

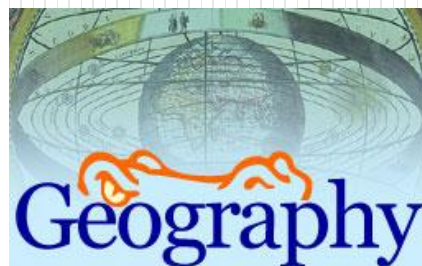
Dense, Intense and Complex Data Workshop

Big Geographic Data and GISciences

Liang Mao

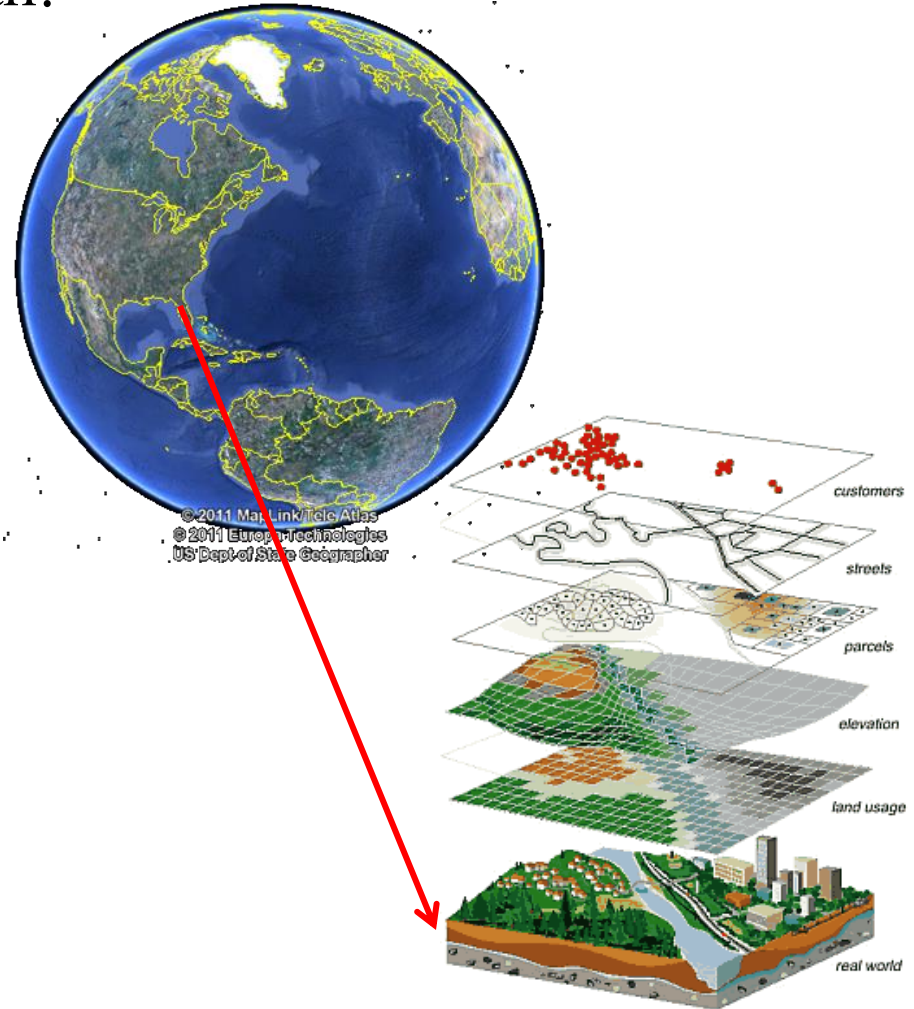
Department of Geography

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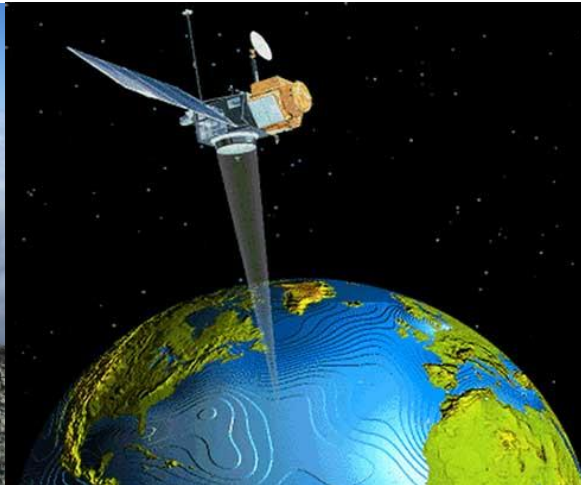
Why Geographic data is big?

- Geographic data is any data that contain information about geographic locations on the Earth.
- Earth is BIG;
- Every location carries a **MULTITUDE** of information;
- Information at every location is **DYNAMIC**.



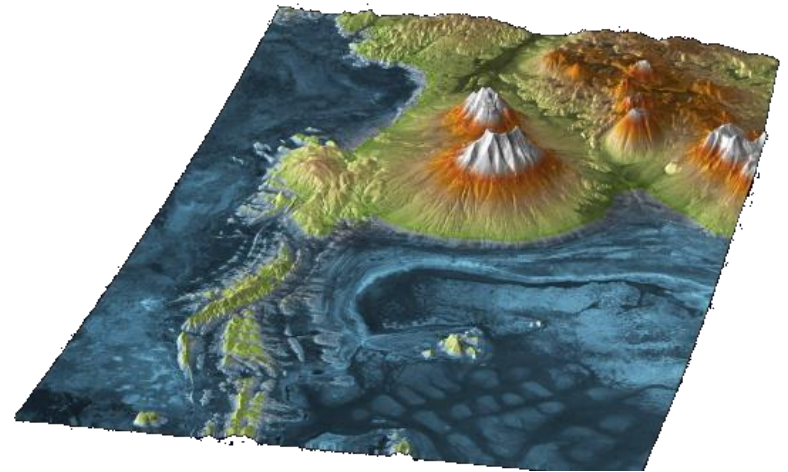
How geographic data are generated?

- Large-scale survey, e.g., Census, Ground survey
- Earth observation system, like satellite images
- Digitization of maps
- Geocoding textual records
- GPS, mobile phones, and Internet

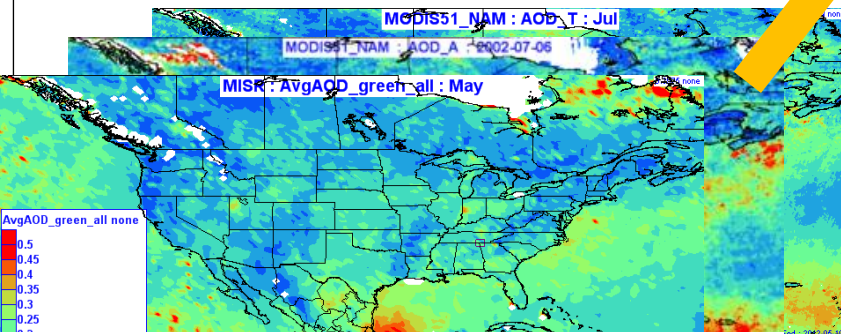
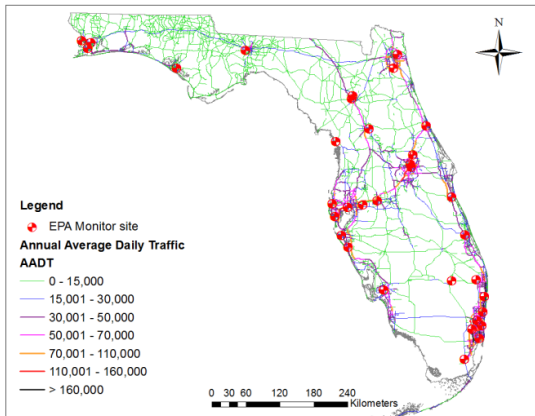
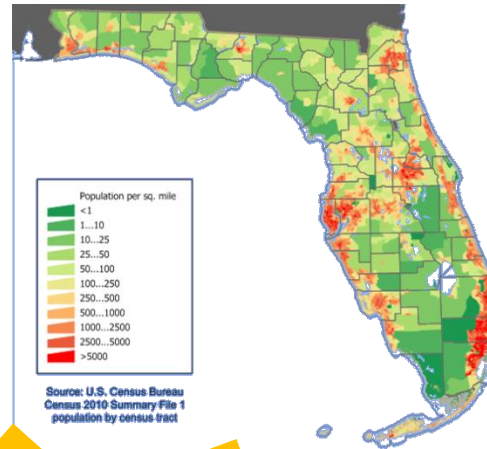
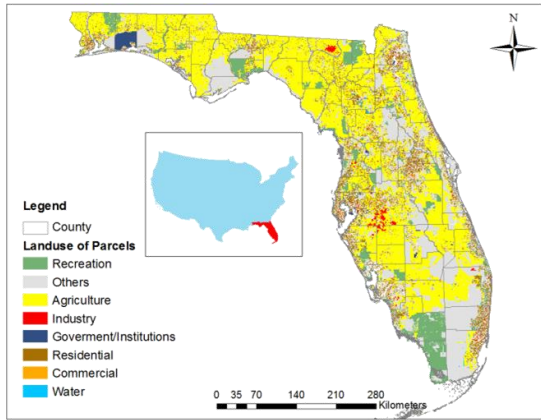


GISciences

- A set of academic disciplines that deal with geographical data, such as data acquisition, storage, analysis, management, and visualization.

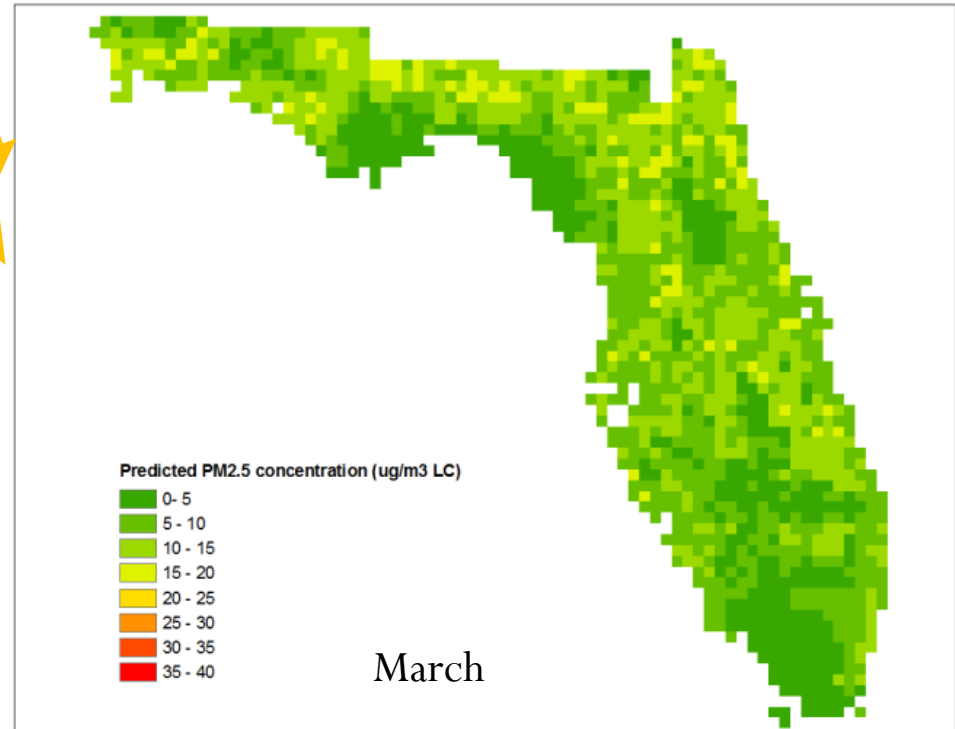


Big data for geospatial modeling



$$PM2.5 = f(\text{PopDens}, \text{LandUse}, \text{Transportation}, \text{AerosolDepth}, \text{Time})$$

Mao, et al. 2010



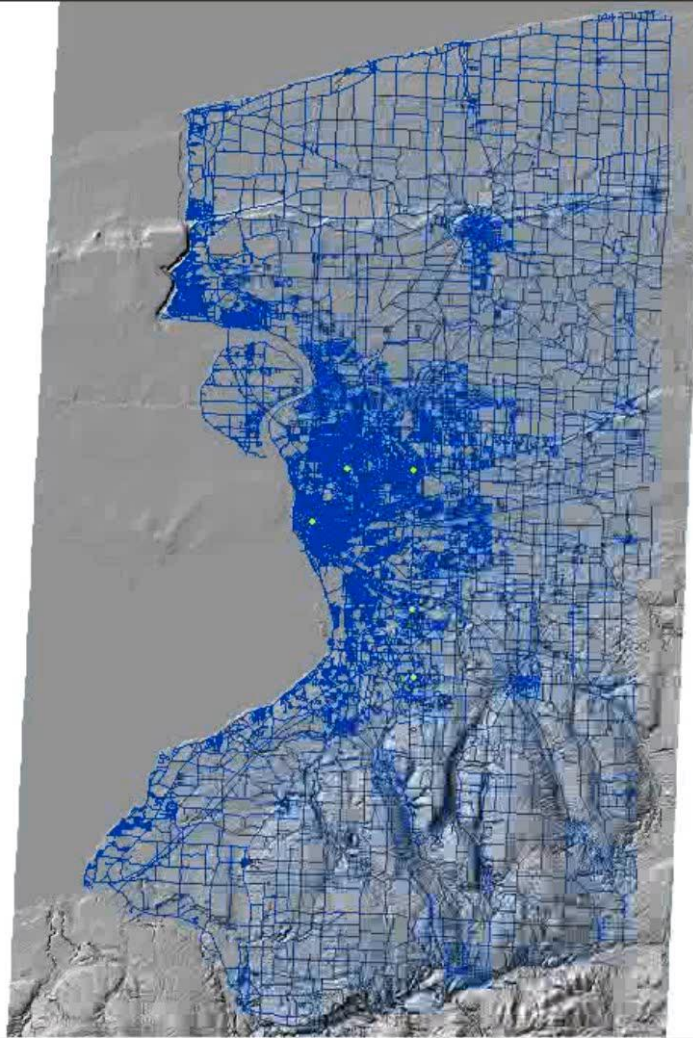
March

Daily Satellite imagery data of 2005

Big data for geospatial simulation

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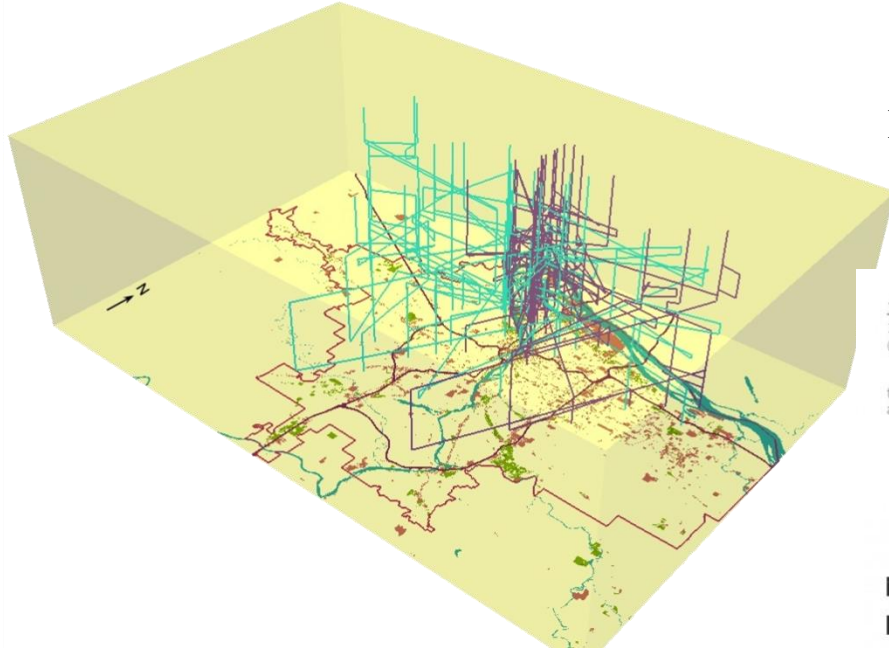
- Massive agent-based simulation of human contact network and influenza transmission in an urbanized area of 1 million people.



- ❖ Households: 400,870
- ❖ Businesses: 36,839 (offices, factories, schools, service places, health facilities, etc)
- ❖ 25,029 recorded trips

Geo-visualization of Big Data

3D visualization of human activities (Mei-Po Kwan and Jiyeong Lee).

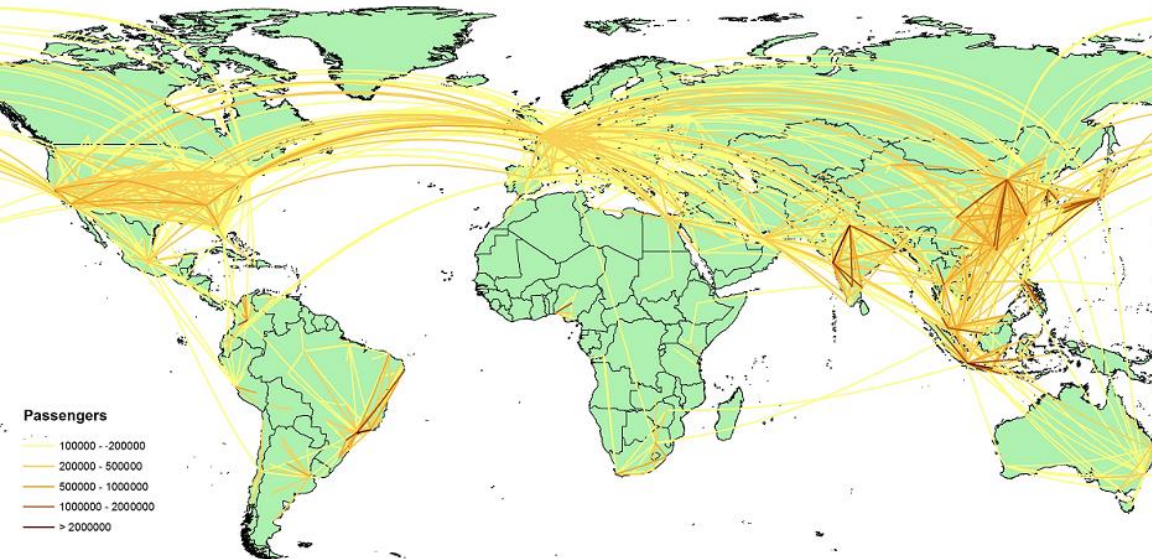
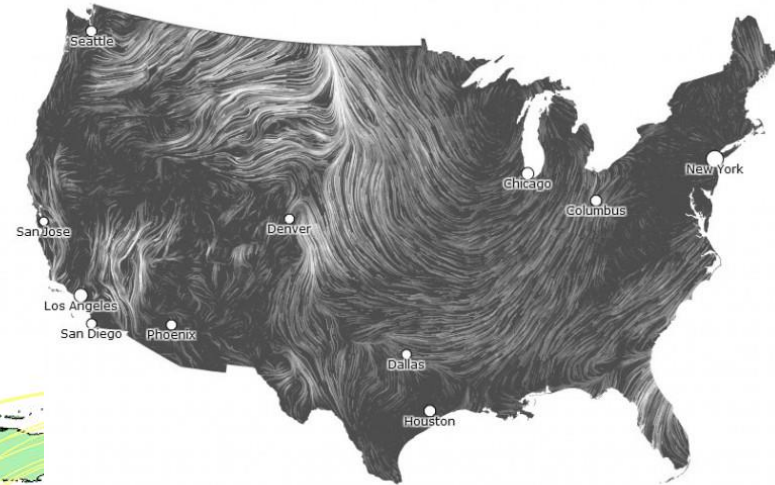


June 6, 2012
10:00 am EDT
(time of forecast download)

top speed: 29.1 mph
average: 7.0 mph



Dynamic wind map (from Hint. FM)



Worldwide Air Traffic . Huang et al. (2013)

Future Challenges

- Finer spatial-temporal resolution
- Differences in quality, standard, format, and semantics in data sharing
- Individual privacy issue in medical records, mobile phone data.
- Lack of integrative data search engine

Thank You!