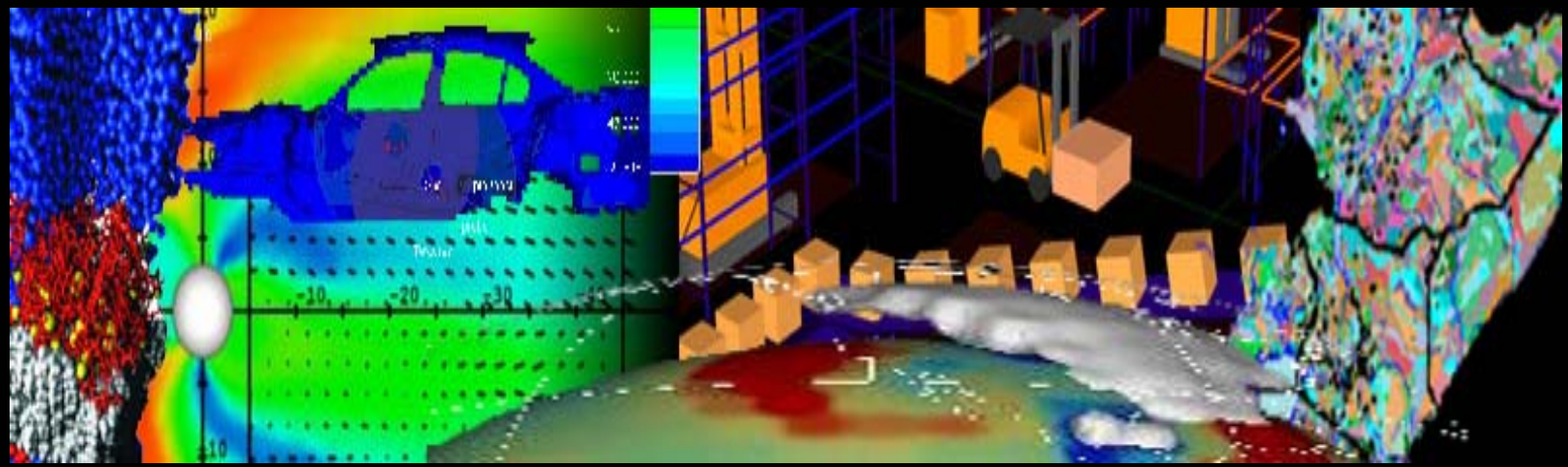
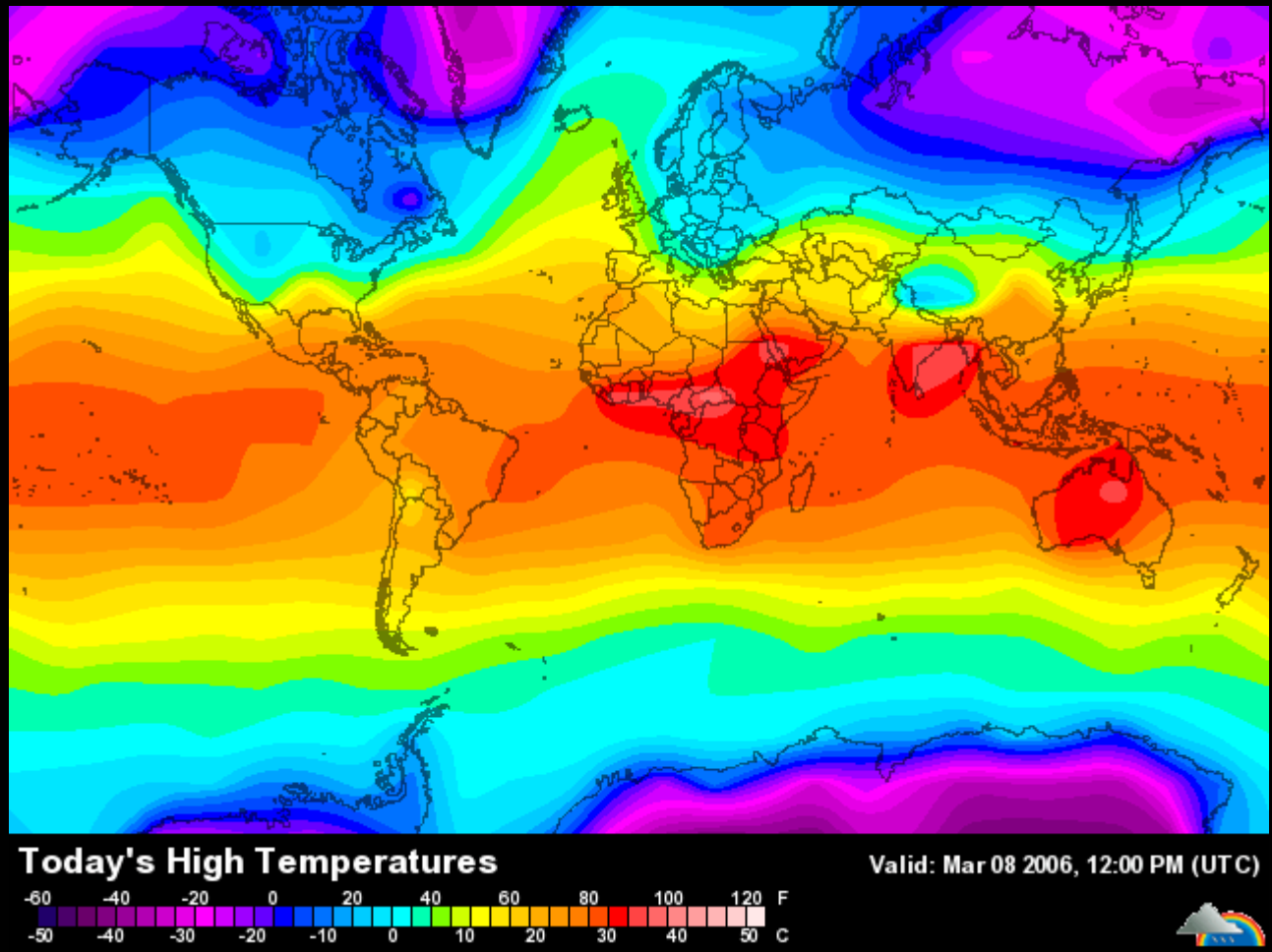
# DATA CENTER

*Make sense of your data*

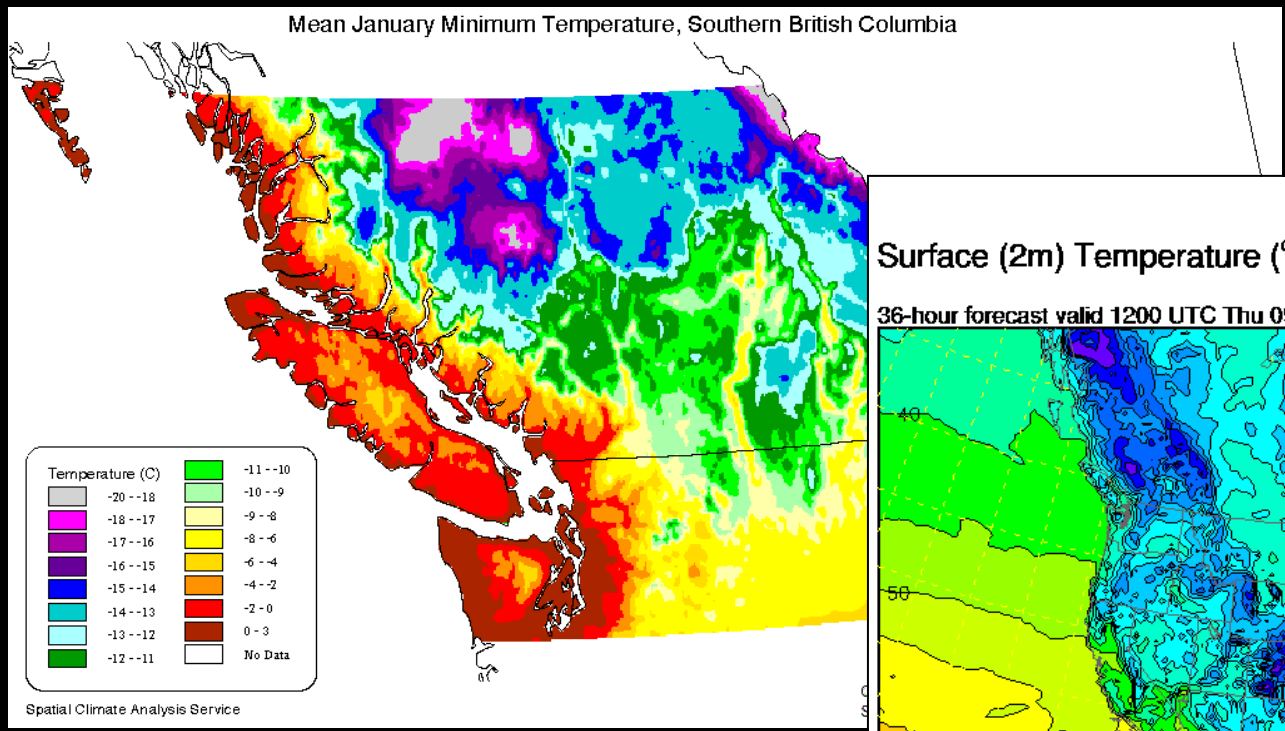


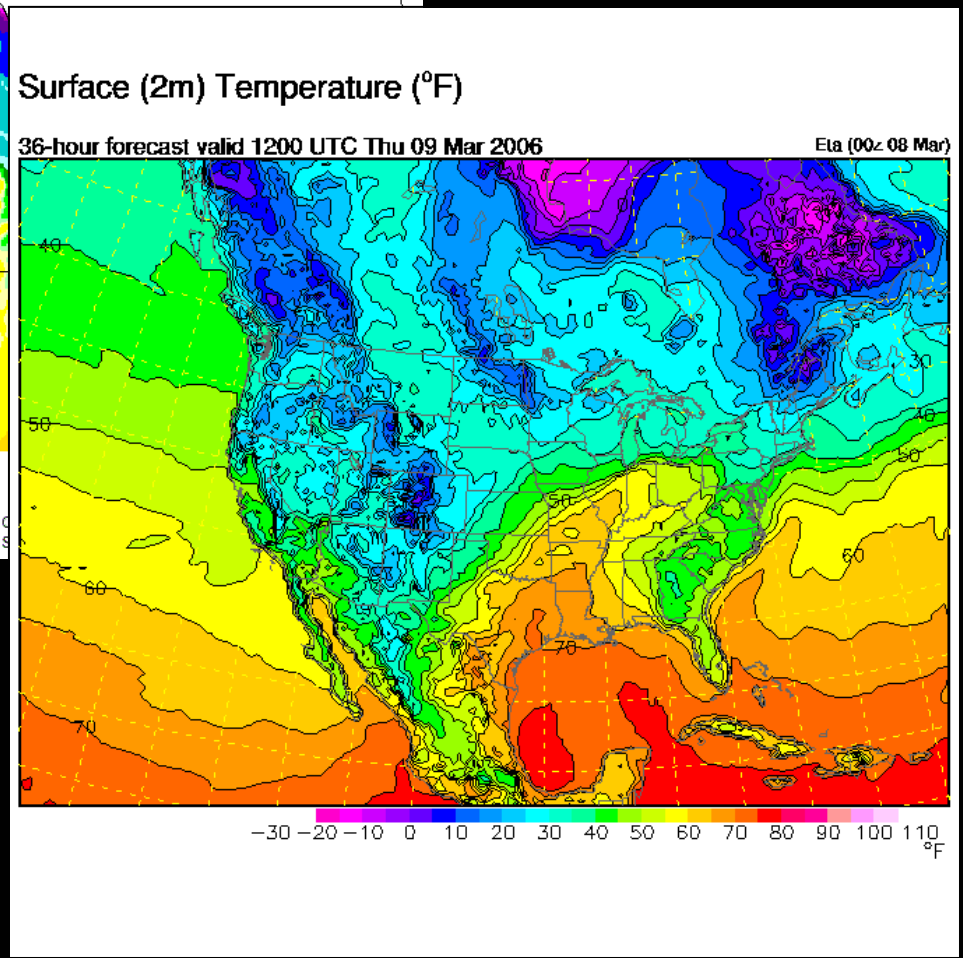
David Brock, Founder and Director
Data Center
Massachusetts Institute of Technology

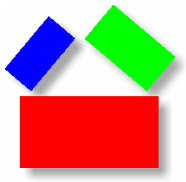
# SPATIAL DATA



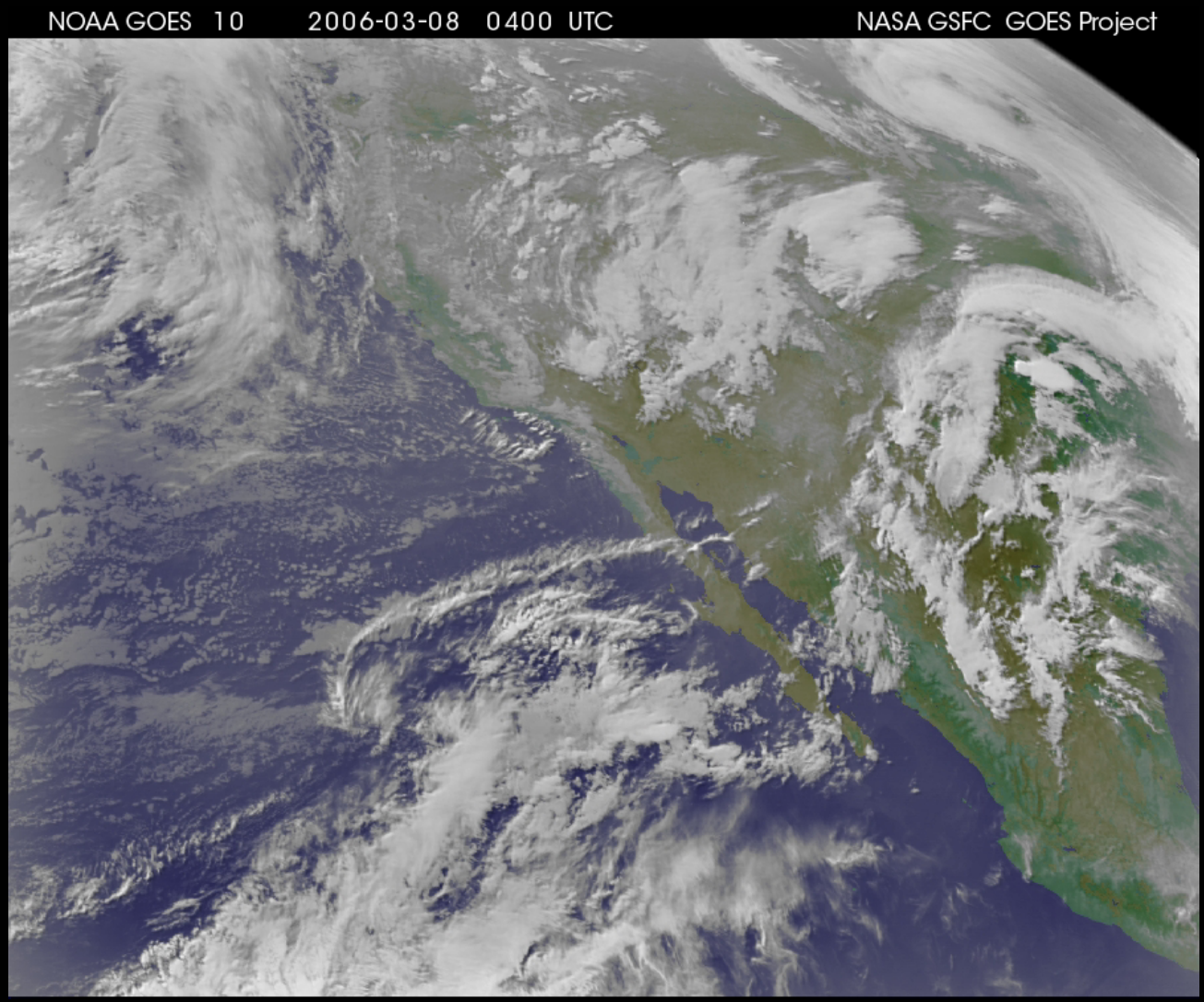
# SCALE AND RESOLUTION



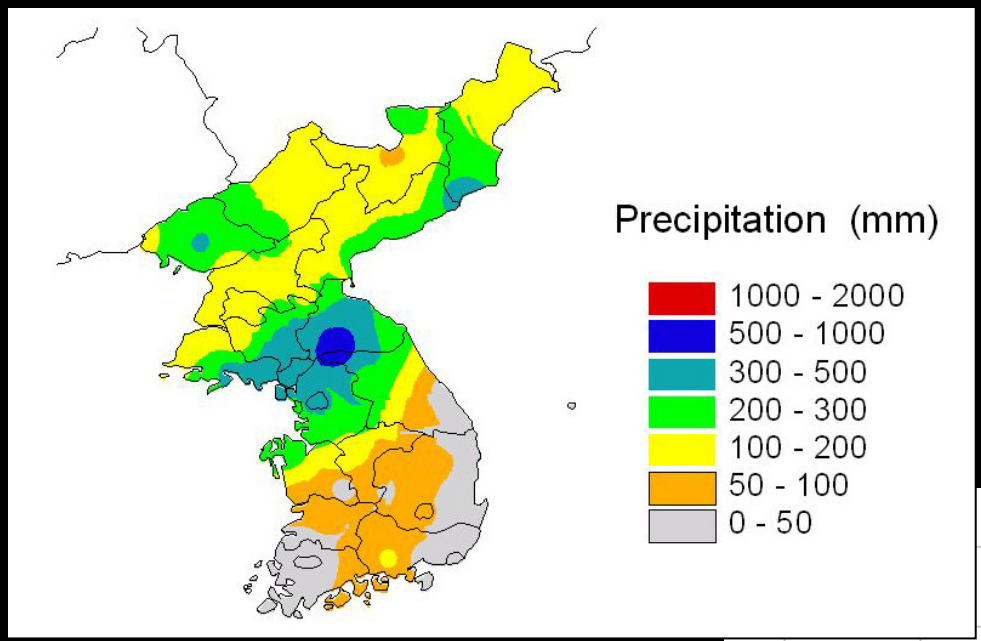



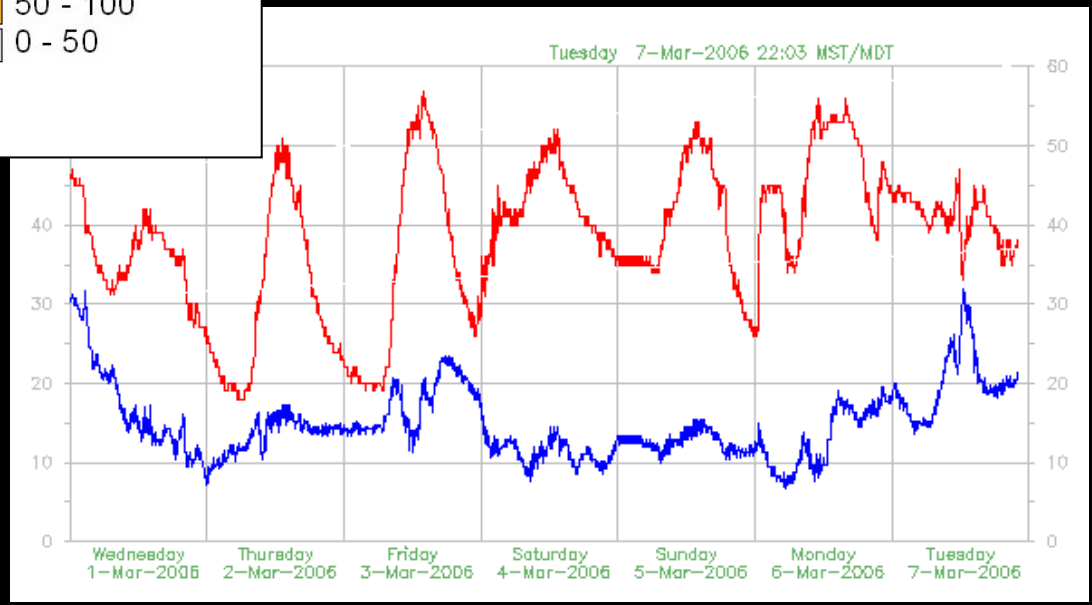


# PROJECTIONS AND TRANSFORMATIONS

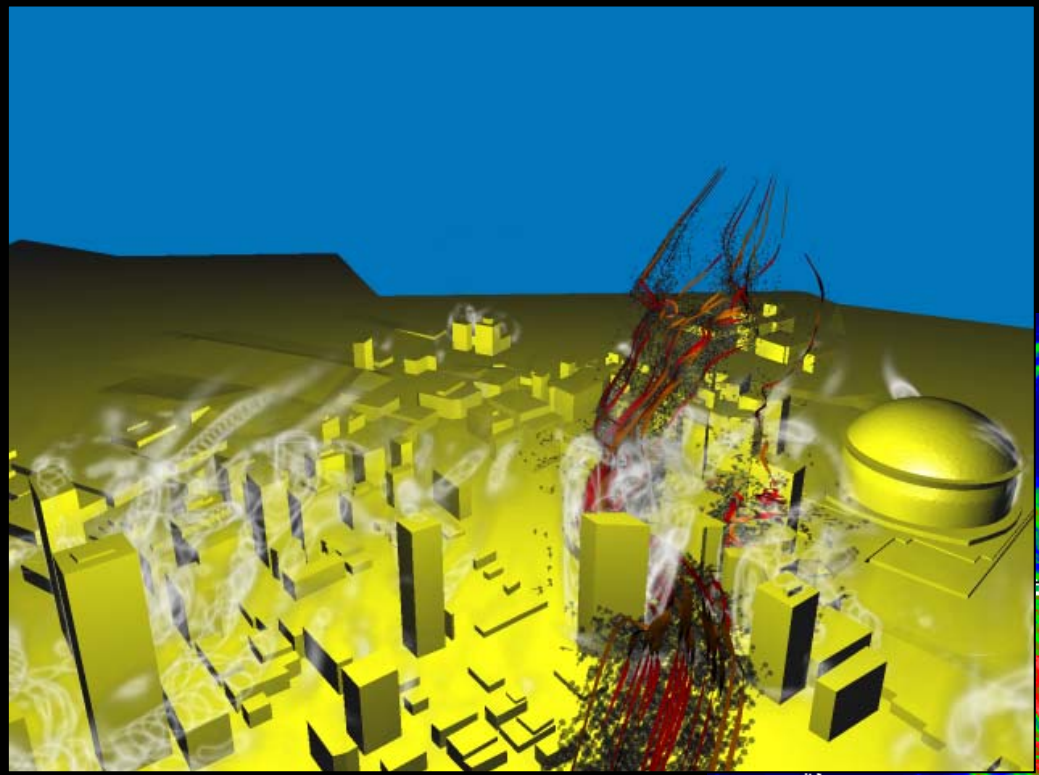


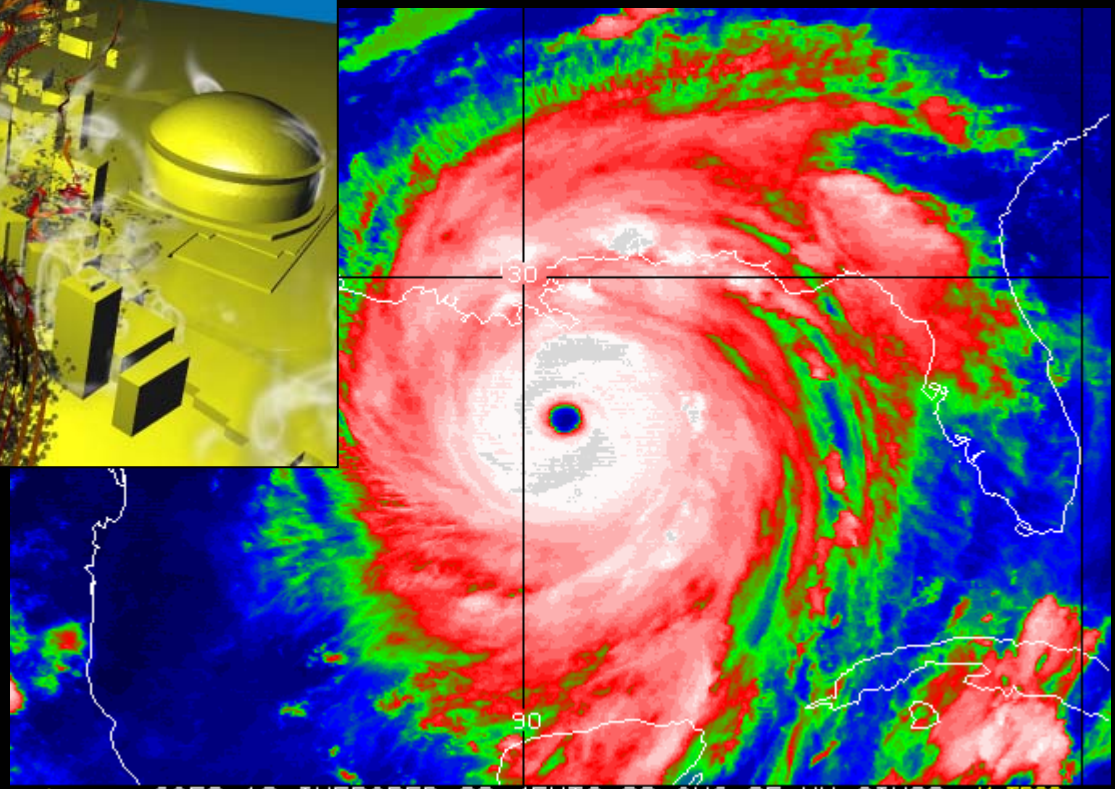
# TEMPORAL AND SPATIAL



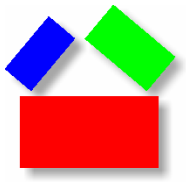



# MULTI-DIMENSIONAL DATA





# Current Standards

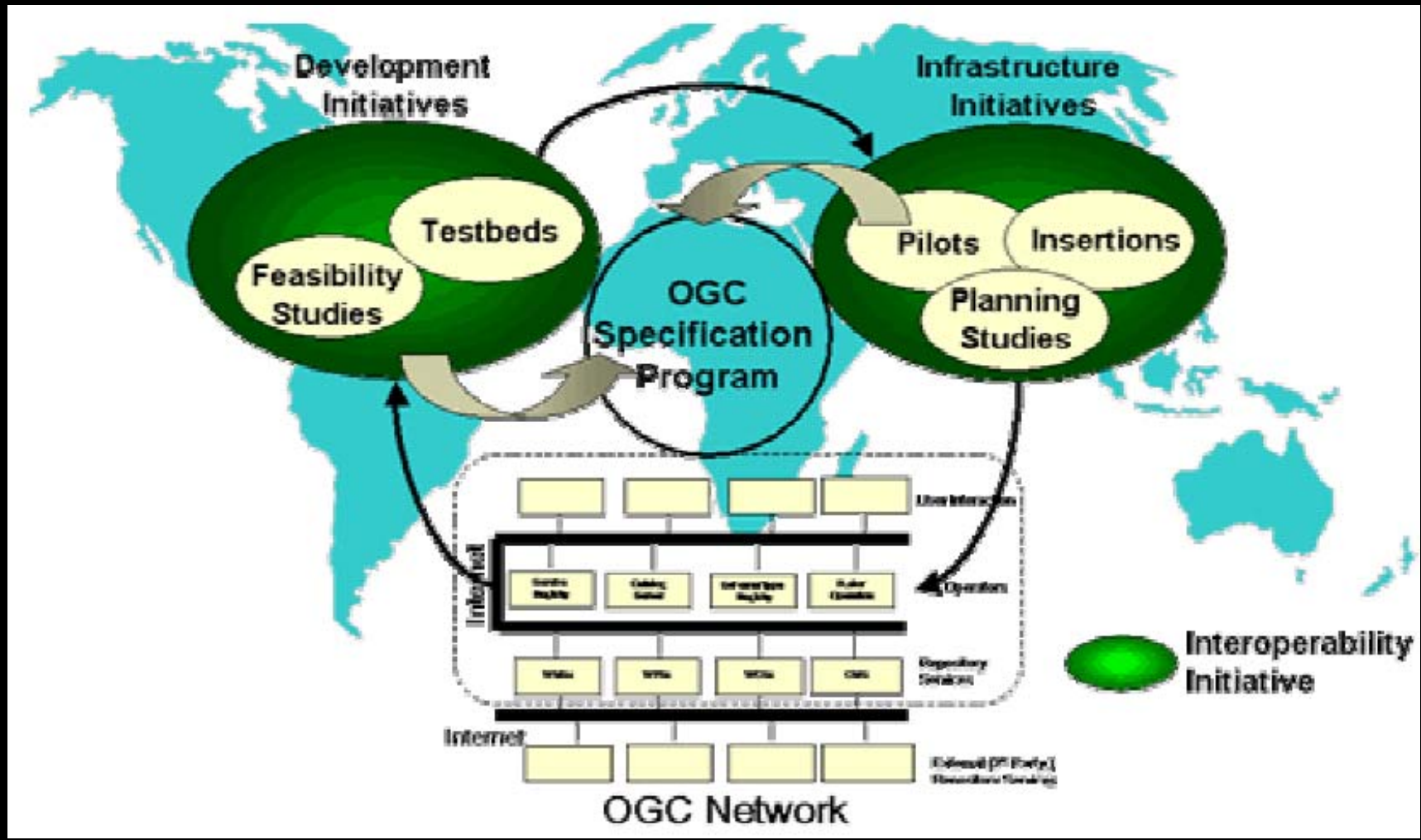


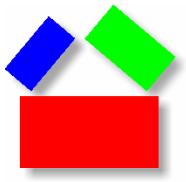
# ESRI Shape Files

The ESRI shapefile format is used for vector data in a GIS environment. They consist of a minimum of three files: main file (.shp), index file (.shx), and a database file (.dbf).

```
LON 2.910000
LAT 1.030000
DATE 01/09/2004
TIME 09:57
DIR 217.0000
SPD 1.1000
DISPDIR -217.0000
SPDKTS 2.1
```

# Open Geospatial Consortium (OGC)



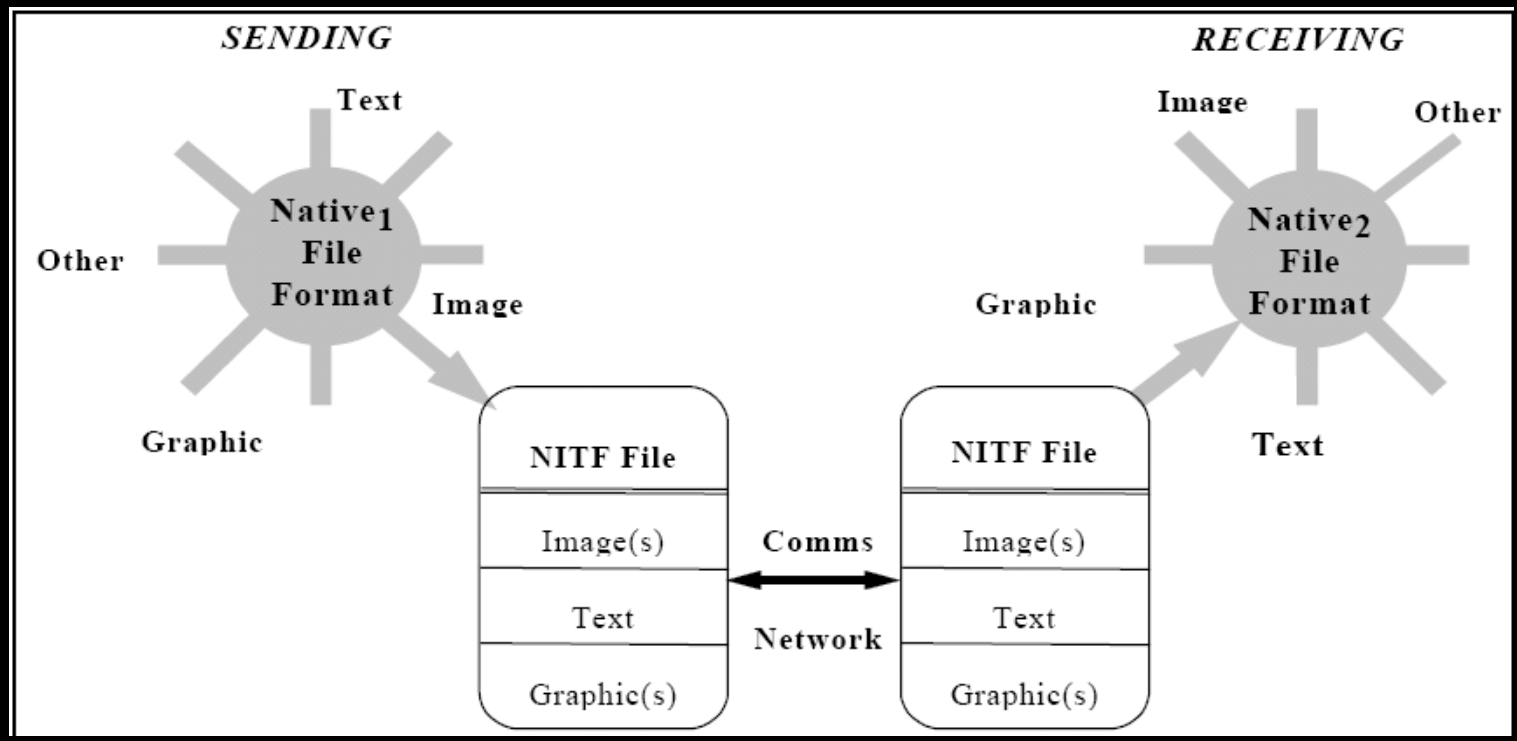


# Open Geospatial Consortium (OGC)

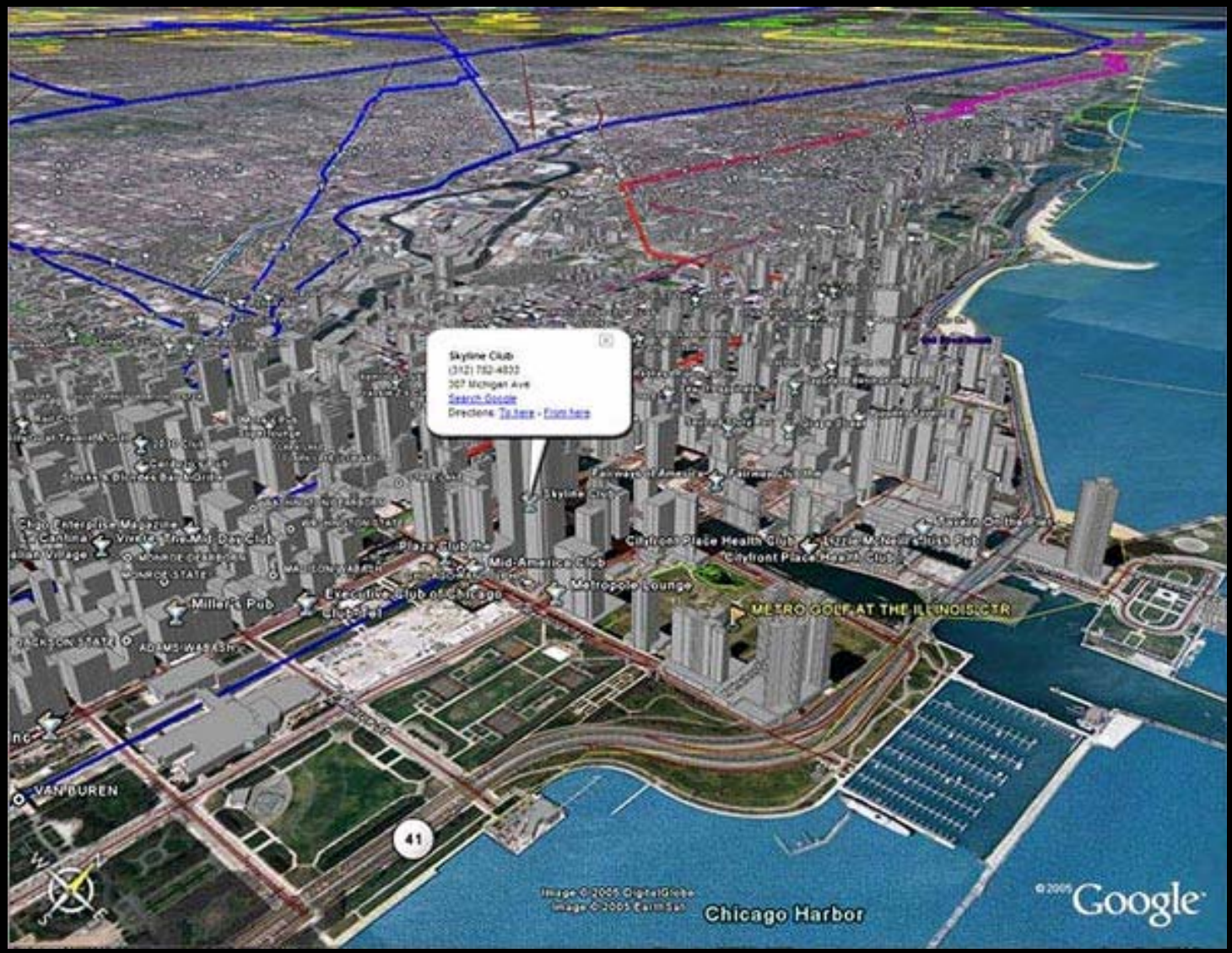
- OGC Reference Model - a complete set of reference models.
- WMS - Web Map Service
- WFS - Web Feature Service
- WCS - Web Coverage Service
- CAT - Web Catalog Service
- SFS - Simple Features - SQL
- GML - Geography Markup Language

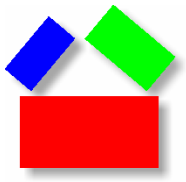
# National Imagery Transmission Format (NITF)

National Imagery Transmission Format (NITF) standard was developed in 1994 with the purpose of providing interoperability in spatial data among various government agencies. The NITF standard (MIL-STD-2500B1998) provides for efficient transmission and storage of electronic imagery among Department of Defense (DOD) and Intelligence Community (IC).



# Google Keyhole Markup Language (KML)

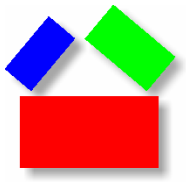




# Google Keyhole Markup Language (KML)

KML (Keyhole Markup Language) is an XML-based language for managing three-dimensional geospatial data in the program Google Earth

```
<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://earth.google.com/kml/2.0">
<Placemark>
  <description>New York City</description>
  <name>New York City</name>
  <Point>
    <coordinates>-74.006393,40.714172,0</coordinates>
  </Point>
</Placemark>
</kml>
```

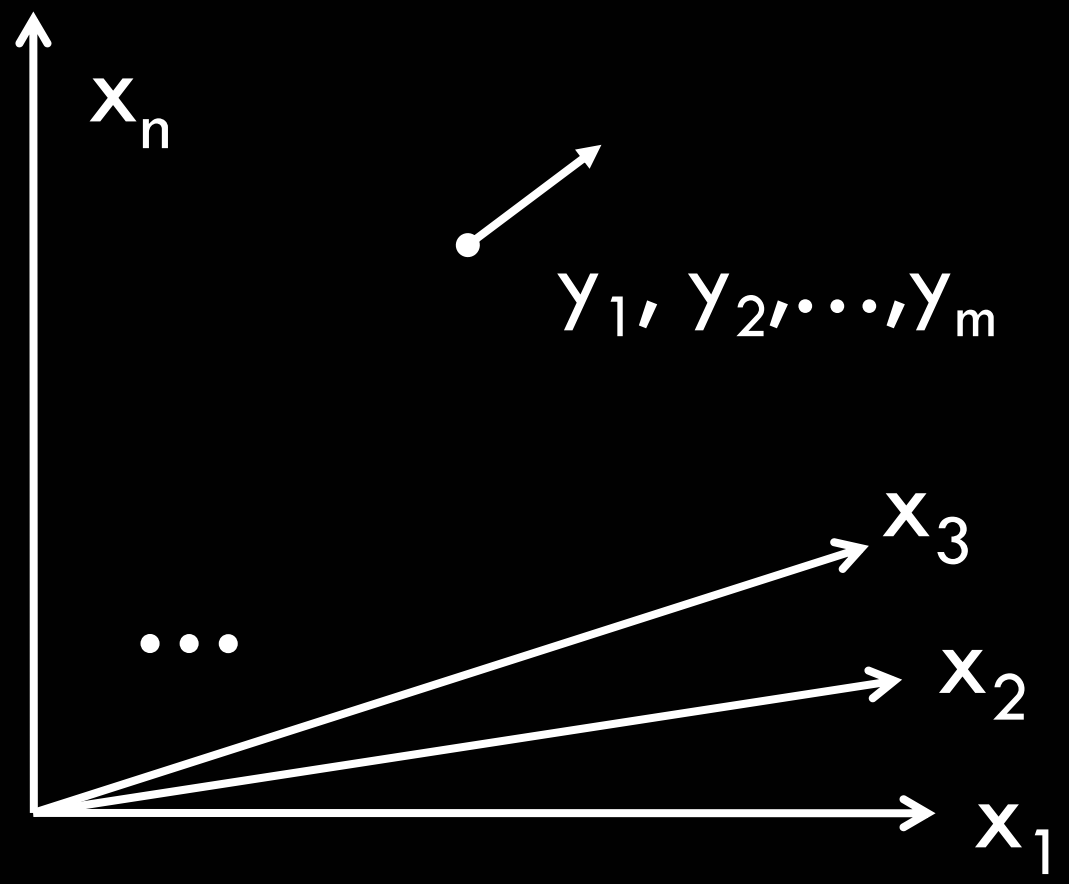




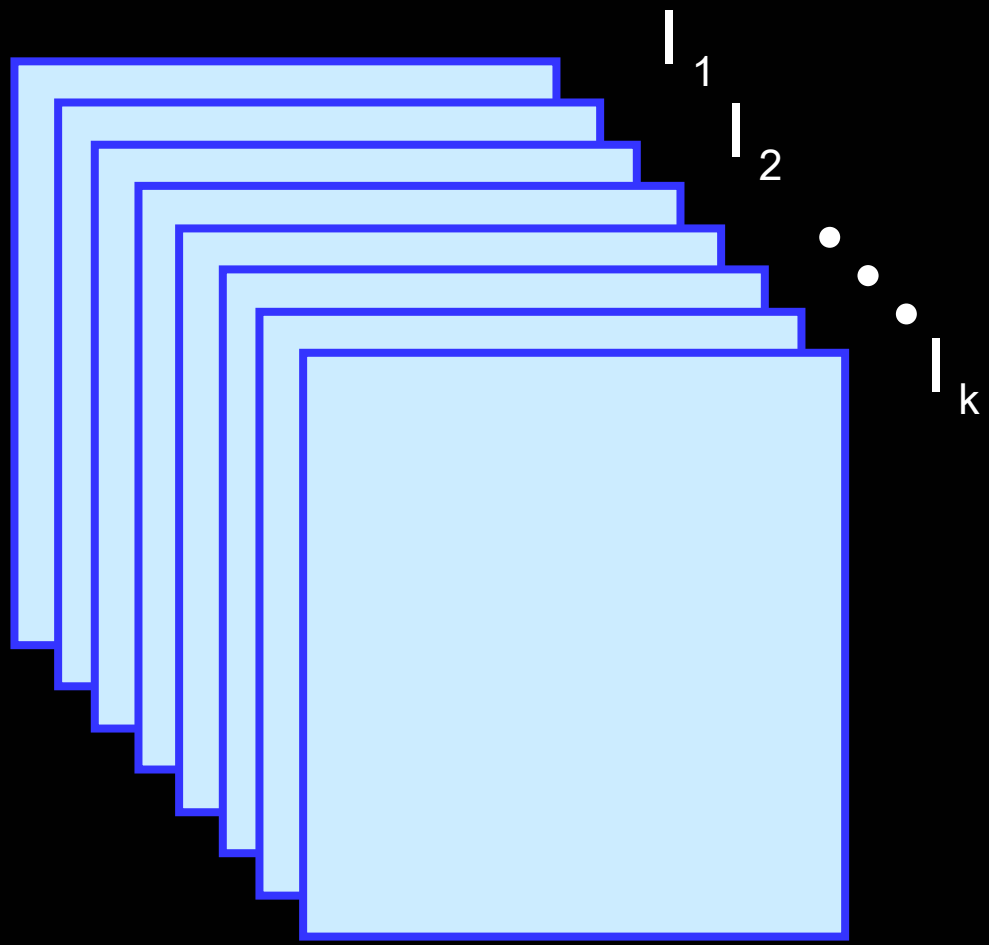
# M

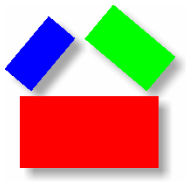
*A Modeling Language*

# M - Spatial Data Representation

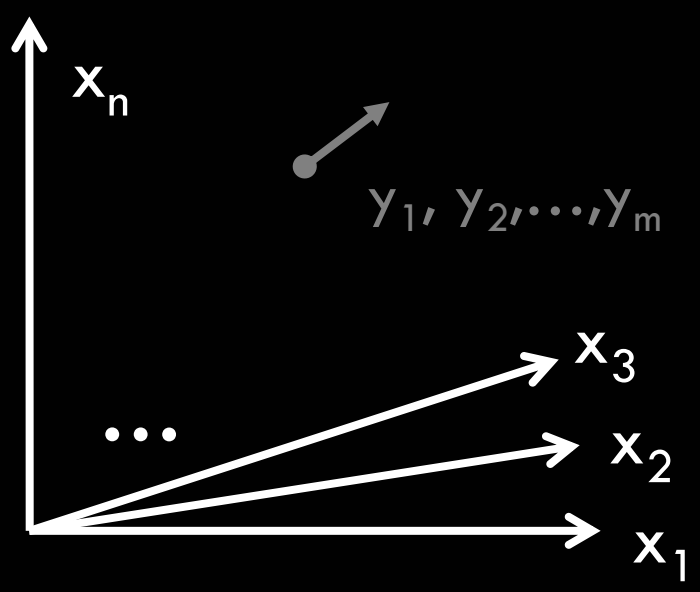


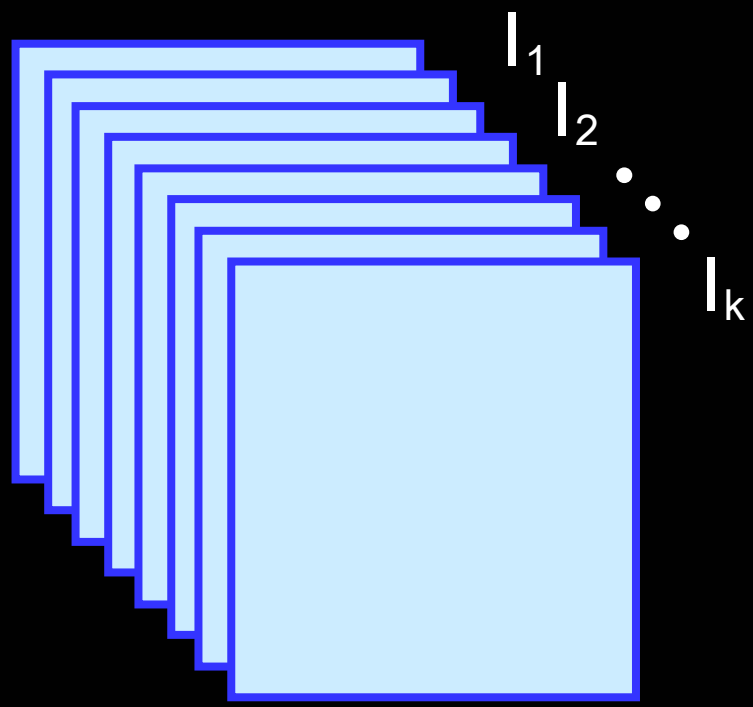
# M - Spatial Data Representation





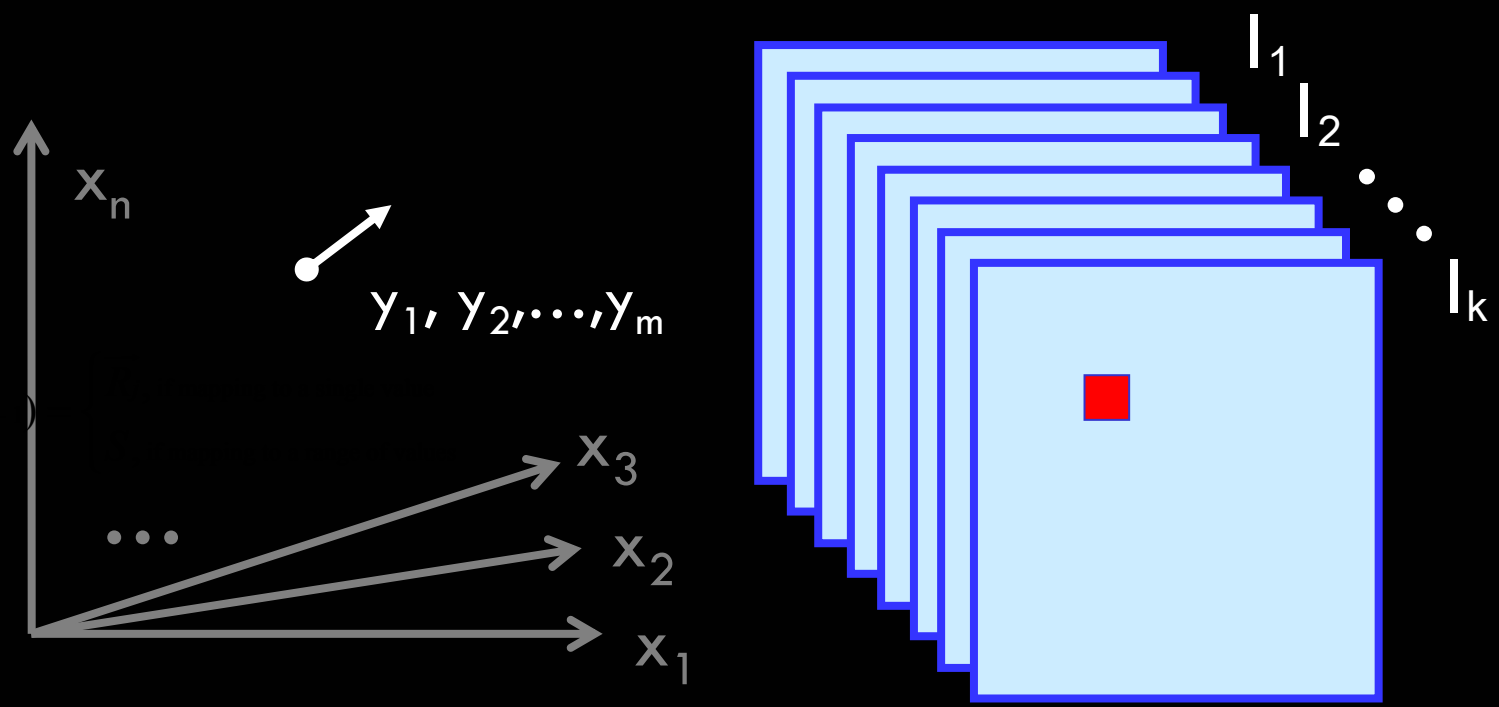
# M - Spatial Data Representation



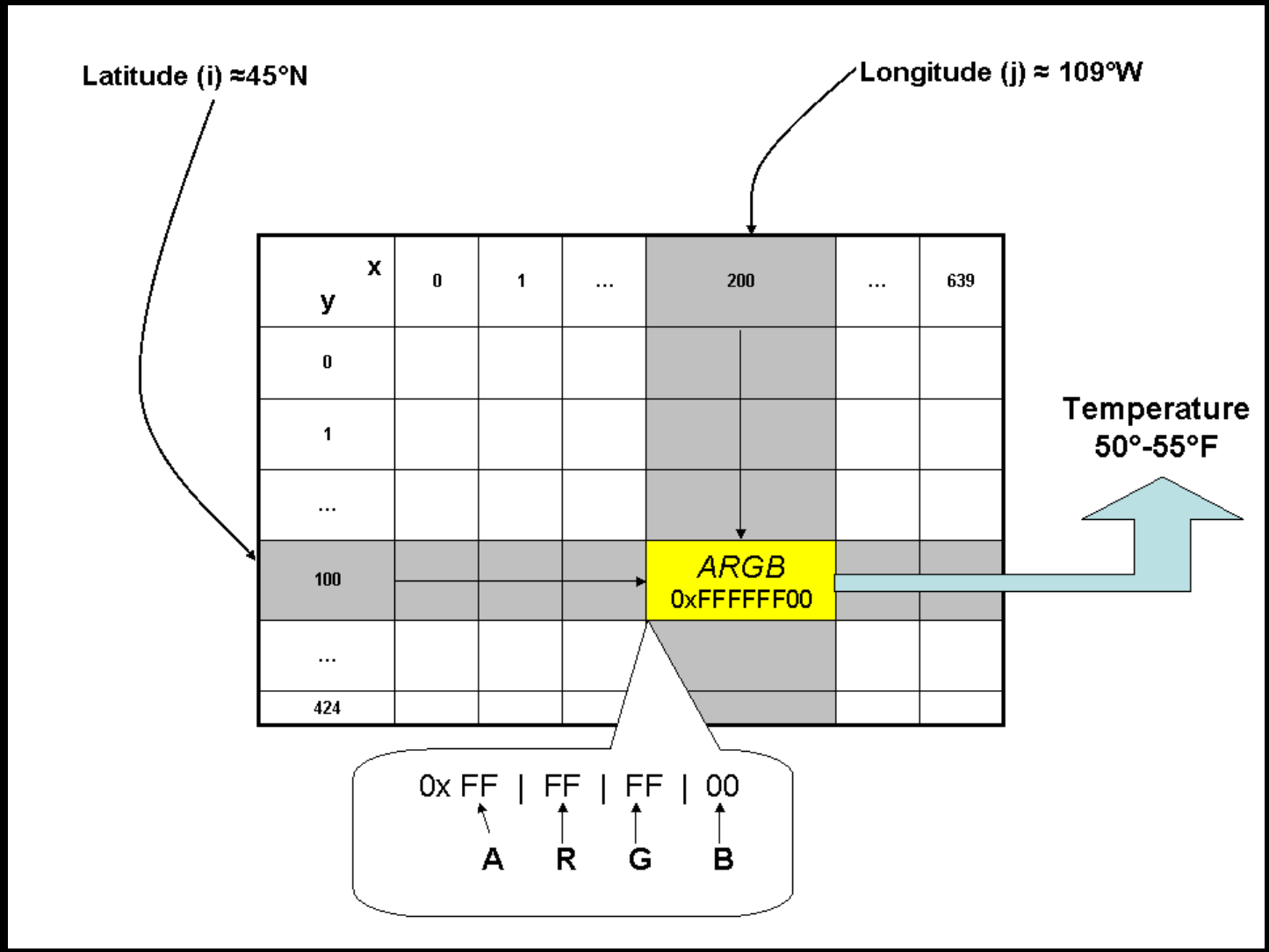

$$f(x_1, x_2, \ldots, x_n) \rightarrow I_1, I_2, \ldots, I_k$$

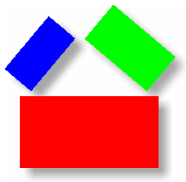
# M - Spatial Data Representation




$$g(ARGB_{i,\,i+1}) = \begin{cases} \overrightarrow{R_j}, \text{ if mapping to a single value} \\ S, \text{ if mapping to a range of values} \end{cases}$$

# M - Spatial Data Representation

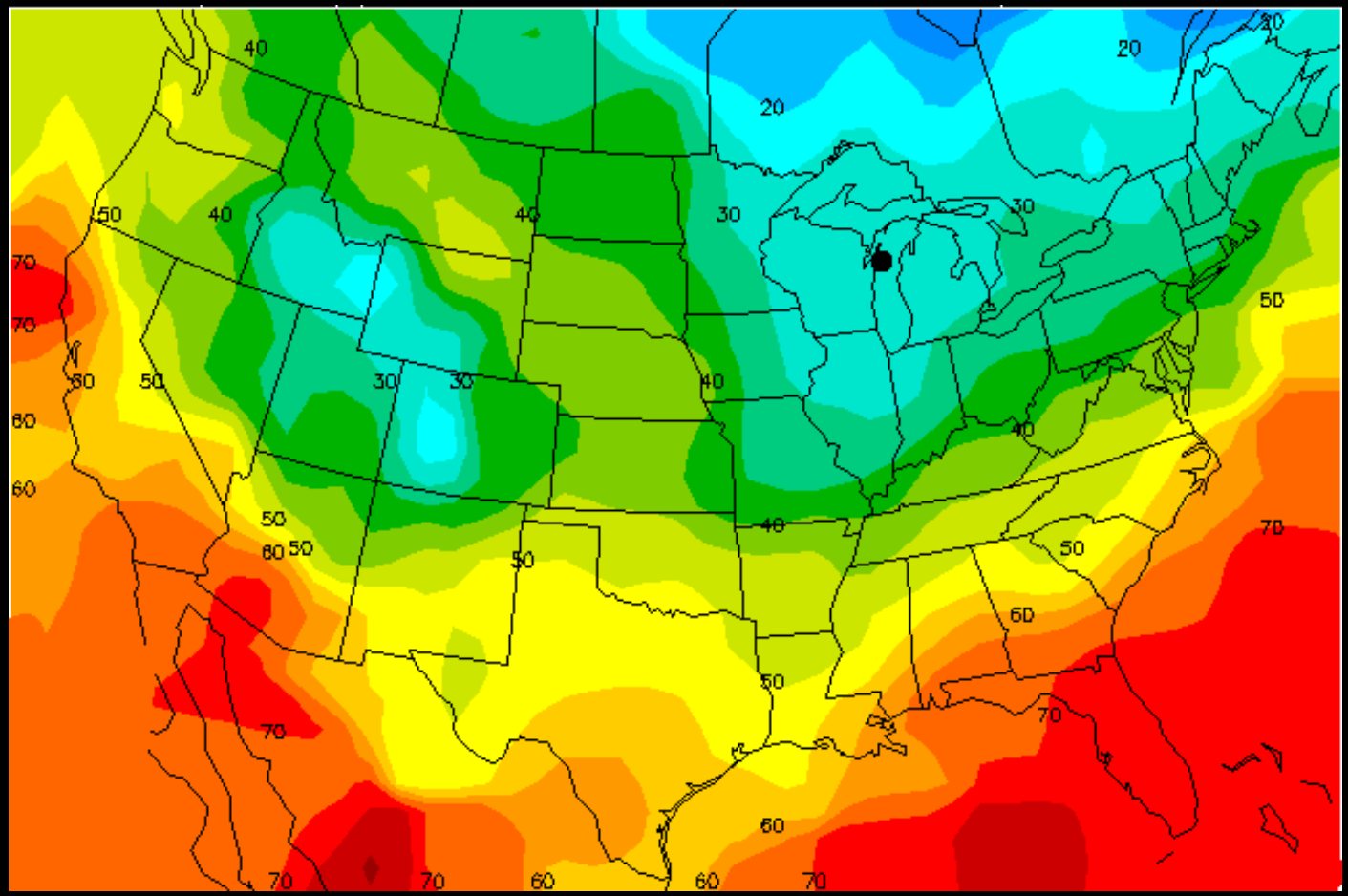




# M - Spatial Data Representation

```
<?xml version="1.0" encoding="utf-8" ?>
<!-- Color-Temperature map -->
<spatial.1_data.1_descriptor.1>
      <image.2_function.7_url.1>
            http://localhost/TemperatureMapF/Service1.asmx?WSDL
            </image.2_function.7_url.1>

            <color.4_temperature.1_map.1>
                        <color.4_temperature.1_pair.3>
                                    <color.1>FFFF00FF</color.1>
                                    <temperature.1>-12.5</temperature.1>
                        </color.4_temperature.1_pair.3>
                        <color.4_temperature.1_pair.3>
                                    <color.1>FFBF00FF</color.1>
                                    <temperature.1>-7.5</temperature.1>
                        </color.4_temperature.1_pair.3>

                                                ...

            </color.4_temperature.1_map.1>
            <Image.2>

            <url.1>http://localhost/temperatureMapF/other/sfc_con_temp_m
od.gif      </url.1>
                        <width.1>640</width.1>
                        <height.1>425</height.1>
                        <begin.7_latitude.2>48.07</begin.7_latitude.2>
                        <begin.7_longitude.1>-
133.34</begin.7_longitude.1>
                        <end.8_latitude.2>21.35</end.8_latitude.2>
                        <end.8_longitude.1>-72.32</end.8_longitude.1>

            <date.5_time.6>03/04/2006:17.0.0.0</date.5_time.6>

            <map.1_projection.4>Mercator</map.1_projection.4>
```

# M - Spatial Data Representation



# M - Spatial Data Representation

50% Drop in semiconductor yield
March 2006

# M - Spatial Data Representation