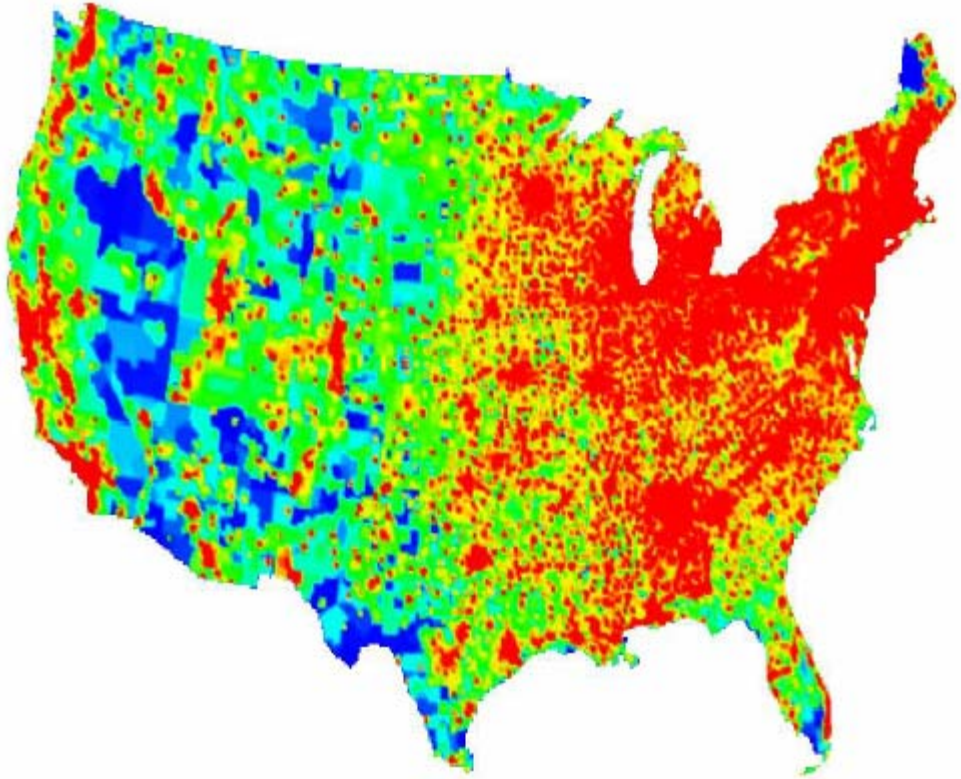
Agricultural



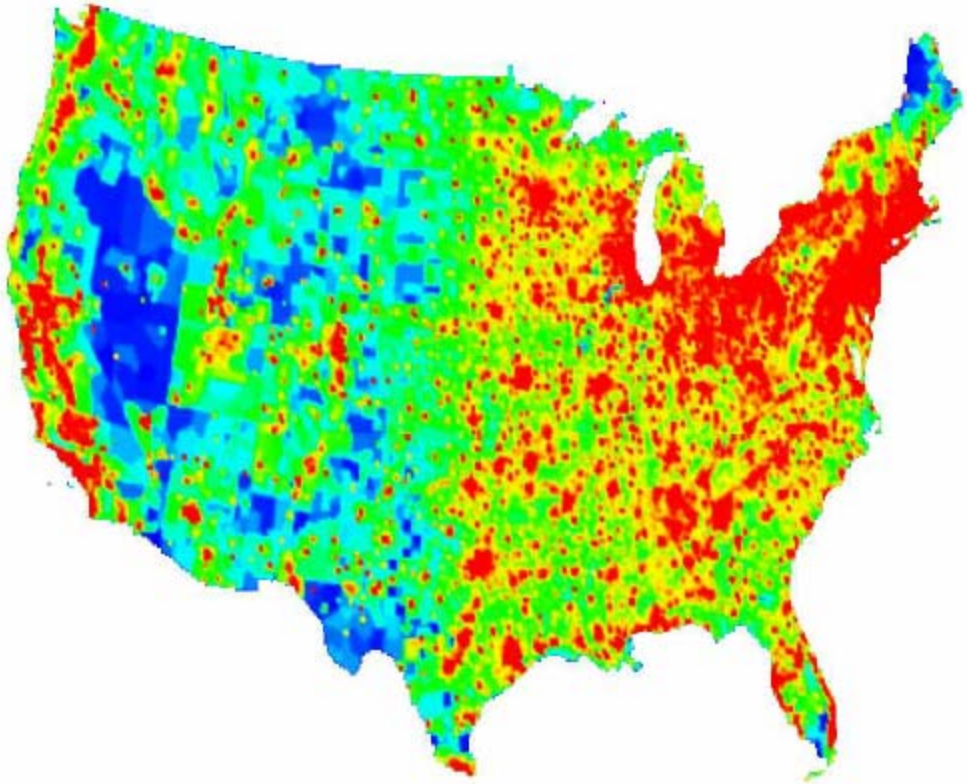
Utility



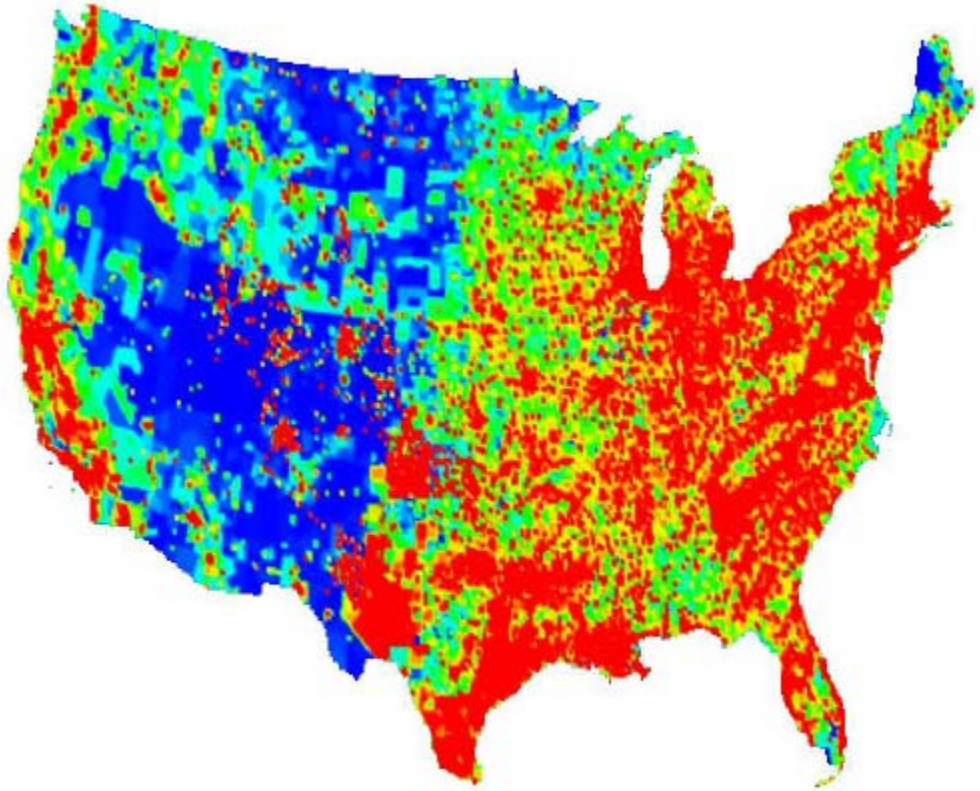
Residential



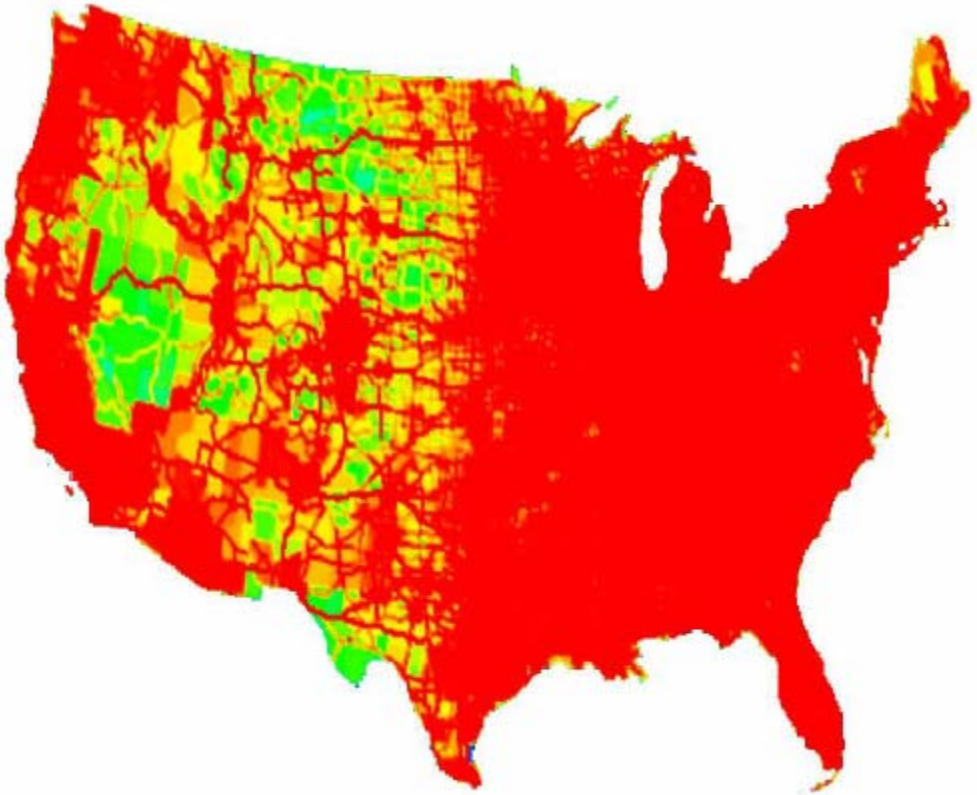
Commercial



Industrial



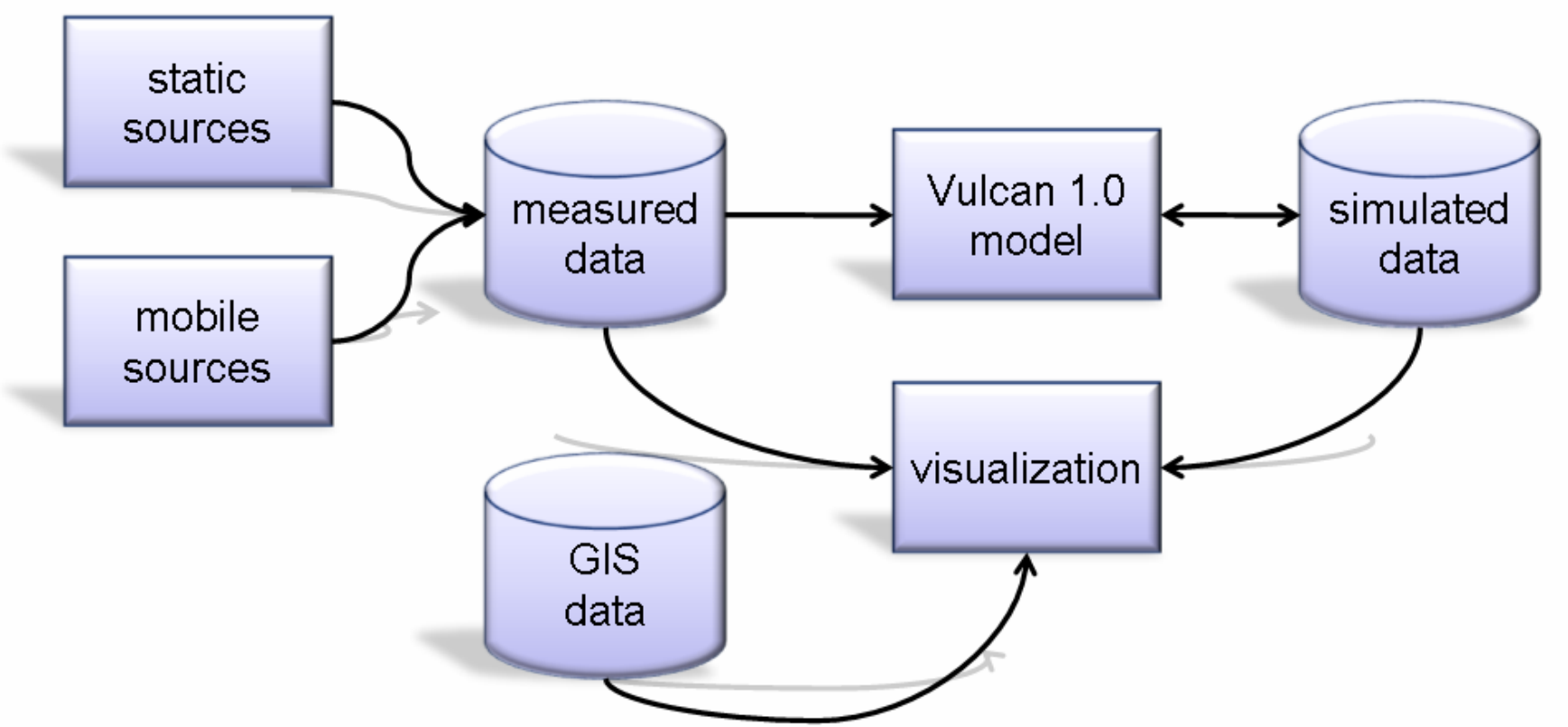
Mobile



CO_2 Transportation

- Advected through the atmosphere by wind currents.
- Too costly to measure CO_2 levels in the atmosphere.
  - Use the advection property to convert emissions data into concentrations through simulation.

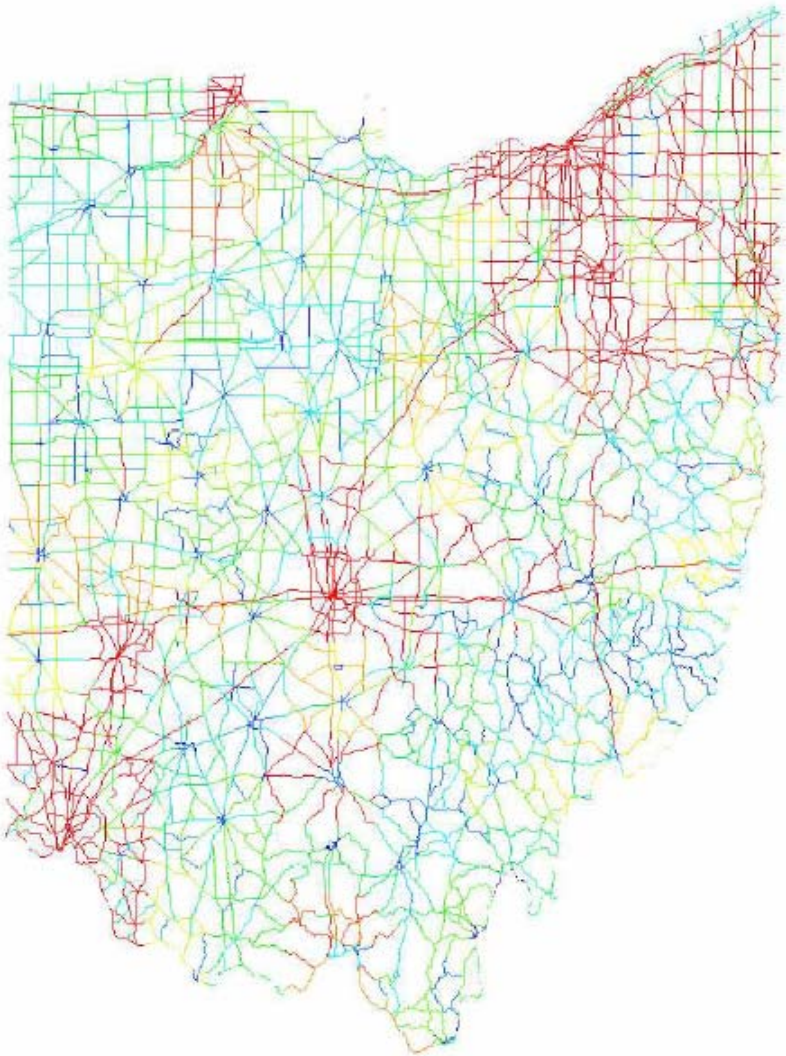
System Outline

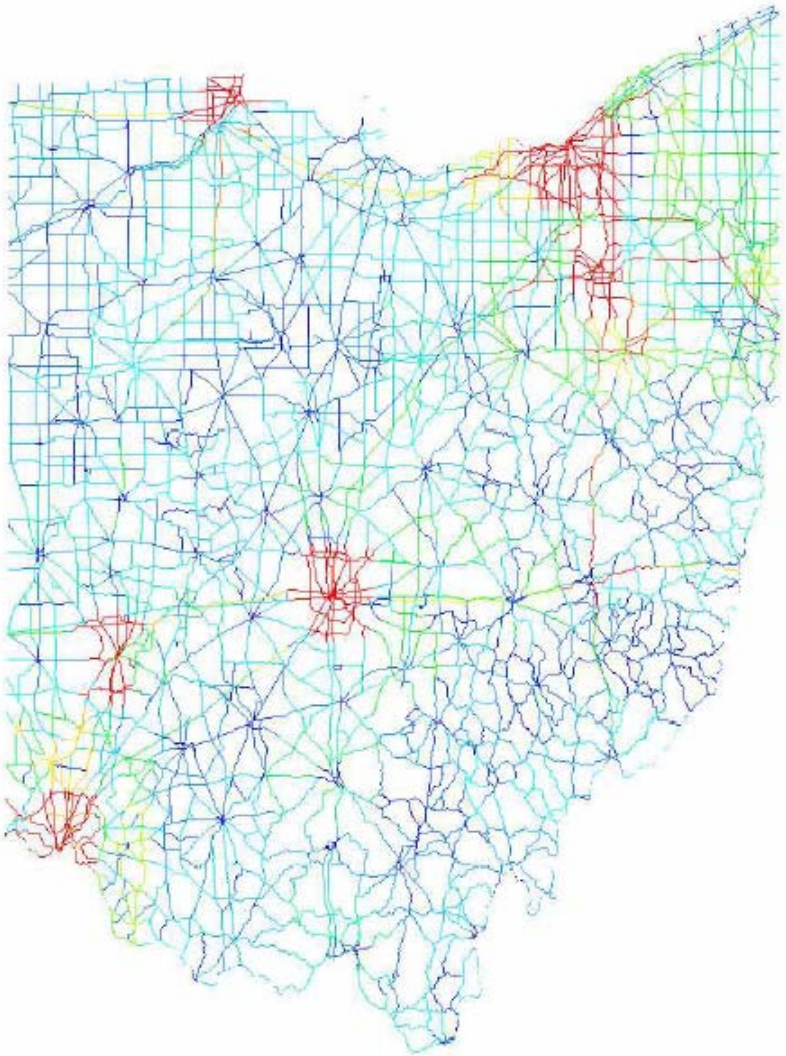


Visualization Methods

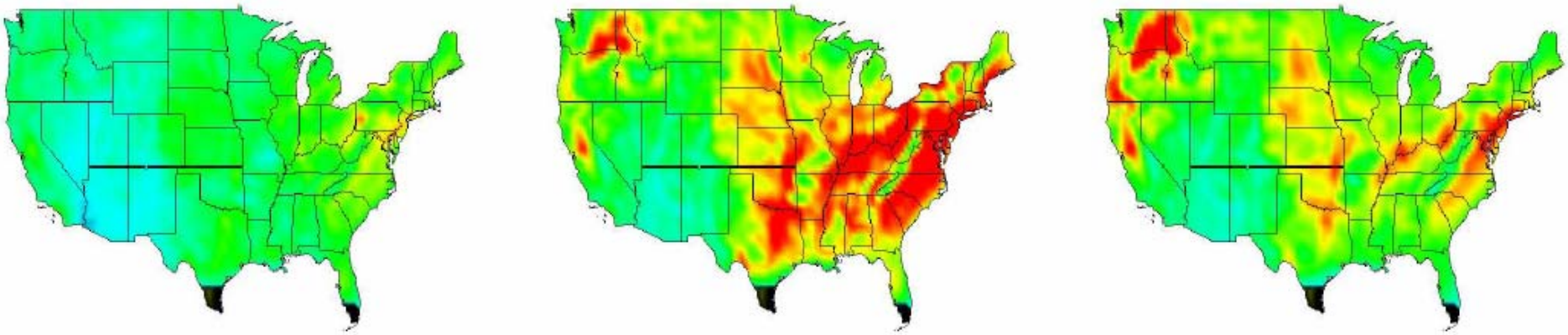
- Supports:
  - GIS vector data
  - 2D scalar data
  - 3D scalar data
- Allows for various rendering options:
  - Shaded relief map with political borders
  - Crisp borders using stencil buffer
- All spatial data mapped together

2D Viz (road network)





2D Viz (surface concentration)



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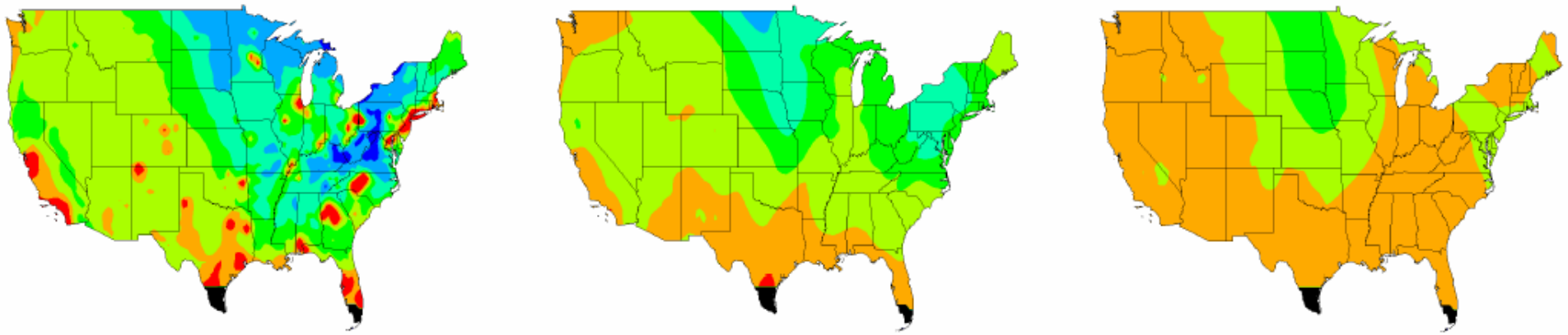
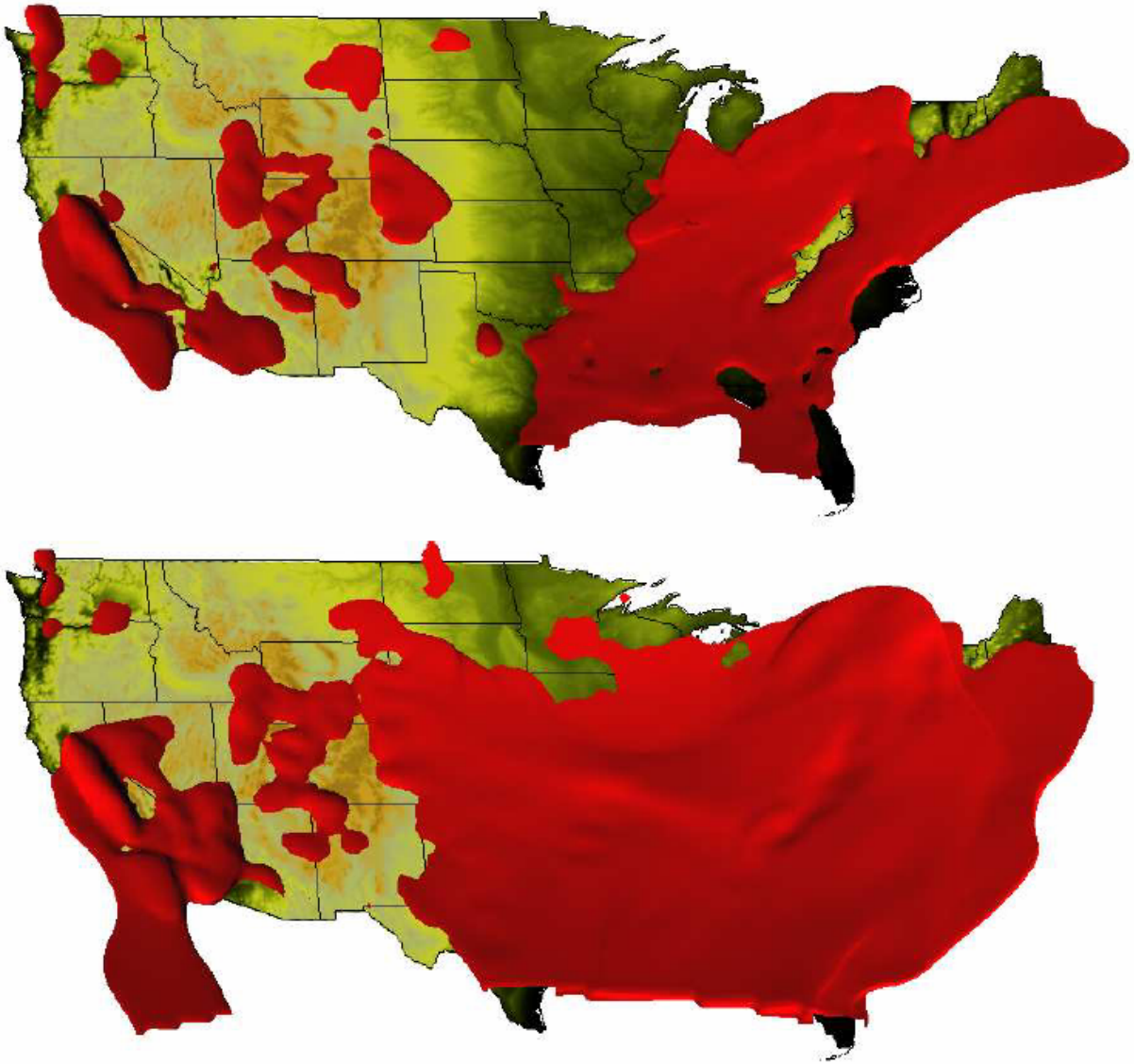


3D Visualization



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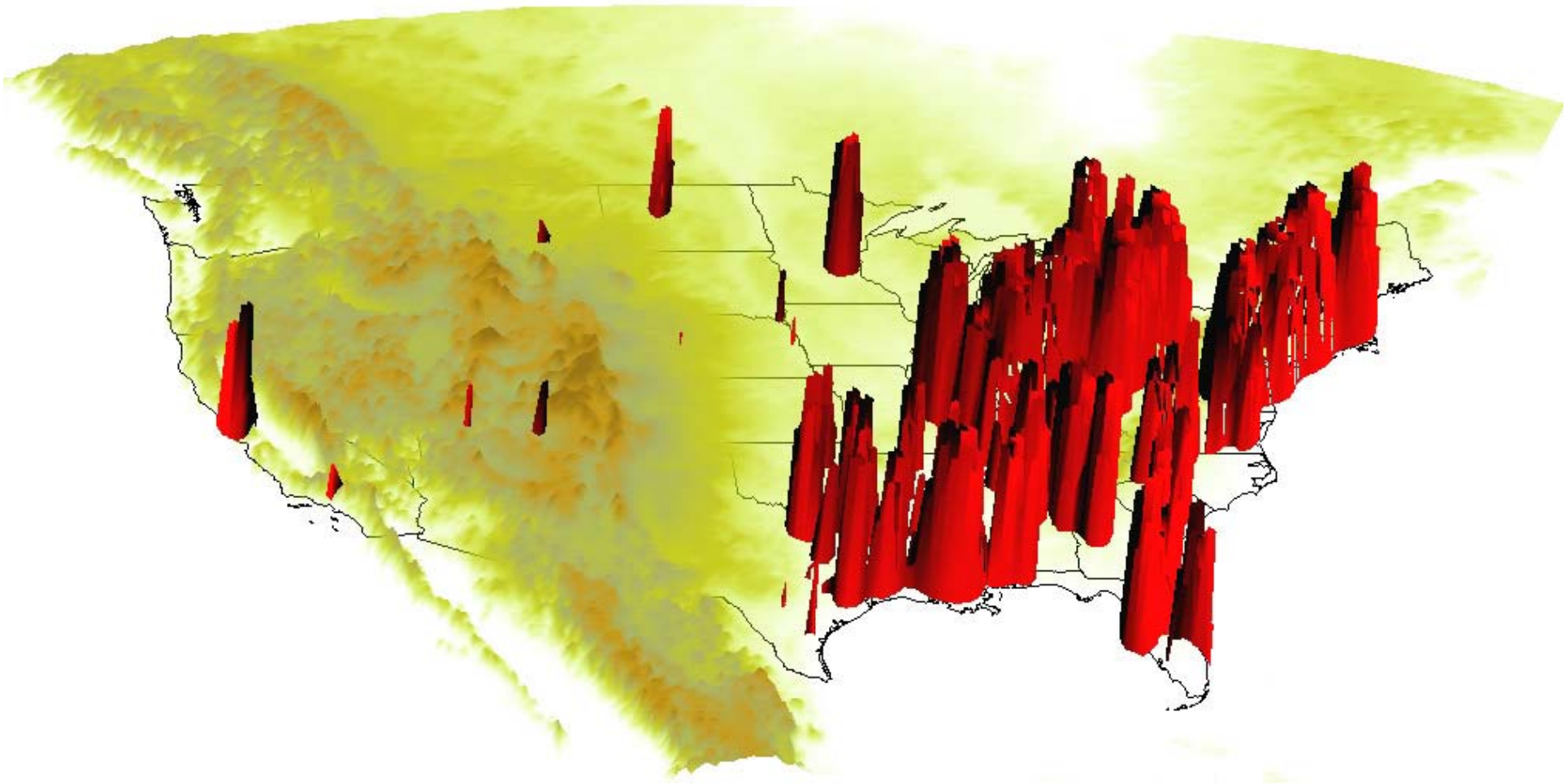

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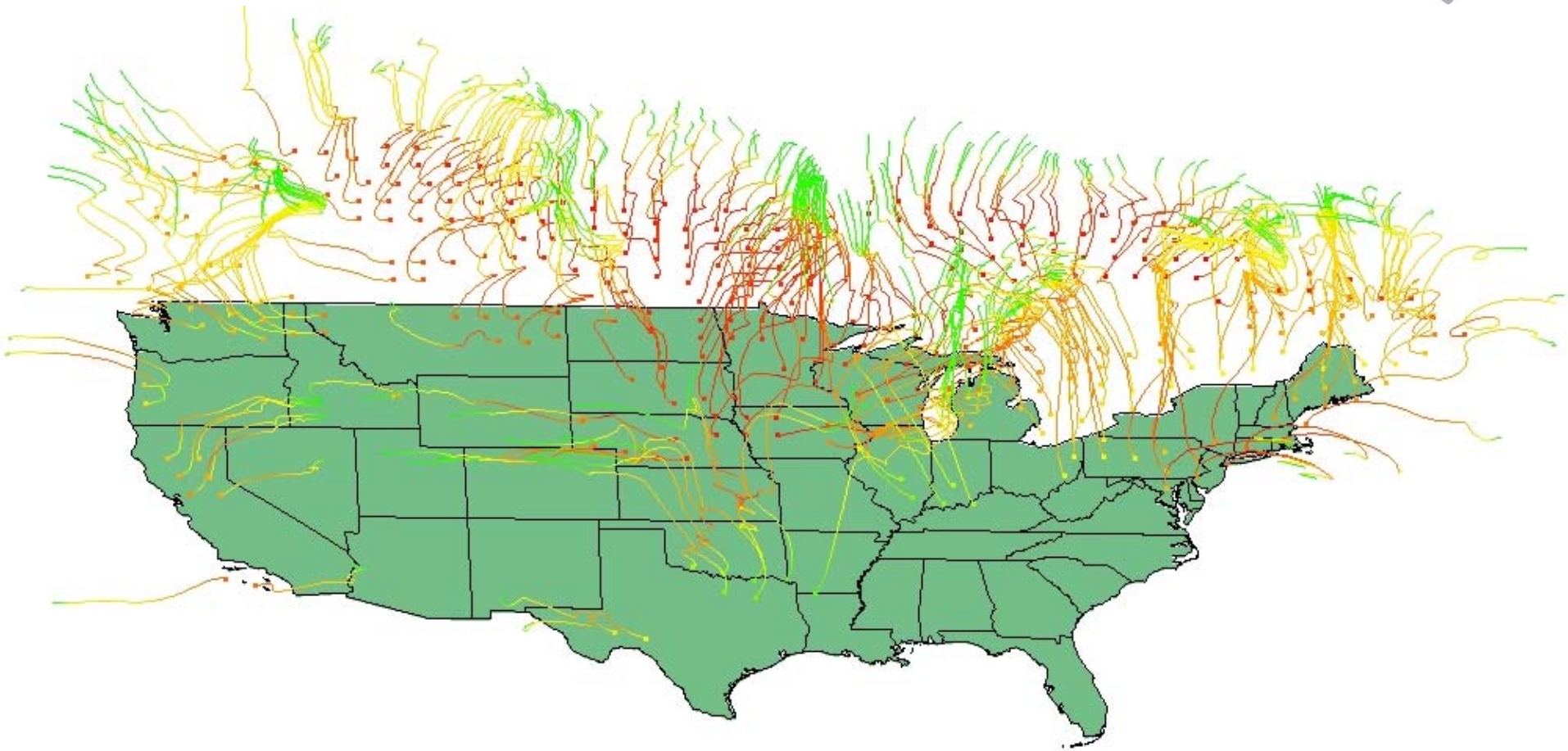
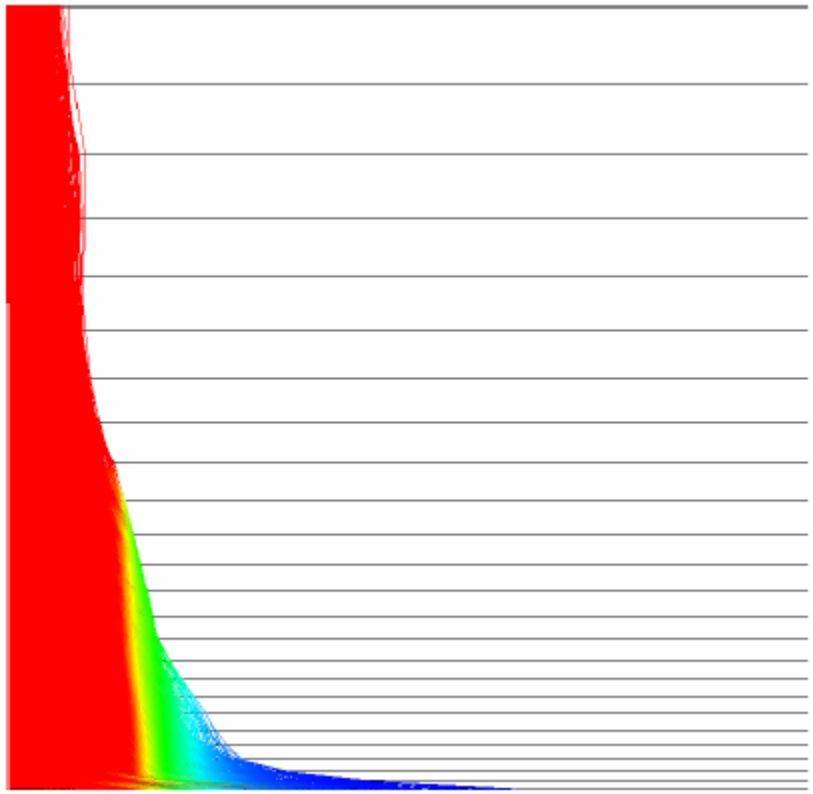
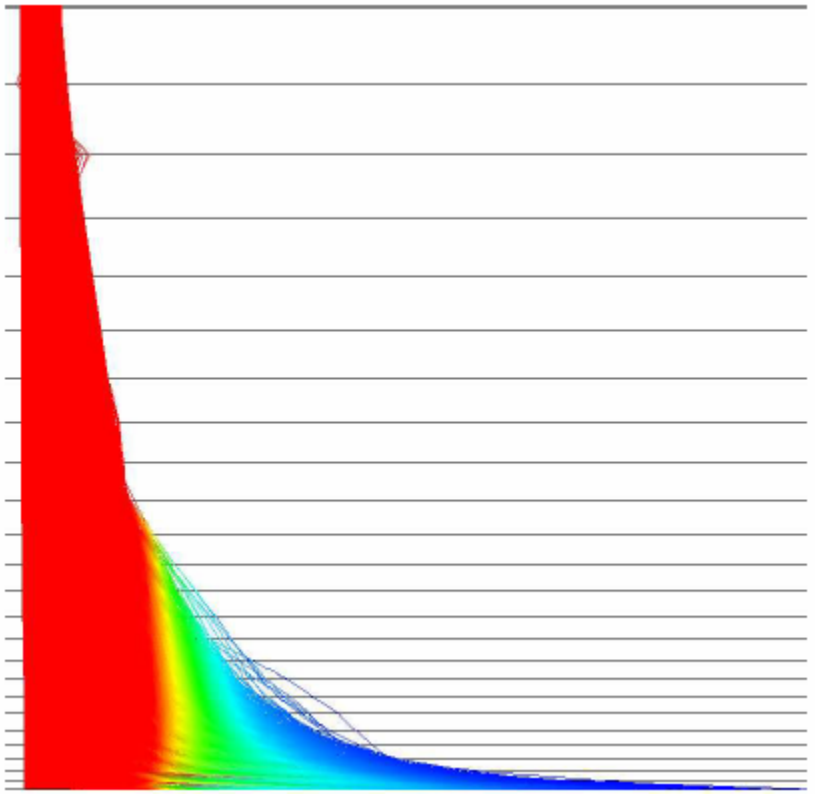


Histogram





Videos

- http://www.youtube.com/watch?v=eJpj8UUMTaI
- 150,000 hits in two days

Project Webpage

- http://www.purdue.edu/eas/carbon/vulcan/index.php

Media Coverage

- First week
  - New York Times
  - Wired
  - EcoGeek, Daily Green
  - CNET
  - Various local papers in US
  - UK (Guardian)
  - YouTube (~150,000 hits)

Media Coverage

- Today
  - Wired (again)
  - Reuters
  - Scientific American
    - http://scientificamerican.blip.tv/#838252
  - More local papers
- Future
  - Kevin is a very busy man these days…

Response

- Very positive from the media and most viewers
  - Would like to see data for more of the world
- The viewers complaints:
  - “Hi-Res” images
  - Images look too much like pop. density
  - Waste of money
  - Conspiracy

YouTube comments

- “Check out the big red dot in west central Utah (Delta, UT, to be exact.) ALL the power produced there is shipped to Los Angeles.”

YouTube comments

- “oh great. another fear-mongering global warming fanatic.“

YouTube comments

- “It is all George Bush's fault...[freaking] liberals.”

YouTube comments

- “Wow, all this work to track a gas that is colorless, odorless, and not only completely harmless but necessary for life to exist on earth. I am not impressed.“

YouTube comments

- “Funny how these so called "top scientists" that attempt to cloud the global warming issue just so happen to be funded to do their research and publish their materials by some of the worlds largest oil companies....Im certain there are no conflicts of interest....”
- Looks like some want to be expert wanting more NSF or other government money. Why does the government want to push the global warming myth? Cause then they can raise taxes for there pork barrel projects!”

YouTube comments

- "My taxes paid for this.
  I want a refund."

YouTube comments

- “boring”
- “americas gross”
- “fraud”

YouTube comments

- “CO2 actualy makes the world colder. thats a little fun fact for all of you.”

YouTube comments

- “I'm a Scientologist, and trust me, our creators are going to return with the Zeborian, its a vessel that they are sending to save Earth. It departed the galaxy Voulmatrica, or as Man calls it, M64, almost 1.5 million years ago filled with crude oil, and oxygen, because believe it or not, crude oil is only found 2 places; Earth, and Voulmatrica. They will arrive at Cape Canaveral in January of 2010, at 7:30 in the evening. We'll all be okay, well, all of our followers. Everyone else will be dead”