

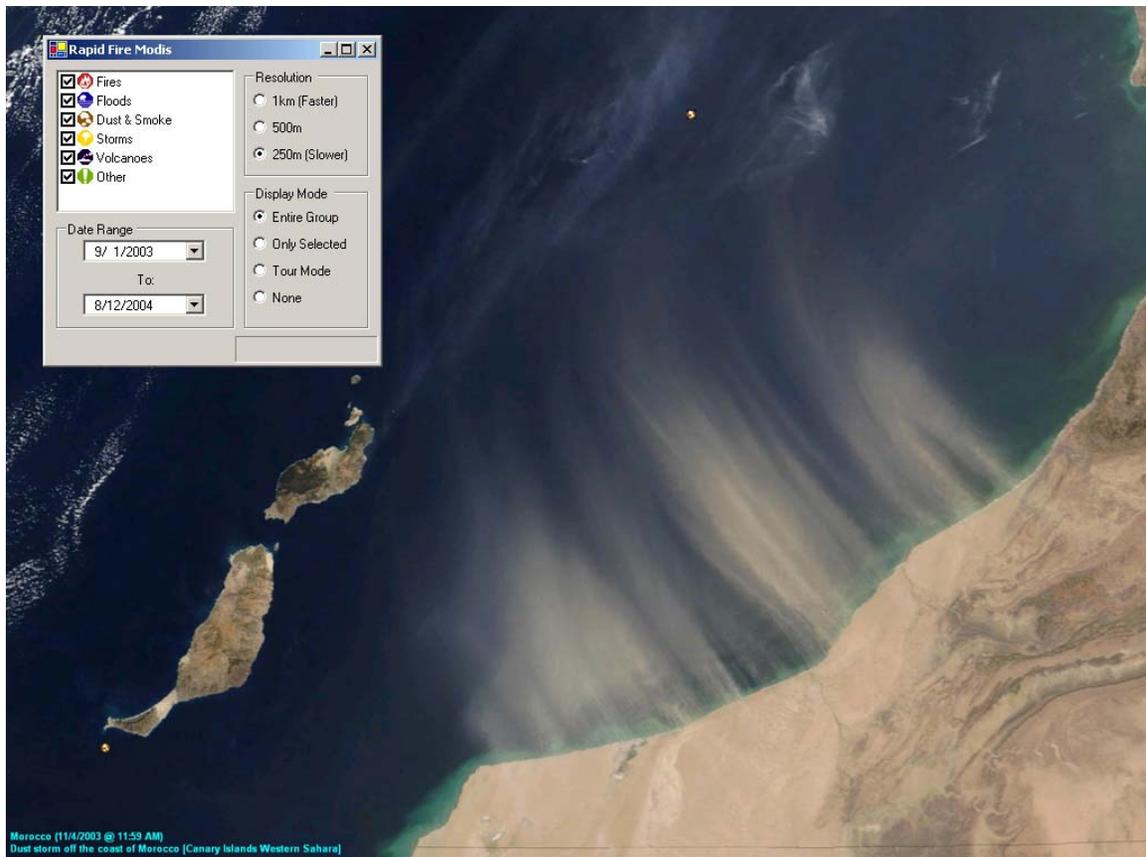
Isn't That Spatial

Exploring the World in 3D: NASA World Wind

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In my last column, I discussed one of the most amazing geographic visualization tools of our time—Google Earth. For this issue, I'd like to explore another tool in the "Virtual Globe" category—NASA's World Wind. Virtual Globes include Google Earth, World Wind, TerraExplorer, and ESRI's soon-to-be-released ArcGIS Explorer. World Wind's debut was in 2004, predating Google Earth by one year. World Wind has some wonderful features that, in my opinion, merit its use in the geography classroom from primary to university level.

World Wind (worldwind.arc.nasa.gov/) can be downloaded free from NASA through a variety of mirror sites. Like Google Earth, World Wind allows the user to zoom from satellite altitude to any place on the Earth's surface at the neighborhood level. World Wind makes use of high resolution Landsat imagery, USGS digital aerial photographs, and elevation data from the Shuttle Radar Topography Mission to enable you and your students experience the planet in a visually robust, three-dimension mode, almost as if you were flying around the planet on your own personal NASA spacecraft.



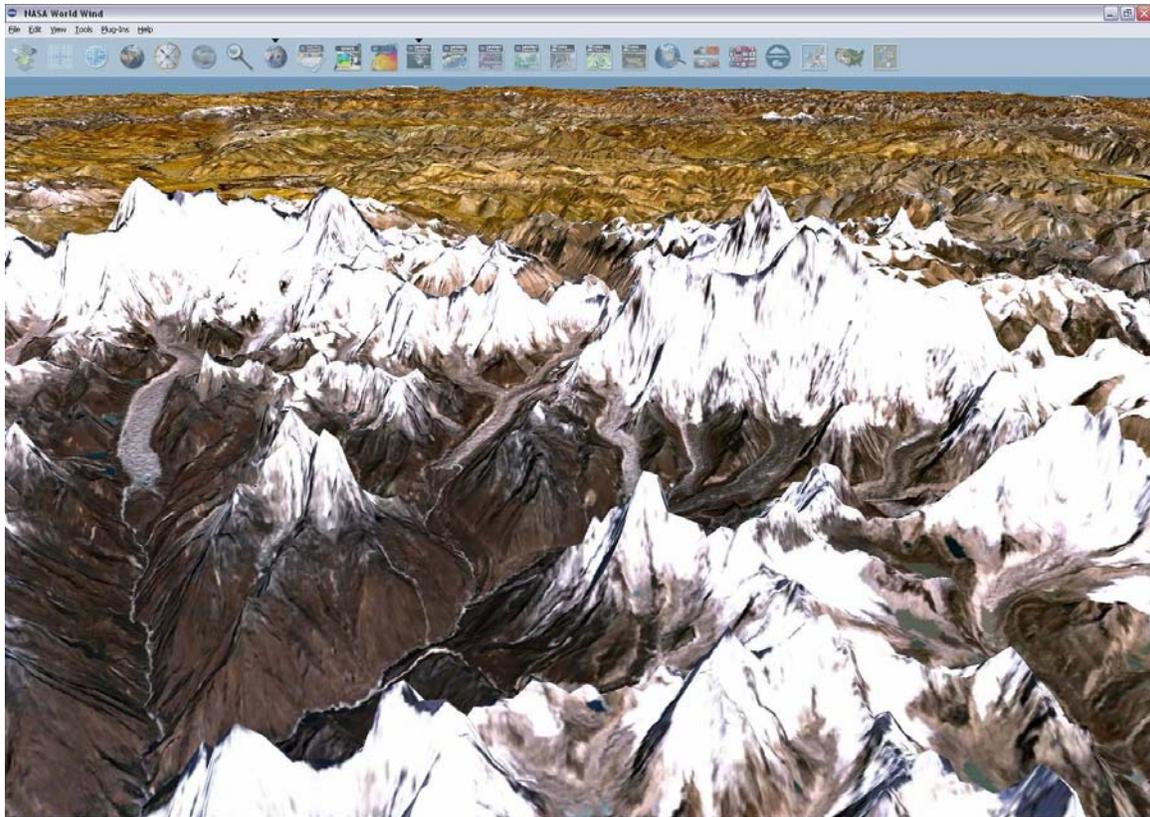
Dust storms off Morocco using MODIS data within World Wind.

Navigating through World Wind only requires a few clicks of a mouse, with additional guides and features available through a simple menu. One can go to any location via a feature name or its latitude and longitude.

Features

World Wind contains a full copy of the Blue Marble, a spectacular true-color image of the entire Earth as seen on NASA's Earth Observatory site. Blue Marble was compiled from a variety of satellite imagery, such as MODIS, but many of the image sets can be viewed individually as well.

One of World Wind's best features is that satellite updates are automatically updated. World Wind therefore allows the investigation of recent world events, weather patterns, fires, and more. NASA has produced a set of animations that demonstrate a variety of subjects such as hurricane dynamics and seasonal changes across the globe. World Wind can play these animations directly on the software's world interface. Some geography educators are in schools that are part of the GLOBE (www.globe.gov) program. World Wind can display GLOBE data, such as temperature, cloud cover, or precipitation, based on the time period the user specifies—even readings that were collected by students around the world just yesterday! World Wind contains a complete set of country borders, cities, transportation, latitude-longitude lines, and other layers for easy reference. The features and names increase in number as the user zooms in so that none of the maps become too cluttered. World Wind comes with a variety of visual guides that help the user's experience such as latitude and longitude lines, as well as extremely precise coordinate data. The vertical exaggeration in 3D can be adjusted. The program has some functionality to bring in coordinate data directly from GPS receivers and display those coordinates on the three-dimensional Earth.



Mt Everest, as viewed with World Wind.

System Requirements

World Wind requires Windows 2000 or XP, 256 MB of RAM, .NET runtime environment, DirectX, (both of which you can freely download), and a 3D graphics card. The World Wind install is 62 MB in size, which includes much data, but after a certain point, World Wind will download large images from the Internet. For this reason, the connection to the Internet must be a broadband line.

World Wind allows the user to set the cache size and to change the location of the stored imagery. The same cache can be shared among multiple computers, which might be helpful in a school lab to ease internal network traffic and traffic out to the Internet. The images are also stored in such a way that makes it possible to retrieve the individual image tiles from the cache.

World Wind vs. Google Earth

Both World Wind and Google Earth belong to the family of Virtual Globe tools. Both are powerful, visual programs, but they do have different purposes and different development histories. NASA is a science organization, while Google is an advertizing company. World Wind is free,

while Google Earth comes in a free version, a Plus version (\$20), and a Pro version (\$400). Google Earth uses commercial satellite imagery (such as from DigitalGlobe), and therefore has more high-resolution imagery available for much of the world than World Wind. However, World Wind has a scientific visualization and animation viewer and a wealth of different types of imagery, some of which are updated daily. World Wind's open source nature of the program means that people can modify the source code. Google Earth users can create KMLs from Google Earth and send them to others to look at, but they can't really modify the program itself. Google Earth's Macintosh version came out in early 2006 but the World Wind Macintosh version is not far off with this fall's version 1.5. World Wind also supports a plugin that allows you to import Google Earth's KML files.

Google Earth's download is about 12 MB, while World Wind is 62 MB. The reason is that Google Earth starts with only one initial view of the Earth, while World Wind comes with about 50. World Wind also includes all of the place names in the download.

In my opinion, both World Wind and Google Earth have a natural home in the geography classroom. Currently, I use Google Earth to investigate local landforms and phenomena because the imagery is at a higher resolution and I find the navigation easier to control. I use World Wind when I want to examine phenomena at a global or regional scale, when I wish to investigate current conditions around the world, and when I seek different types of satellite imagery in different parts of the electromagnetic spectrum.

Value for Geography Education

Because of its engaging nature and wealth of data, World Wind can be used to investigate geographic patterns on the Earth's surface. These patterns could include the clouds that form on the windward side of the Cascades, sediments from the Amazon in the Atlantic Ocean, ice sheets in Antarctica, dust in Mongolia, and much more. It can be used to investigate a site that students are traveling to on a field trip, the location of a news story, or the route of a historic or present-day explorer. The Gaza Strip, the Straits of Magellan, and other real places can be examined in detail and in 3D. While World Wind does not have the functionality of a GIS, it does provide an excellent first step into geotechnologies. It could lead an educator and students to a future that would include the use of GPS and GIS tools. As with any technology, however, students will get the most out of World Wind in the classroom of a teacher who is able to guide them inquiry-driven, problem-based, exploratory learning.

I have met the education coordinator for NASA World Wind and I know how committed he and NASA are to supporting and improving this product to help educators and students investigate the Earth. World Wind doesn't stop with the Earth, either. Remember, it was created by NASA—they definitely know

how to visualize other planets. One can use the same tool to switch to the Moon, Venus, Mars, and Jupiter!

For More Information

The applications for World Wind, like other Virtual Globe tools, are rapidly expanding. One excellent way to find out more about World Wind and explore applications is to visit the World Wind Wiki, a knowledge base about NASA's World Wind that anyone can edit: www.worldwindcentral.com. Or, read and contribute to the forums, on: <http://www.worldwindcentral.com/wiki/Forums>. Better yet, download the World Wind program and start exploring and share with your colleagues what you are doing with World Wind!