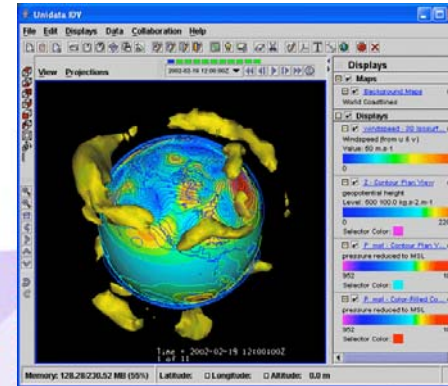# Integration of Quantitative and Qualitative Information
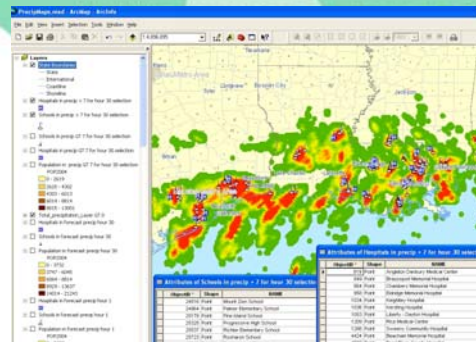

Social Science

Data / Information

Earth Sciences

GIS

Olga Wilhelmi
NCAR
Boulder, CO

PLAN Workshop
Oslo
12-13 April, 2007

Different Ways of Thinking about Data

- **In the GIS (solid earth and societal impacts) community, common data are:**
  - A collection of *features* (e.g., roads, lakes, plots of land, census blocks, zip codes) with geographic footprints on the Earth (surface).
  - The *features* are <u>discrete objects</u> with attributes which can be stored and manipulated in a **database**

- **In the Earth Science (atmosphere and oceans) community, common data are:**
  - A set of *parameters* (e.g., pressure, temperature, wind speed) which vary as <u>continuous functions</u> in 3-dimensional space and time.
  - Data are simply discrete points in the mathematical function space

- **In the Social Sciences community common data are:**
  - spatially and/or temporally structured *quantitative* or *qualitative* and *context-specific* pieces of information
  - *Quantitative* data are represented by numbers and statistics
  - *Qualitative* data are represented by words (interviews), objects (artifacts), pictures (photo, video)
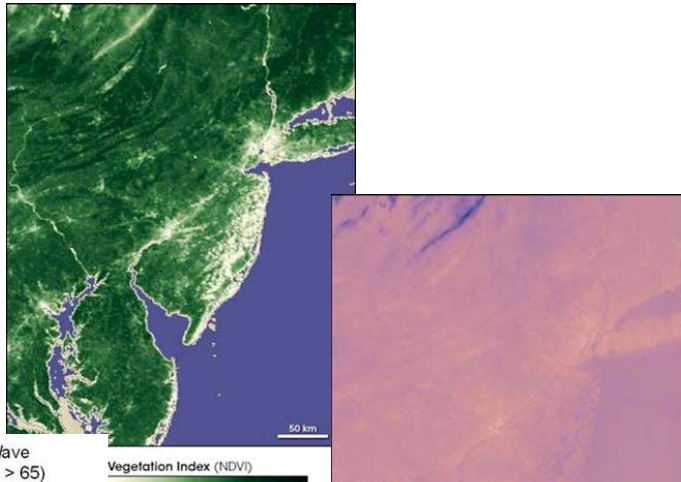
Spatial Integration (quantitative)

Spatial Integration (quantitative)

1999 Philadelphia Heat Wave
(Census Block Groups: Age > 65)

Vegetation Index (NDVI)

1999 Philad
(Census Block Groups

(Census Block Groups: Hispanic Population Density)

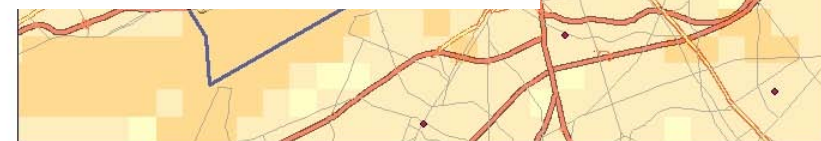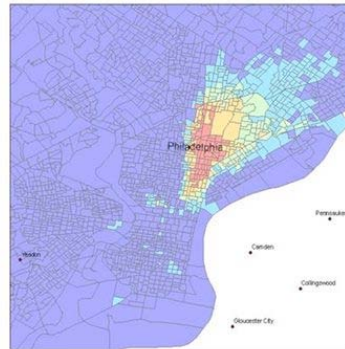Weighting of different layers can be either quantitative (spatial statistics) or qualitative (informed judgment)

Ardmore

Philadelphia

Pennsauken

Cherry Hill M

mden

Collingswood

Barclay

ster City

Haddonfield

☐ Philadelphia County

Major Roads
— Limited Access
— Highways
— Secondary Roads
- - Other
— Highway Ramp

Excessive heat risk
Low

High

Wilhelmi, Uejio, Samenow, 2007

Spatial Integration (challenges)

- Data formats

- How data are stored and retrieved

- Semantics

- How metadata collected and made available

- How the Earth is represented and its impact on spatial accuracy

- How uncertainties and errors are measured and quantified

- Different scales may affect the end result (have to work at the resolution of the coarsest data set)

- How well information can be modeled? Generalized? Upscaled/downscaled?

Temporal Integration

- **Temporal dimension of PLAN data (dynamic nature of human and natural systems)**

- **Social science data (both quantitative and especially qualitative) are snapshots in time, while natural system can be monitored or modeled continuously**

- **Range of climate projections; few (mostly on national level) demographic and economic projections**

- **Uncertainty of future projections**

- **Legacy of quantitative and qualitative data**

CCSM3 IPCC RUNS
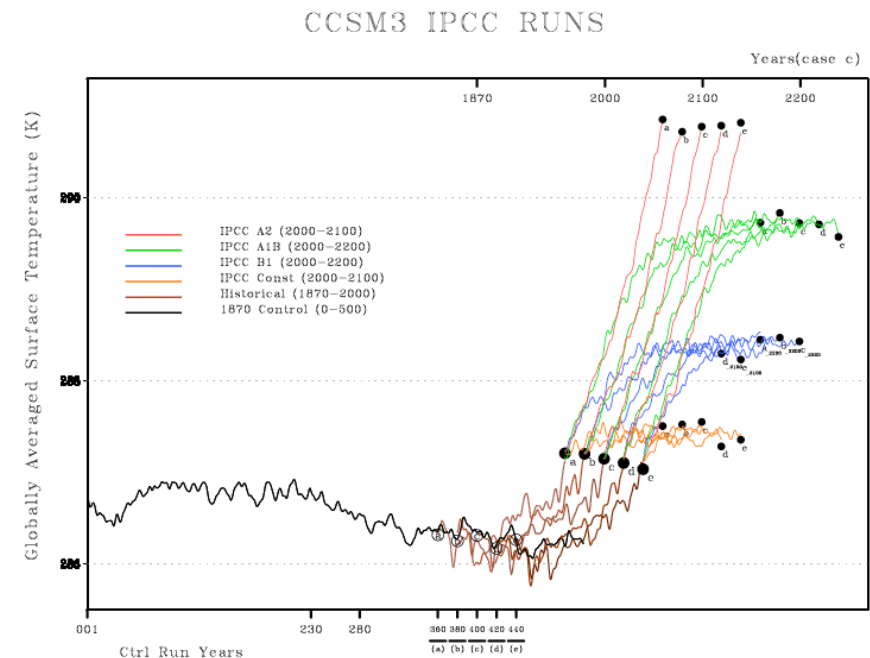
Conceptual Integration

- Visualization of information

- Geographical referencing (XY, place name, geographic identifier) allows for mapping data together to reach a *common interpretation*

- Methodological differences (concepts and study objects) may create challenges

Philadelphia County ☐ ▲ July 1999 Heat Mortality

Major Roads
- Limited Access
- Highways
- Secondary Roads
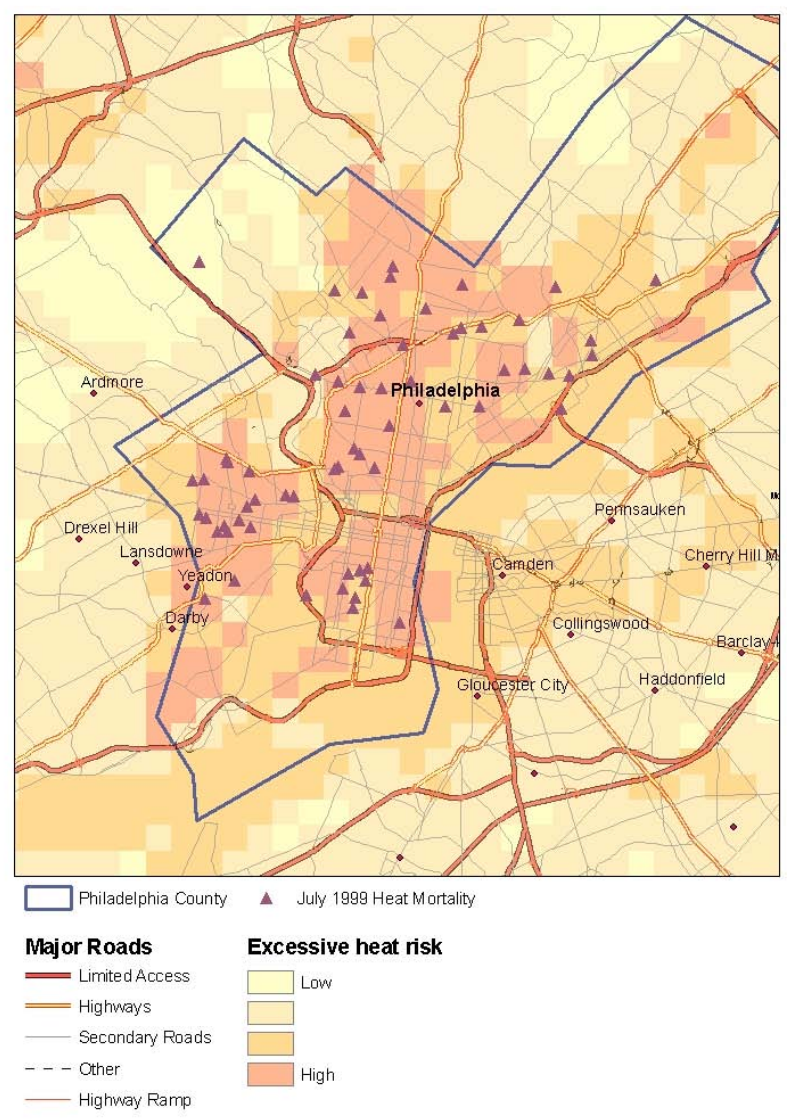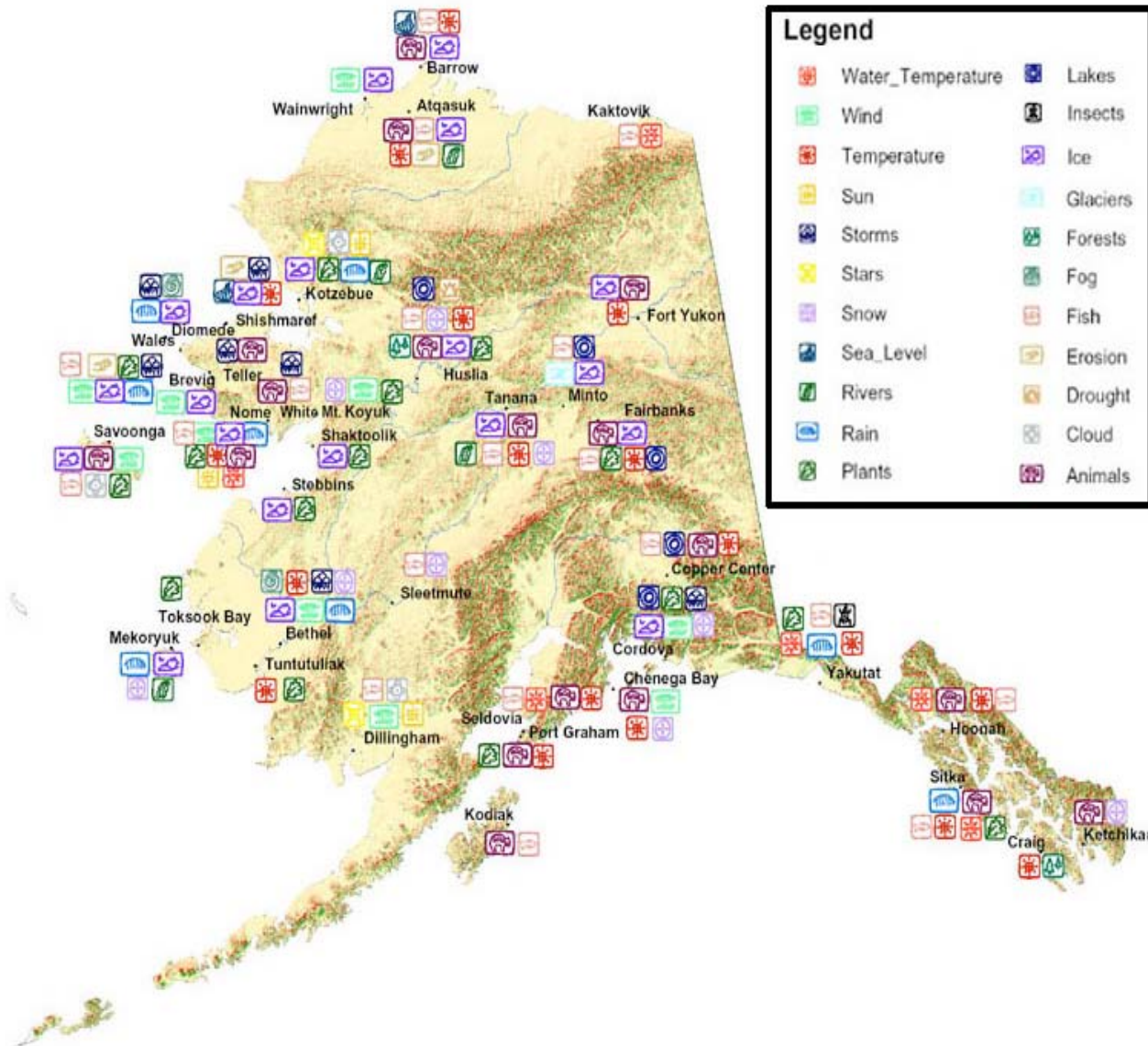- Other
- Highway Ramp

Excessive heat risk
- Low
- High

Observations of Climate Change

From S. McNeeley