The AGS environmental databases consist of several separate database components, which include:

- WeatherRisk
- Hurricane Risk
- Tornado Risk
- Damaging Wind Risk
- Hail Risk
- Temperature
- Precipitation
- Degree Days
- Air Quality

WeatherRisk and QuakeRisk

Content

The WeatherRisk database consists of four separate types of weather-related hazards: hurricanes, tornadoes, hail, and damaging winds. The data are the results of a series of spatial analysis carried out on records compiled from publicly available USGS sources aimed at producing risk index estimates at the block group level and above.

Also take into consideration are cartographic databases, while certainly interesting, do not provide any "actionable" information to the user, as it is extremely difficult to interpret the likely risk for any given point using historical location data. The spatial analysis undertaken is based on several underlying facts:

- At a "macro" scale, there is a clear pattern of incidents of any type (e.g. "tornado alley")

- At a "micro" scale, the particular path which a single tornado or hurricane takes, or the precise location of high wind incidents or hail is essentially a random occurrence. It is only through the accumulation of a large number of historical records that the randomness at the local scale begins to show a pattern at a regional scale.

As such, a simple count of how many tornadoes have passed through any particular block group is of no value, as this certainly falls within the "micro" scale. Given a long enough historical record (e.g. several thousand years), this might be an appropriate technique for evaluating the potential risk. However, given the relative shortness of these data series, a simple arithmetic exercise is not sufficient. Instead, for any particular point occurrence (e.g. hail observation) a conical filter was applied using a simple distance decay measure. For path events (e.g. a tornado path), a distance-decayed linear filter was applied. For any particular point in space, the accumulated probabilities could then be calculated by summing the areas underneath these conical and linear filters.

All of the resulting indexes are "100" based, which means that a value of 100 for a particular level of geography is the average national value. A value of 200 indicates that the area has two times the average risk level, while a value of 50 indicates that the area is at half the average risk level. For

example, a value of 200 for the "HailIndex" indicates that the particular area is two times as likely to suffer hail damage in any given time period than an area with a 100 score.

Methodology and Data Sources

Hurricane track data was obtained from publicly available USGS records. Atlantic hurricane coverage is from 1896 to 1996, covering a total of 951 storms. Pacific hurricane coverage is from 1949 to 1996, covering a total of 661 storms. Storm locations are tracked every six hours while the storm maintains the minimum wind speed required to be classified as a tropical storm. Along with location, the database includes information on wind speed and barometric pressure.

The risk indexes were derived using a distance decay spatial filter along the line of the storm track with a width of 100 miles each side of the storm track. Statistics at the block group level were then compiled by computing summary statistics of hurricane impact at the block group centroid.

Tornado records published by the USGS from 1950 were analyzed for the purpose of identifying relative risk at the block group level. Unlike hurricanes, which are always presented as a hurricane path, tornadoes are presented either as a path or as a single touchdown point. A total of 38497 separate tornado events were analyzed. Similar spatial filters to those described under hurricanes were applied to both the point and path data.

Reports of damaging hail (over 0.75 inch in diameter) were compiled from USGS data sources, consisting of 86,675 records dating back to 1955. Point filters were applied to this database to derive relative frequency and intensity measures at the block group level.

The WindRisk data elements are based on reported events with wind speeds exceeding 50 knots, and consist of 115,814 separate events dating from 1955.

The composite risk index presents a unified risk index based on the relative damage expected from each of the four types of events. The relative weights of each of the source indexes were derived by weighting estimates of total annual damage caused by storms of each type.

The QuakeRisk database consists of two separate components. The first is a MapInfo point file showing the locations of significant earthquakes during this century. The quality of the additional information is significantly improved in recent years. Quakes in the 3.0 range are included only for the very recent past, while large quakes are tracked back to the turn of the century.

The second, and more important component, is a block group and higher level database which presents the risk of damaging earthquakes on a 100 based scale. This is currently available for only the continental United States and has been derived from USGS models using 0.1-degree grids (except in California and Nevada, where a 0.05-degree grid was used).

Climate

Content

The AGS climate database consists of the following variable groups:

Temperature:	Average, maximum, and minimum daily for January, July, and annual
Precipitation:	Annual rainfall and snowfall
Degree Days:	Annual average heating and cooling degree days
Air Quality:	Air quality indexes

Methodology and Data Sources

The climate database was created from two separate sources. The temperature, precipitation, and degree days variables were derived from an analysis of weather observations from federal government sources. In order to derive values for individual block groups, the data for each observation point (over ten thousand in all) were analyzed using Vertical Mapper in order to estimate the likely values at block group centroids.

The air quality indexes were derived from data obtained from the EPA and modeled using similar methods.