

INTERACTIVE GEOLOGICAL HAZARD MAPS USING GEOHAZARDVIEW

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Abstract: This paper presents the interactive method of showing geological hazard maps and other related information using the new GIS software developed at the Geological Survey of Japan. The main purpose of the software is to easily provide information about geological hazards to a wide range of users. The software incorporates spatial and a-spatial data to interactively present the time, locations and extent of occurrence of geological hazards and other related information. Queries for hazard information can be easily done. Simulations of the occurrence of a particular geological event like the spread of volcanic ash during major volcanic eruptions can also be easily shown.

Keywords: GeoHazardView, Geological Hazard, Tsunami, Earthquake, Volcano.

1. Introduction

Information that can be obtained from the conventional geological hazard maps are not always sufficient to provide the users with their data needs. The difficulty of presenting more relevant information in geological hazard maps in paper form is due to the limited physical space available in this format. Printing more information on these maps has the tendency of confusing rather providing more information to the users.

The digitization of maps and the use of Geographic Information System (GIS) in handling digital maps have been found to be very advantageous [1,2]. This paper shows a system of presenting geological hazard map interactively using the new GIS software developed at the Geological Survey of Japan, AIST. The software was developed to interactively present geological hazard information and to manage and maintain the geological hazard spatial and a-spatial database. Important information can be easily queried using the software and simulation of important geological hazard phenomena can be easily shown on-screen. The software is called GeoHazardView.

2. The GeoHazardView Software

The GeoHazardView software was written using the Microsoft Visual C++ programming language at the Geological Survey of Japan, AIST. It was designed to be very user friendly and can be operated in a straightforward “point and click” operation.

The types of geological hazards that can be handled by the software are volcanic, earthquake, tsunami and landslide hazards. Fig. 1 shows the general flowchart of the GeoHazardView software. The “Hazard Map Display” portion involves the display of the hazard map the same way the map is presented in hard copies. However, in this case, the legend and the symbols displayed on the maps are all interactive. They can be easily double clicked to show more information or display a simulated graphic presentation of an important geological hazard event. In this paper, the software uses the geological hazard information of East Asia.

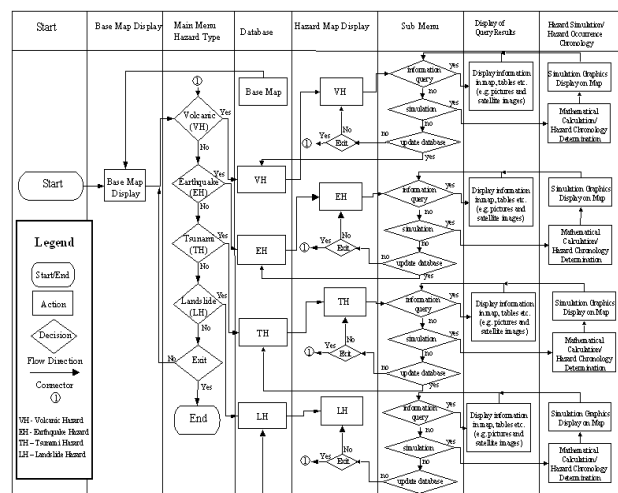


Fig. 1. The general flowchart of GeoHazardView.

1) User Interface

The user interface of the software is typical of a GIS software running under Windows operating system as shown in Fig. 2. The tool bar includes buttons to control the zoom factor, zoom box and panning of the hazard map. Scroll bars are also available for navigating the maps and the status bar is very useful for determining distance changes as the mouse pointer is moved over the map. The choices for the geological hazard types, information queries and other important features of the software can be found on the menu bar. The legends of the hazard maps are also interactive. Fig. 2 shows the volcanic hazard map. It displays an interactive legend where symbols on the legend can be clicked to show the locations of the volcanoes on the map represented by the symbol. Viewing the simulation of the ash distribution from the major volcanic eruptions in the region can also be done using the legend like the one shown in fig. 3. Fig. 4 shows the earthquake hazard map with its interactive legend. Clicking one of the radio buttons on the legend will highlight the earthquake epicenters represented by the symbols on the legend. Knowing more detailed information about an earthquake can also be done by directly double clicking the earthquake symbol displayed on the map.

2) Information Query

Interacting with the geological hazard database is possible using the software. Queries for a particular hazard information like the number of casualties, magnitude and location of earthquake epicenters, names and locations of volcanoes erupted in a particular year can be easily done. Choices for these different search methods can be found on the menu bar. Search parameters can be defined using search dialog boxes to extract the needed information in the database. The result of the query will be displayed on the map and tables. Selecting an item on the table will further show detailed information about a particular geological event. Fig. 5 shows the epicenter of the Kobe earthquake on January 17, 1995. The information about the earthquake including the magnitude scale are shown on the dialog box. The Kobe earthquake information is extracted using the information search feature of the software.

Finding additional information can also be done by directly double clicking on the symbol displayed on the map or on the map's legend. Information like the ones shown in fig. 6 can be easily viewed using the procedure. The date of hazard occurrence query is also possible using the software. Through this, the location of the hazard occurrence on the map in a chosen date will be highlighted.

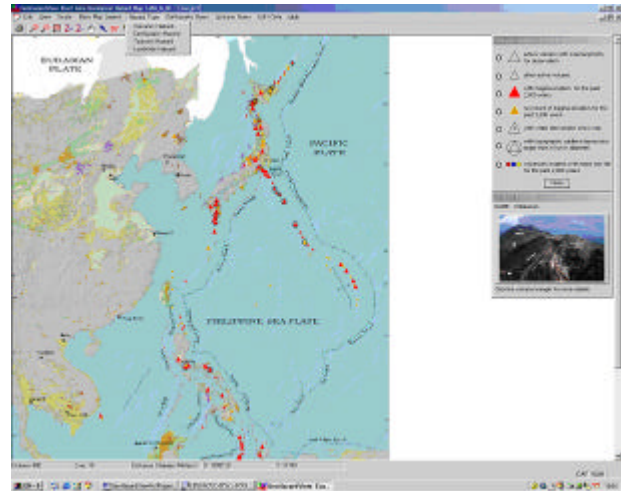


Fig. 2. GeoHazardView on volcanic hazard mode.

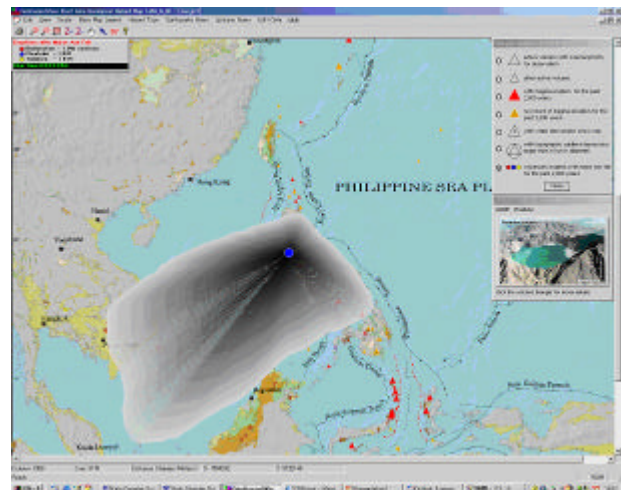


Fig. 3. Simulation of the ash distribution of Mount Pinatubo eruption in 1991.

3) Geological Hazard Occurrence Chronology

One of the most important features of the GeoHazardView software is its capability to show the geological hazard occurrence chronology on the spatial context. It can be set to automatic mode to continuously show locations of hazard occurrence in a chosen range of years in the past. The continuous increment of years will also show changes of the information displayed on the map corresponding to the new geological hazard events that occurred on that year. Fig. 7 displays the highlighted volcanoes erupted on the year 1821. The detailed information about a volcano that erupted on that year can be easily viewed by choosing the volcano on the list box on the right side of the screen. The figure also shows the epicenter of the earthquake near Baguio City, Philippines on July 16, 1990. The details of the earthquake information including the earthquake magnitude scale are shown on the dialog box on the right side of the screen.

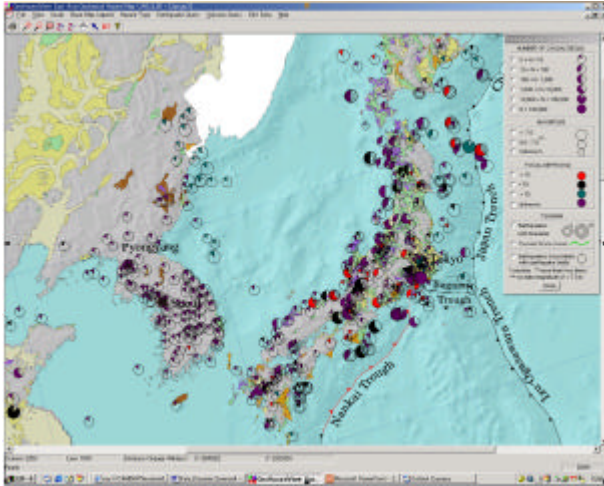


Fig. 4. GeoHazardView on earthquake hazard mode.

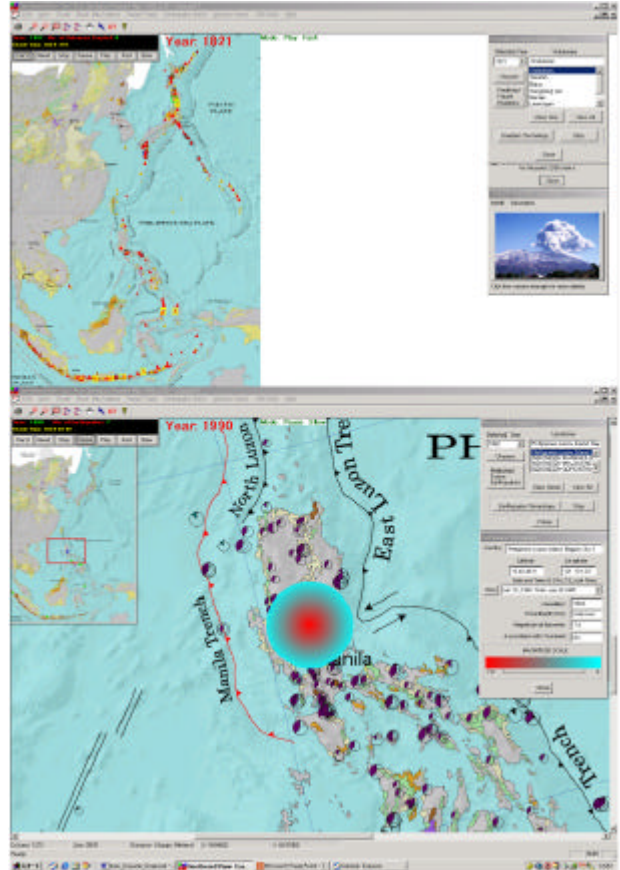


Fig. 7. Geological hazard occurrence chronology.

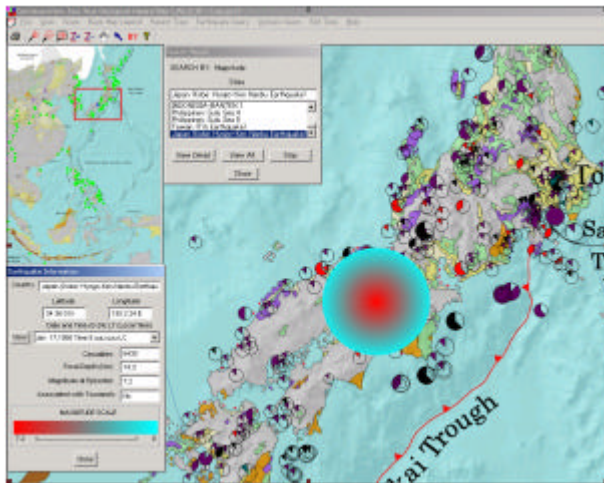


Fig.5. Information query result showing the Kobe earthquake on Jan 17, 1995.

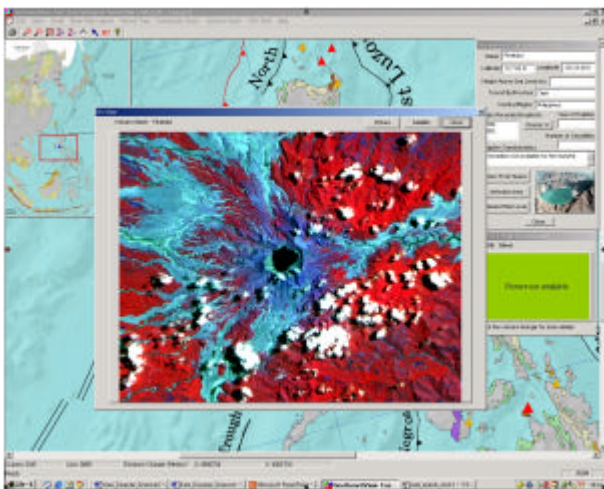


Fig. 6. Information query result showing the satellite image of Mount Pinatubo volcano.

2. Summary

The interactive presentation of the geological hazard map using GeoHazardView software provides a good alternative of viewing geological hazard maps and other related information in paper form. The ease by which geological hazard information can be obtained and the ability of the system to present information in the spatial context makes the software very useful to a wide range of users. It can be an important source of information for land use planners and policy makers and a good teaching material for elementary and high school science classes. The software will be continuously improved adding additional important features in its future versions.

References

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