

Introduction to World Wind

by Dan Sanders

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1 What is World Wind?

World Wind is an application being developed by NASA Research and Development for the NASA Learning Technologies program. From their website[1]:

“World Wind allows any user to zoom from satellite altitude into any place on Earth, leveraging high resolution LandSat imagery and Shuttle Radar Topography Mission (SRTM) elevation data to experience Earth terrain (or any planet with the data) in visually rich 3D, just as if they were really there. Virtually visit anyplace in the world. Look across the Andes, into the Grand Canyon, over the Alps or along the African Sahara.”

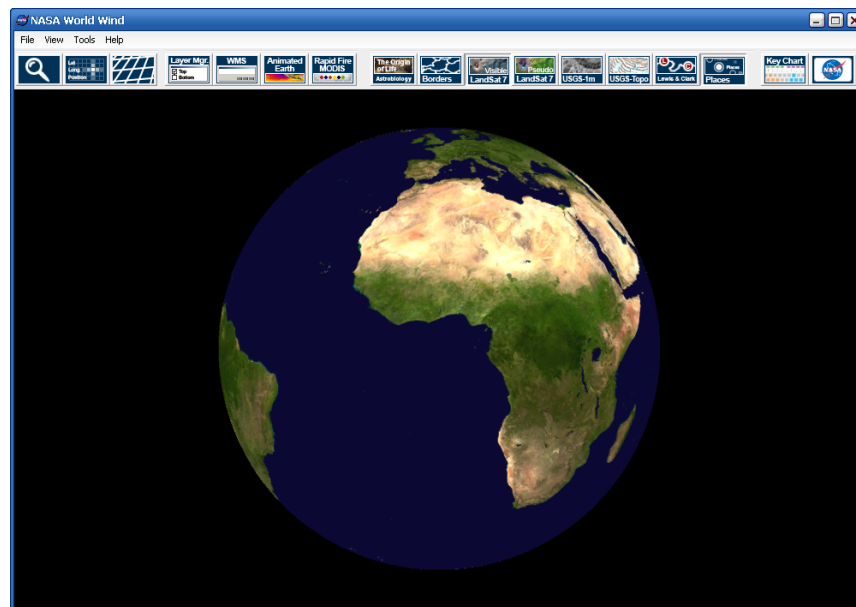
2 Using World Wind

2.1 Starting World Wind

World Wind is located in the top level of the Start menu.

1. Start > World Wind

2.2 The World Wind Interface



World Wind has a very simple interface, comprised of a menu bar, a tool bar, and a viewport.

2.2.1 Tool bar Buttons

	Search	Opens the <i>Place Finder</i>	(2.3.4)
	Position	Toggles the <i>Position layer</i>	(2.4.3)
	Lat/Lon Lines	Toggles the <i>Latitude/Longitude Lines layer</i>	
	Layer Manager	Opens the <i>Layer Manager</i>	(2.4)
	WMS	Opens the <i>Web Mapping Server Browser</i>	(3.2)
	Animated Earth	Open the <i>Animated Earth Manager</i>	(3.4)
	Rapid Fire MODIS	Opens <i>Rapid Fire MODIS</i>	(4)
	Astrobiology Kit	Toggles the <i>Astrobiology Kit layer</i>	
	Boundaries	Toggles the <i>Borders layer</i>	(2.4.2)
	LandSat Visible	Toggles the <i>LandSat Visible layer</i>	(2.5)
	Landsat Pseudo	Toggles the <i>LandSat Pseudo layer</i>	(2.5)
	USGS 1-Meter	Toggles the <i>USGS aerial photography layer</i>	(2.5)
	USGS Topographical	Toggles the <i>USGS topographical (street map) layer</i>	(2.5)
	Lewis & Clark Trail	Toggles the <i>Lewis & Clark trail markers</i>	
	Placenames	Toggles the <i>Placenames layer</i>	(2.4.1)
	Key Chart	Opens the keyboard shortcut reference	(5.1)
	World Wind Website	Opens the World Wind website	

2.3 Navigating the Earth

2.3.1 Panning

There are several ways to pan (travel) to locations on the Earth in World Wind.

- Click the place you wish to pan to.
- Click with your mouse and drag the Earth around.

2.3.2 Zooming

Normally you will use one of two ways to zoom in on an area of interest or back out again.

- Click both mouse buttons and drag; up to zoom in, or down to zoom out.
- Use your scroll-wheel to zoom in and out.

2.3.3 Rotating

The SRTM¹ data presented in World Wind allows you to see the Earth's features in 3D².

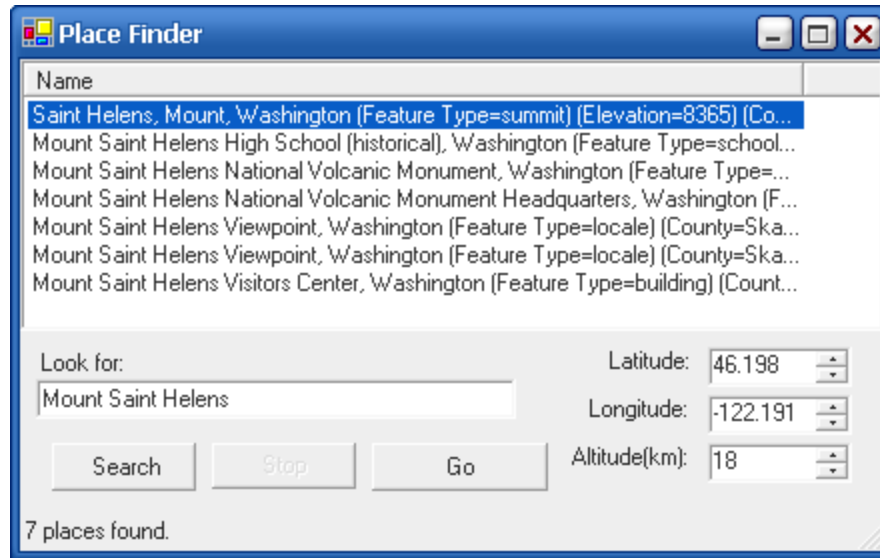
1. Zoom in far enough for the features that you wish to view to stand out.
2. Hold your right mouse button and drag downward³ to tilt the globe.
3. Holding your right mouse button and dragging up restores your original tilt.

¹Shuttle Radar Topography Mission

²Features in this context is understood to mean mountains or other large objects. The SRTM dataset is not detailed enough to create 3D models of buildings or other small objects.

³If you find that you dislike any roll that you accidentally cause while rotating the Earth with your mouse, you may use the *W* and *S* keys instead.

2.3.4 Place Finder



The easiest way to locate a specific place is with the *Place Finder*.

1. Type in some words found in the name of the place that you are looking for. Capitals and spelling matter.
2. Click *Search*, or press the [Enter] key.
3. Wait. This may take a long time.
4. Locate the place that you are looking for in the list and click on it. In this case, Mount St. Helens is the first one on the list. You can tell because it says “Feature Type=summit”, and it is a mountain that we are looking for.
5. Choose *Go*.

Practice Exercise

1. Locate “Lake Cowichan”.
2. Rotate your view to see the shape of the Cowichan Valley.
3. Follow the path of the valley to Duncan

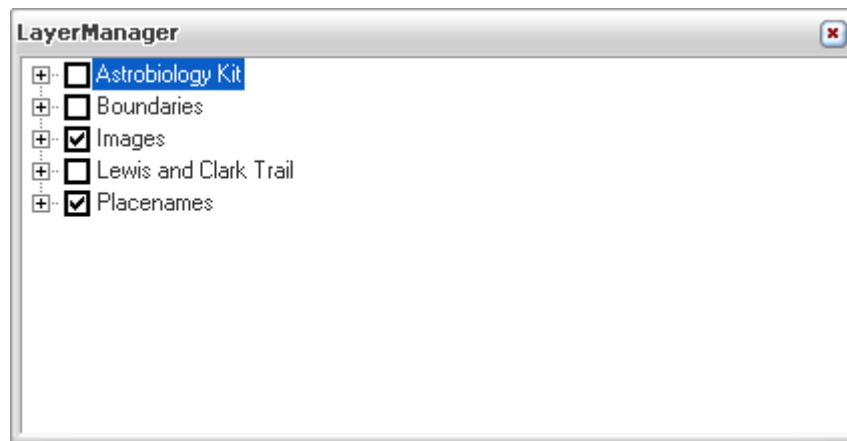
2.3.5 Locating a Place by its Coordinates

If you already know the coordinates of a place you wish to see, you may enter them into the Place Finder and then click go.

Practice Exercise

1. Go to coordinates 5.8, -55 at an altitude of 14km. What are the white objects that you see?

2.4 Layers



World Wind has much information to present, and it is divided up into layers. A layer is a grouping of one specific type of information and may be easily toggled on and off. Many layers have dedicated tool bar buttons, but the *Layer Manager* allows you much more control.

2.4.1 Placenames Layer

The *Placenames* layer shows the names of places on the Earth, in increasing detail as you zoom in. I recommend turning the *Placenames* layer off whenever you do not need it, as it tends to cover up other data.

2.4.2 Boundaries Layer

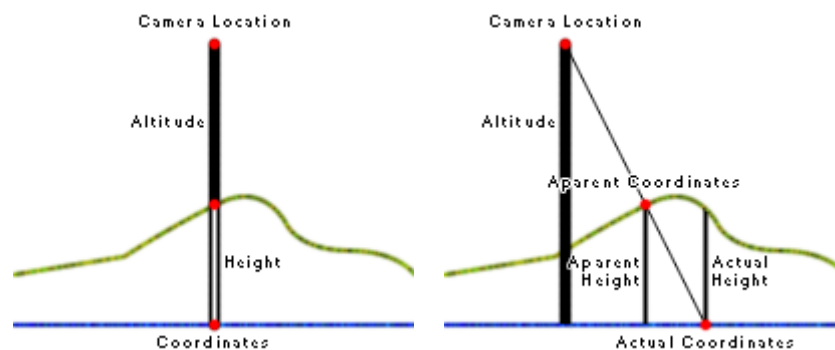
The *Boundaries* layer shows country borders⁴. I recommend turning the *Boundaries* layer off whenever you do not need it, as the program runs faster without it.

⁴The *Boundaries* layer also shows borders for the states in the United States of America. Nobody is quite sure why they get special treatment, but hopefully other countries will be covered soon.

2.4.3 Position Layer

```
Latitude: 45.9091491699219
Longitude: -103.703956604004
Heading: 2.45408828050131E-05
Altitude: 21,108,594.00 Meters
```

The Position layer serves to tell you the location of what are looking at, and where you are looking at that location from. It is important to note that the latitude, longitude, altitude, and terrain elevation displayed refer to the location at sea level that is in the center of the viewport, not the terrain. These images show that relationship:



You may toggle a crosshair in the center of the viewport from the *View* menu or by pressing [F9].

2.4.4 Blue Marble

The Blue Marble project aims to create true-color images of the Earth and make them available to the public free of charge. World Wind uses the Blue Marble imagery to draw the globe when you are zoomed very far out, right up until high-resolution satellite imagery takes its place. While the Blue Marble images are beautiful to look at, at high zoom levels they are not detailed enough to be useful. At that point, they sometimes begin to cause problems such as flickering and random polygons as you rotate or pan. If you experience these problems, you may turn off the Blue Marble images:

1. Open the *Layer Manager*.
2. Uncheck both of the Blue Marble layers.
3. Don't forget to turn them back on when you zoom out again.

2.5 Satellite Imagery

As you should have noticed already, when you get to a certain zoom level, higher resolution satellite imagery is loaded. You can tell which area is currently being downloaded by a red box that appears around it, and a NASA logo in the top-right corner indicates when the NASA server is being accessed. There are two different satellite image sets to choose from, the LandSat 7 true-color image, and the LandSat 7 pseudo-color image. You may also look at the USGS (United States Geological Survey) aerial photographs, which provide *very* high resolution images of the entire United States, and the USGS Topographical images, which are very detailed street maps that you may zoom into.

Satellite Image Color

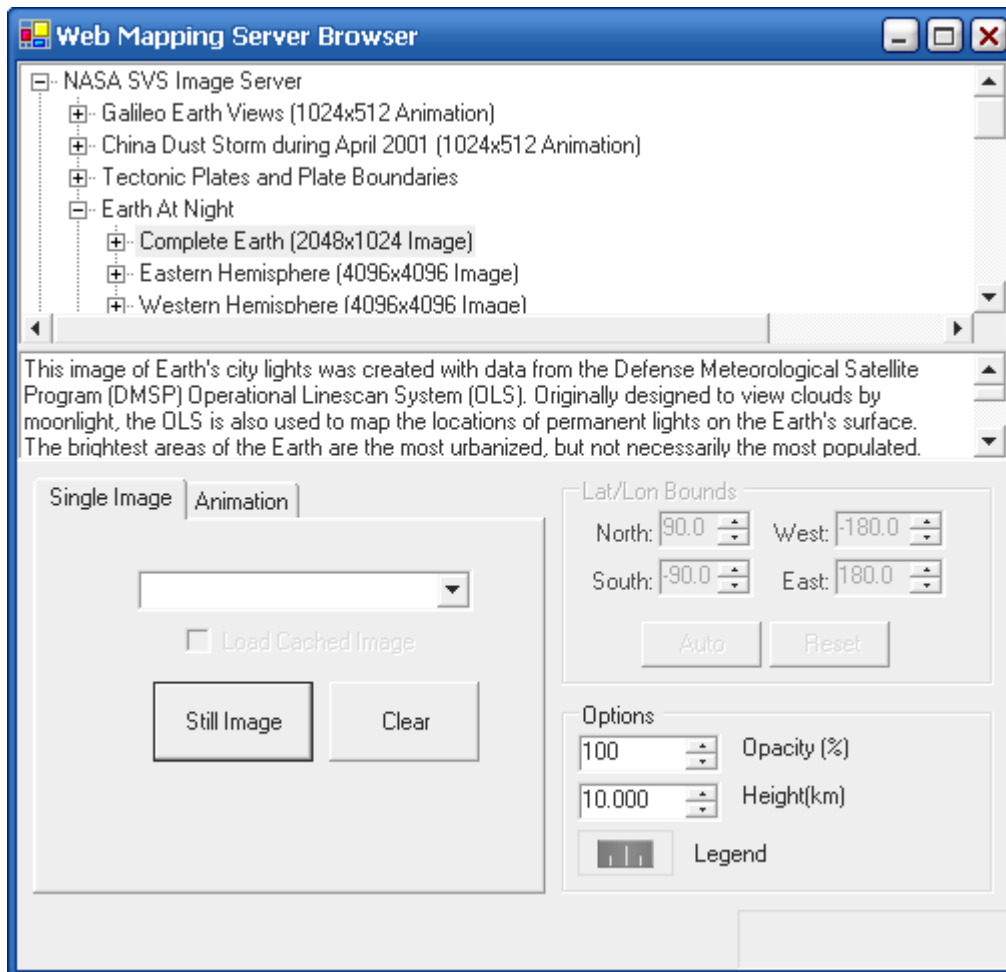
The LandSat 7 satellite used by World Wind does not see in color like humans do. Instead, it sees in many different “bands,” or ranges of color from the spectrum. By mixing these bands into a single image, known as a composite image, an image similar to what your eyes would see can be created. World Wind makes two different composites available to you, known as the visible composite, and the pseudo composite. The visible composite simply approximates what colors your eyes would see. The pseudo composite is more interesting - by including bands from outside of visible light, such as infrared, obstructions such as clouds can be averted, creating an image with much more contrast. LandSat 7 also creates images from a band known as the panchromatic band that has much more detail than any of the other bands. By combining the panchromatic image with images from other bands, a composite which is both colored *and* detailed can be created.

3 WMS

3.1 What is WMS?

WMS stand for Web Mapping Server, which is a technology that allows standardized communication of geodetic data between a server and a client. World Wind is a glorified WMS client, all of its data is streamed from servers available to any other WMS client.

3.2 Using the WMS Browser



Once you have opened the WMS Browser, you are presented with a list of images that you may view.

If you simply want view the image that you have selected, you may do so by pressing the *Still Image* button. In many cases, you may select a specific date or time that you wish to see before you display it.

You may have noticed a tab labeled *Animation*. On that page you may specify a date range, after which you should click the play button. World Wind will begin downloading all of the images within that range, and will display them one after the other. Be warned, it may take a long time to download the many images of a long animation.

3.3 Options

- The opacity box in the options pane of the WMS Browser allows you to make the overlay transparent, so that you can see the land below it.
- If you are looking at a data layer but you wish to know more about what its colors mean, try the *Legend* button.

3.4 Animated Earth

The *Animated Earth Manager* is very similar to the *WMS Browser*, and as a matter of fact, the *WMS Browser* has access to all of the same data. The *Animated Earth Manager* is being phased out and will not be covered in this guide.

4 Rapid Fire MODIS

4.1 What is Rapid Fire MODIS?

Rapid Fire MODIS keeps track of events occurring in the world, such as floods and earthquakes, and allows you to see satellite imagery of them.

4.2 Displaying Data

When you open Rapid Fire MODIS, icons are displayed on the Earth in the locations of specific events. If you click on one of them, images of that event will be downloaded and then displayed.

4.3 Options

- Selecting a date range may be very helpful
- You may select the detail of the downloaded images. 1Km is the lowest detail, while 250m is the highest.
- There are several modes of operation. Tour mode can be very interesting.

5 Appendix

5.1 Keyboard Shortcuts

Data Layers
 Dynamic Layers (F1), MODIS Hot Spots (F2), Tracing Example (F3)

Context Guides
 Boundaries (F5), Placenames (F6), Lat / Long Lines (F7), Planet Axis (F8)

Visual Guides
 Crosshairs (F9), Position (F10)

Navigation
 Motion Momentum (F11), Point Go-To (F12)

Panning Controls
 ↑, ↓, ←, → (arrows); Mouse (left button)

Rotate & Roll Controls
 W, A, S, D; Mouse (middle button)

Zoom Controls
 7 Home, 1 End; Mouse (scroll wheel)

Stop
 [Red Bar], [Red Octagon]; Mouse (right button)

Layer Controls
 Dynamic Layers (F1), MODIS Hot Spots (F2), Tracing Example (F3), Boundaries (F5), Placenames (F6), Lat / Long Lines (F7), Planet Axis (F8), Crosshairs (F9), Position (F10), Motion Momentum (F11)

Vertical Exaggeration
 [Slider]

World Wind
 Learning Technologies learn.arc.nasa.gov

References

- [1] NASA World Wind, Retrieved December 17, 2004, from <http://learn.arc.nasa.gov/worldwind/index.html>