GEODE (Geo-Data Explorer)—A U.S. Geological Survey Application for Data Retrieval, Display, and Analysis through the Internet

GEODE (Geo-Data Explorer) is a free service offered by the U.S. Geological Survey (USGS) on the Internet at http://geode.usgs.gov (fig. 1). It provides digital geographically referenced data to the desktop computers of any user, including policymakers, land and resource managers, educators, industries, and private citizens. The ultimate goal of GEODE is to provide diverse users a gateway (data portal) that will supply real-time data and analysis over the Internet without the need for special hardware, software, and training.

GEODE allows the user to retrieve, display, and manipulate multiple types of information, such as satellite images, geologic maps, graphics, live camera feed, three-dimensional images, and spreadsheet data. The available data coverages (see box) are dynamic, as they are frequently updated; some datasets are international in scope, and some are specific to the United States. Users can combine these datasets to design their own maps (figs. 2 and 3) and digital products.

Users manipulate spatial information through a geographic information system (GIS) interface that allows them to query complex databases. GEODE uses a combination of digital and Internet capabilities to integrate data. The user controls the selection of maps (GIS coverages), imagery, and data; the presentation of map displays; and a variety of data-querying options. The user can create maps and data tables tailored for specific purposes and can download the results to a desktop computer for printing and offline use.

Examples of Data Publicly Available through GEODE

World and U.S. energy resources of oil, gas, and coal

World and U.S. mineral resources

Water resources

Real-time streamgage data

Real-time earthquake monitoring data

Volcano hazard data

Coastal and marine bathymetry data

Land use and land ownership data

Geologic maps

Digital elevation coverages

Air photographs

Satellite images

U.S. Census Bureau demographic data

Locations of cultural features such as roads, schools, hospitals, airports, and railways
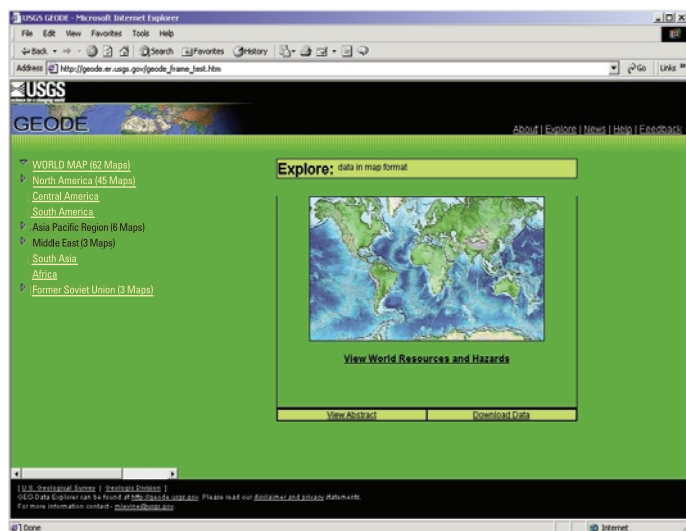
Figure 1. GEODE's navigational page. From here, users can choose a study area where they can build a map, view the "Help" section, send feedback, or visit a download site (where metadata describe shape files) without entering the application.
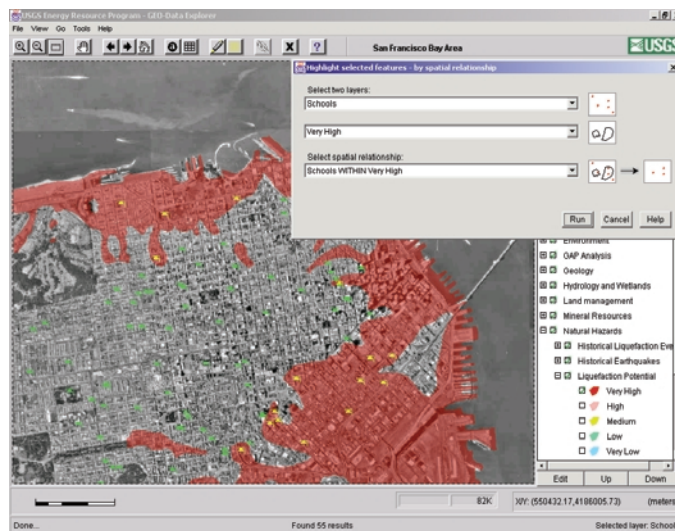
Figure 2. A sample map prepared by using GEODE. It shows schools (in yellow) located within areas of high liquefaction potential (red) in the San Francisco Bay area, California. Users can choose which data layers to display and then run queries on combined data. The query builder window in the top right corner displays images of the types of data that will be queried; these data can be point, line, or polygon datasets.
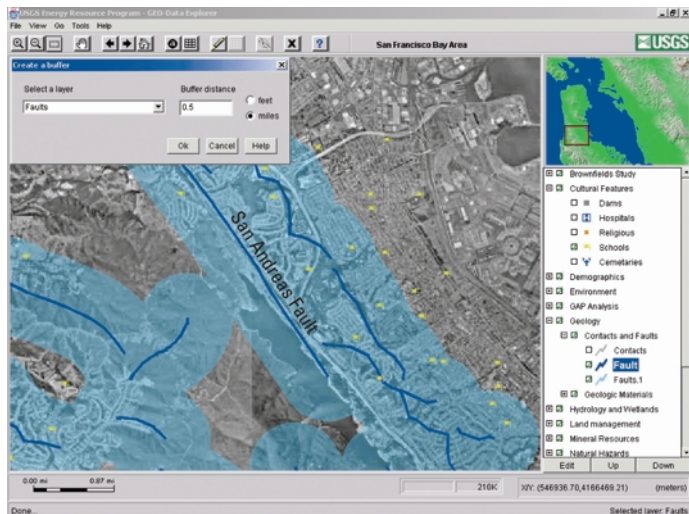
Figure 3. A sample map prepared by using GEODE and the "create buffer layer" feature. The map shows schools (in yellow) located within 0.5 mile of major faults (heavy blue lines) in the San Francisco Bay area, California. Users can activate data layers and then create buffers that appear a given distance around a selected feature. In the map, light blue shows buffer areas within 0.5 mile of the major faults. The user-generated buffer layers can be turned on and off like the original layers.
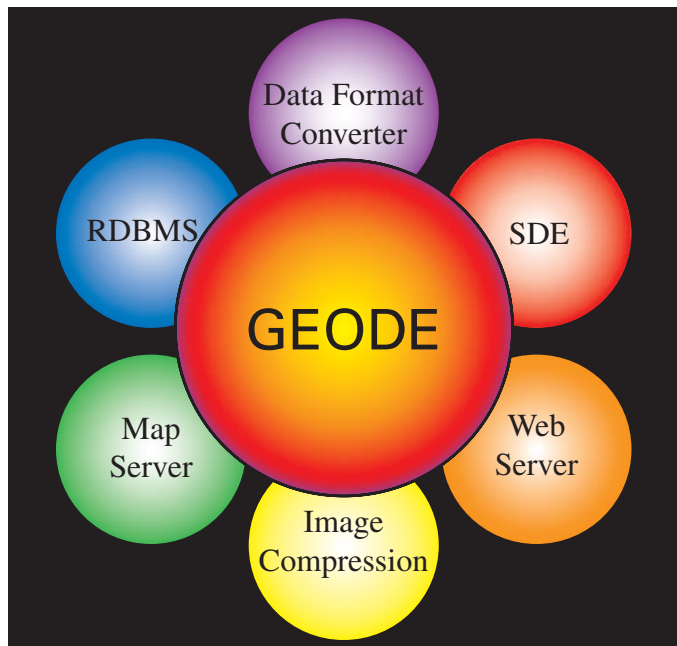
Figure 4. A model showing the six modules linked to GEODE. The system is designed so that any module can be upgraded as new products become available. RDBMS, relational database management system; SDE, spatial data engine.

GEODE'S CAPABILITIES

Some of GEODE's capabilities are listed below:

- GEODE can display many different data formats simultaneously.
- GEODE allows the user to download selected specific parts of datasets.
- GEODE can show real-time data instantaneously.
- GEODE can display data at multiple scales (county, State, national, world).
- GEODE can display datasets of unlimited size.
- GEODE allows users to customize maps and map symbols.
- GEODE can export a graphic image (.jpeg) of the user-modified maps.

GEODE'S MODULAR NATURE

GEODE includes a unique application, created by the USGS, that provides basic functions and dynamic links among six commercial modules (fig. 4):

- Data format conversion engine
- Spatial data engine (SDE)
- Web server
- Image compression engine
- Map server
- Relational database management system (RDBMS)

The system is designed so that any module can be easily upgraded or replaced as software improves or as new products become available.

GETTING STARTED

The first time that you use GEODE, go from the welcome page (http://geode.usgs.gov) to "Help with GEODE" and then to the setup section. The setup section recommends installations and confirms that your machine fulfills basic requirements to run GEODE successfully. Then you can go to the navigational page (fig. 1) and build queries. GEODE is accessible by various computer types; the application runs directly through the user's Internet browser without the need for additional software.

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