Sharing geographic databases via the world wide web: applications to the whole Italian territory and a focus on lava flow hazard at Mount Etna

S. Tarquini, M. Favalli, and L. Nannipieri

Istituto Nazionale di Geofisica e Vulcanologia, Sezione di Pisa, Pisa, ITALY

The use of Geographic Information System (GIS) technologies is indispensable when dealing with the management of Natural Hazards. GIS software combines advanced elaboration tools with a flexible visualization of data providing an effective way to communicate the outcomes to non-experts. The popularity of easy accessible desktop tools such as Google Earth (GE in the following) and in-car satellite navigation systems testifies the global technological advancement of current low-cost electronic devices that provide effective 3D geospatial representations of data.

The availability of a reliable Digital Elevation Model (DEM) is often important to carry out a suitable elaboration of a GIS database. A DEM is also necessary to derive a 3D representation of the landscape. During the last few years, we delivered two systems to allow online visualization of DEMs and/or other geospatial data.

Since June 2007, a new Digital Elevation Model (DEM) of the entire Italian territory, realized by the INGV (named TINITALY/01), is available to authorized users for web browsing. The system is based on the open source MAPSERVER and allows a dynamic visualization of high resolution zenithal or perspective views of the DEM as hillshaded or stereo anaglyph images. This system includes seven views cumulatively covering the entire Italian territory: four perspective views and three zenithal views. The pixel of these images ranges from 5 to 10 m.

Since April 2008, we opened to authorized users a GE-based system to browse via Web four geographic databases: (1) 20 to 5 m resolution colour-shaded images of the TINITALY/01 DEM (covering the entire Italian territory); (2) colour-shaded images of a bathymetric and elevation model which covers the southernmost regions of Italy with the neighbouring seas (25 m resolution); (3) an intensity image of the LiDAR-derived DEM obtained from the September 2005 survey of Mount Etna (2 m resolution); (4) colour-shaded image obtained from the June 2005 LiDAR survey of the Vesuvius volcano (1 m resolution).

Additionally, the GE-based system can be effectively used to present the simulation results from numerical models within a geographic context, to support the assessment and communication of the impact associated to geophysical mass flow on a volcanic area.

Finally, we are currently developing a system to interactively navigate a large database of lava flow simulations at Mount Etna (including more than 80,000 simulated vents). The simulations database has been derived using the DEM-driven DOWNFLOW probabilistic code. By elaborating this database a 10m-resolution hazard map has been derived and can be loaded via Web using GE. Upon a click on any location on a map of the volcano, this system is expected to convert on the fly the requested simulation from the database to an image format that can be loaded and visualized by GE.