NASA World Wind

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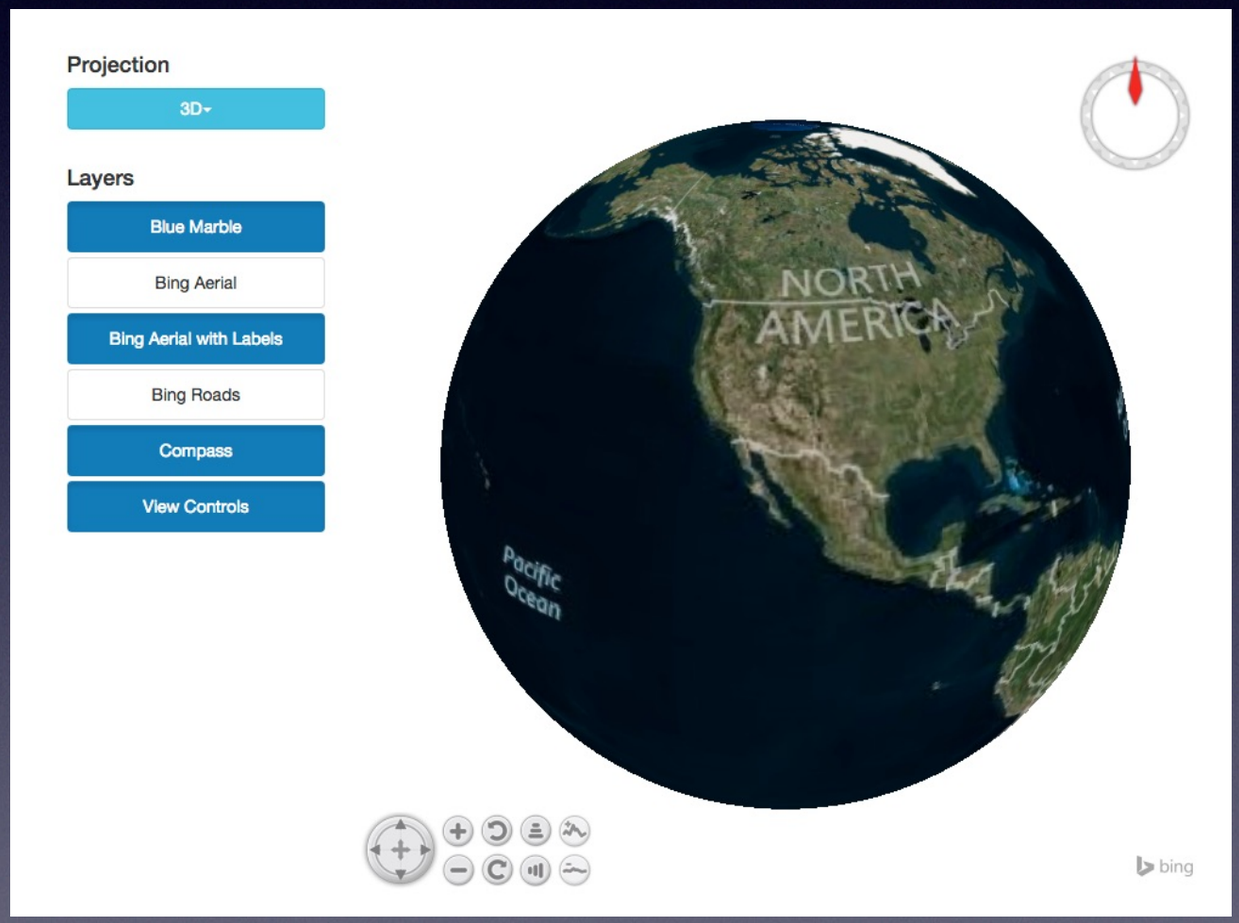
World Wind Is

- Open-Source Virtual Globe
- Library to Use in Applications and Web Pages
- An Application Component
  - Not an App in Itself
- Cross-Platform
- Java, JavaScript/HTML5

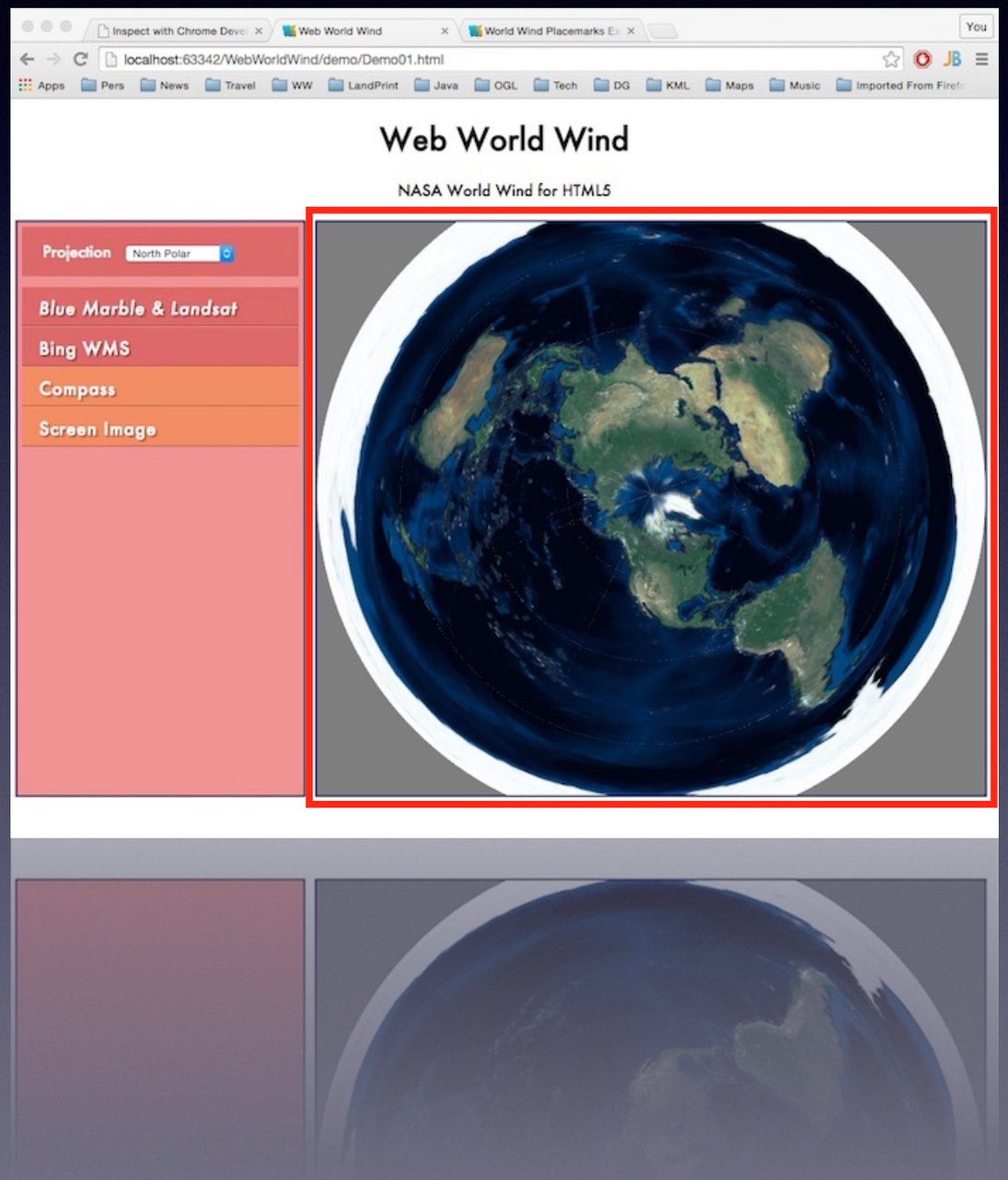


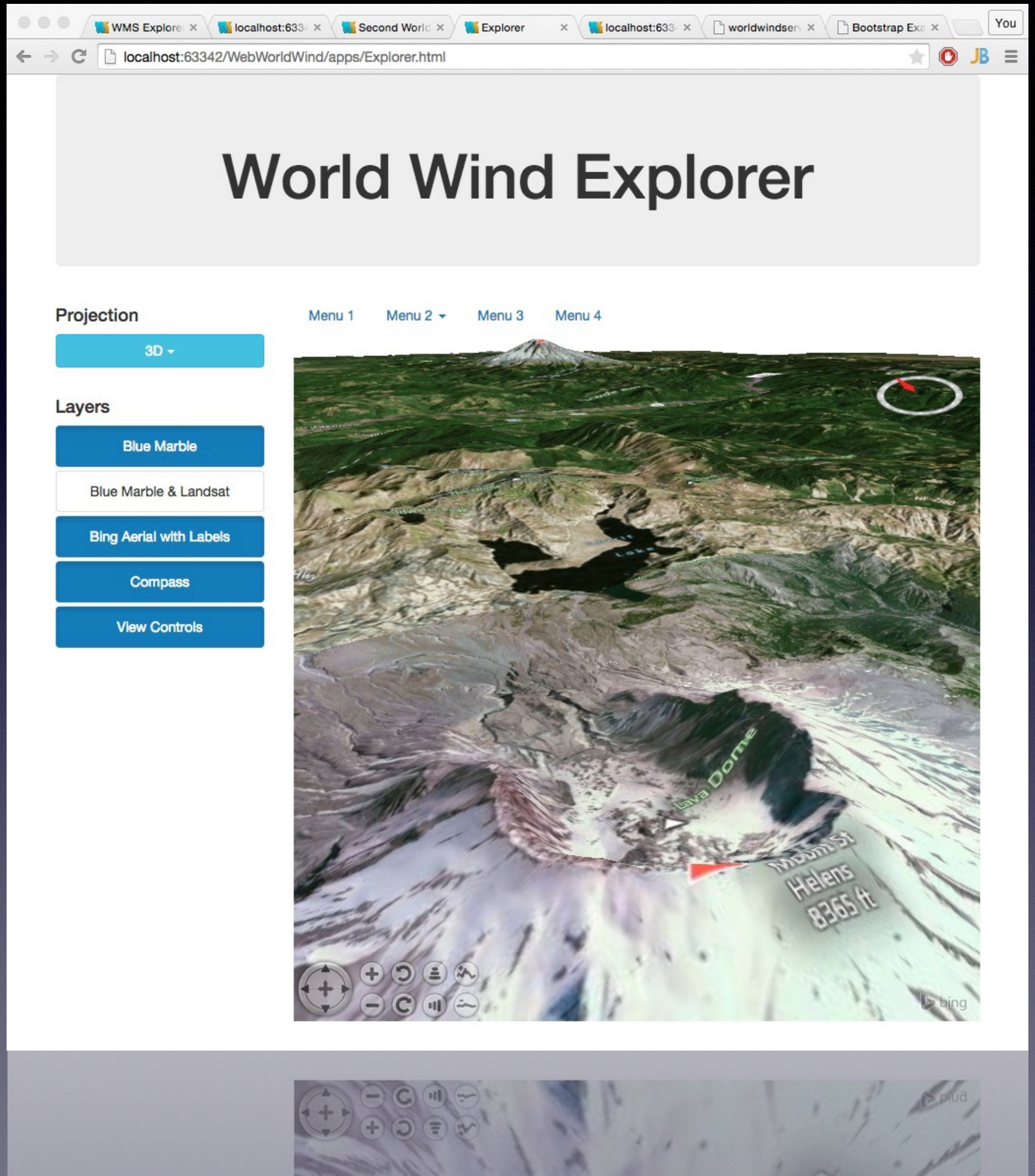
World Wind Provides

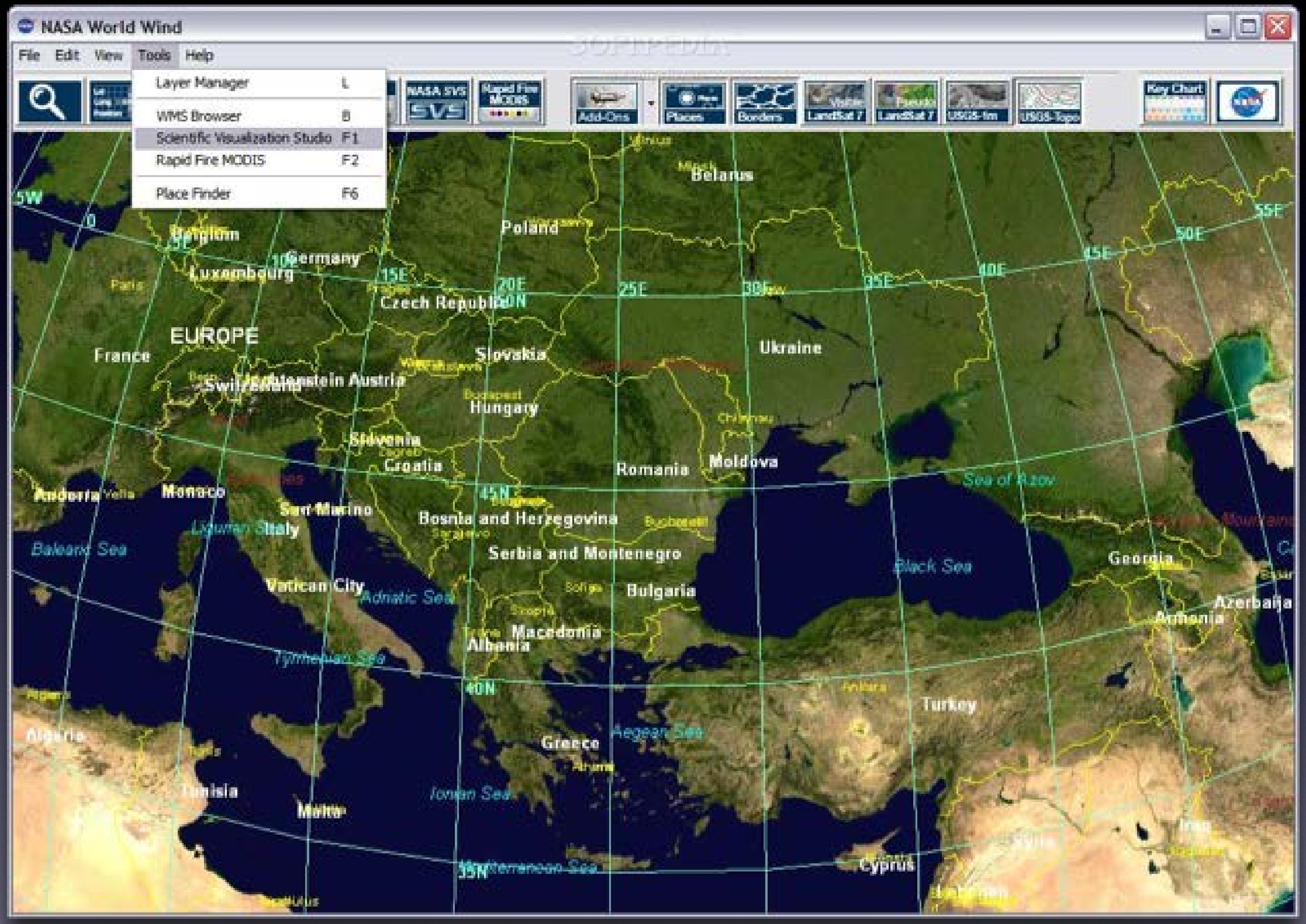
- Geographic Context for Data and Information Visualization
- Rich Set of Shapes and Graphics Primitives
- Data Import From Local, Web, Cloud, Database, OSM,…
- Viewing, Picking, Scene Control
- Platform Independence

App Component

- Element in Web Page or App
- Component of App
- Place Anywhere
- Multiple Locations
- Single Library
- Virtual Globe API with Terrain




WMS Explore
localhost:633
Second World
Explorer
localhost:633
worldwindser
Bootstrap Exa
You
localhost:63342/WebWorldWind/apps/Explorer.html
World Wind Explorer
Projection
3D
Layers
Blue Marble
Blue Marble & Landsat
Bing Aerial with Labels
Compass
View Controls
Menu 1
Menu 2
Menu 3
Menu 4
Lava Dome
Helens
8365 ft
bing


NASA World Wind
File
Edit
View
Tools
Help
Layer Manager L
WMS Browser B
Scientific Visualization Studio F1
Rapid Fire MODIS F2
Place Finder F6
Add-Ons
Places
Borders
Landsat 7
Landsat 7
USGS-Im
USGS-Topo
Key Chart
Belarus
Poland
Belgium
Germany
Luxembourg
Paris
Czech Republic
EUROPE
France
Slovakia
Ukraine
Switzerland
Liechtenstein
Austria
Budapest
Hungary
Slovenia
Croatia
Romania
Moldova
Sea of Azov
Andorra
Monaco
San Marino
Italy
Bosnia and Herzegovina
Serbia and Montenegro
Black Sea
Georgia
Azerbaija
Armenia
Balearic Sea
Vatican City
Adriatic Sea
Bulgaria
Macedonia
Albania
Tyrrhenian Sea
Turkey
Aegean Sea
Greece
Algeria
Tunisia
Malta
Ionian Sea
Cyprus
Mediterranean Sea
Iraq
Syria
5W
0
5E
10E
15E
20E
25E
30E
35E
40E
45E
50E
55E
45N
40N
35N

INFOCON: 3 UNCLASSIFIED FPCON: Alpha

JTTOCC Common Operating Picture (CHRISTENOT, GARY)

Layers
- Terrain
- Weather
- Profiles
- Tracks
- Overlays

15:04:15L 20:04:15Z

20 mile(s)

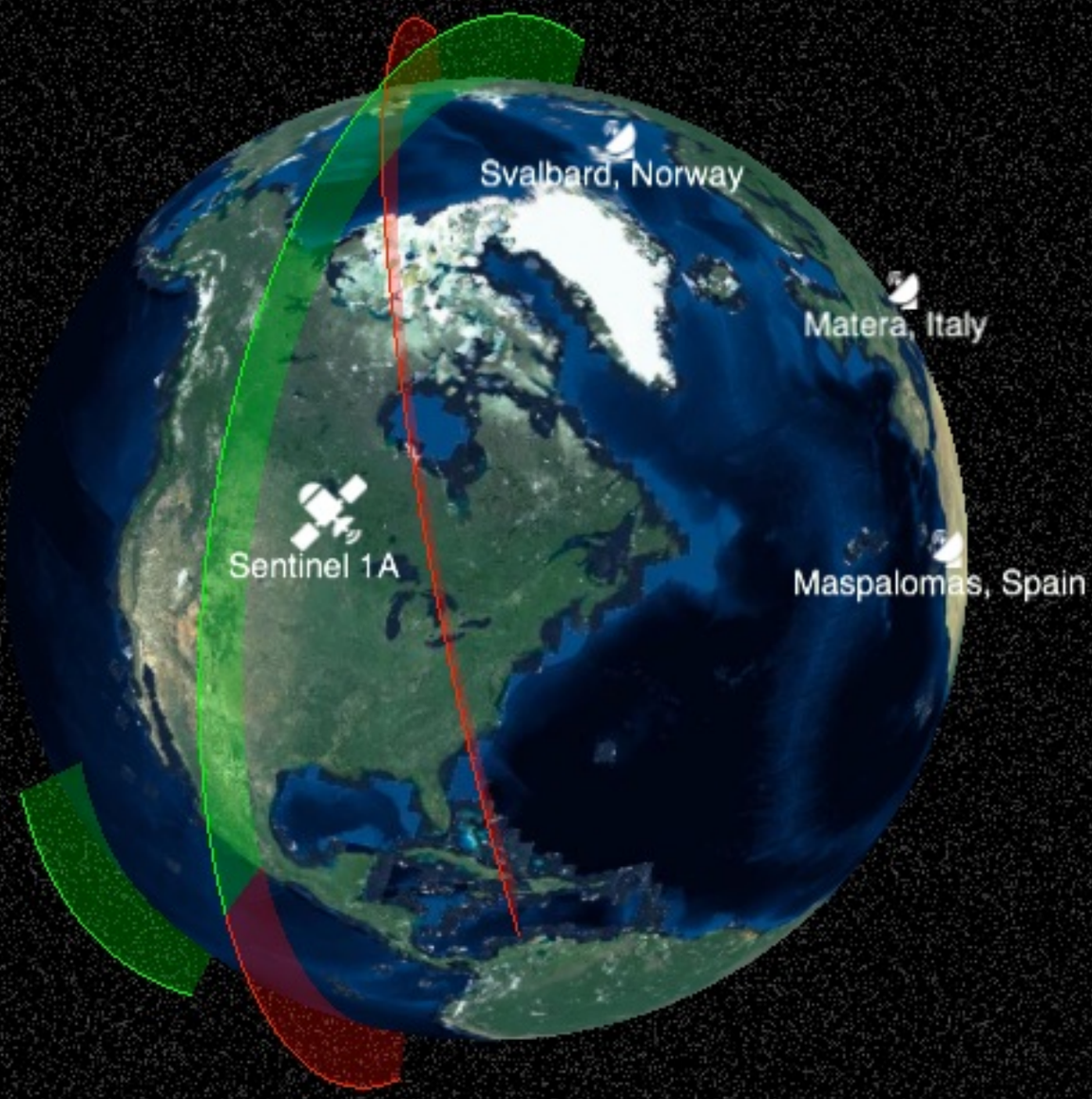
Altitude 214 mi 30.5413° -85.1166° 16RFU 80671 80274 Elev 0 feet

3:04 PM
5/22/2014

Simple Sentinel-1A Tracker

Latitude: 47° 57' 34.62" N | Longitude: 94° 36' 24.18" W | Altitude: 703.02km

Help | Representation: 3D | Follow: Off



Built by Yann Voumard with Web World Wind, Satellite JS and icons made by Freepik from www.flaticon.com.

RaptorX 1.4 : 2010_03_16_08_41_47

File View Data Imagery Tools Help

Map Objects | Icons | Layers | Map Tools | Connections | Channels

Globe

Event Log | Favorites | Files | Apps | Tracking

200 m

Decimal Degrees Lat 34.48953° Lon -115.86604° Elev 502m

Eye Alt: 220 m Heading: -4° No Network

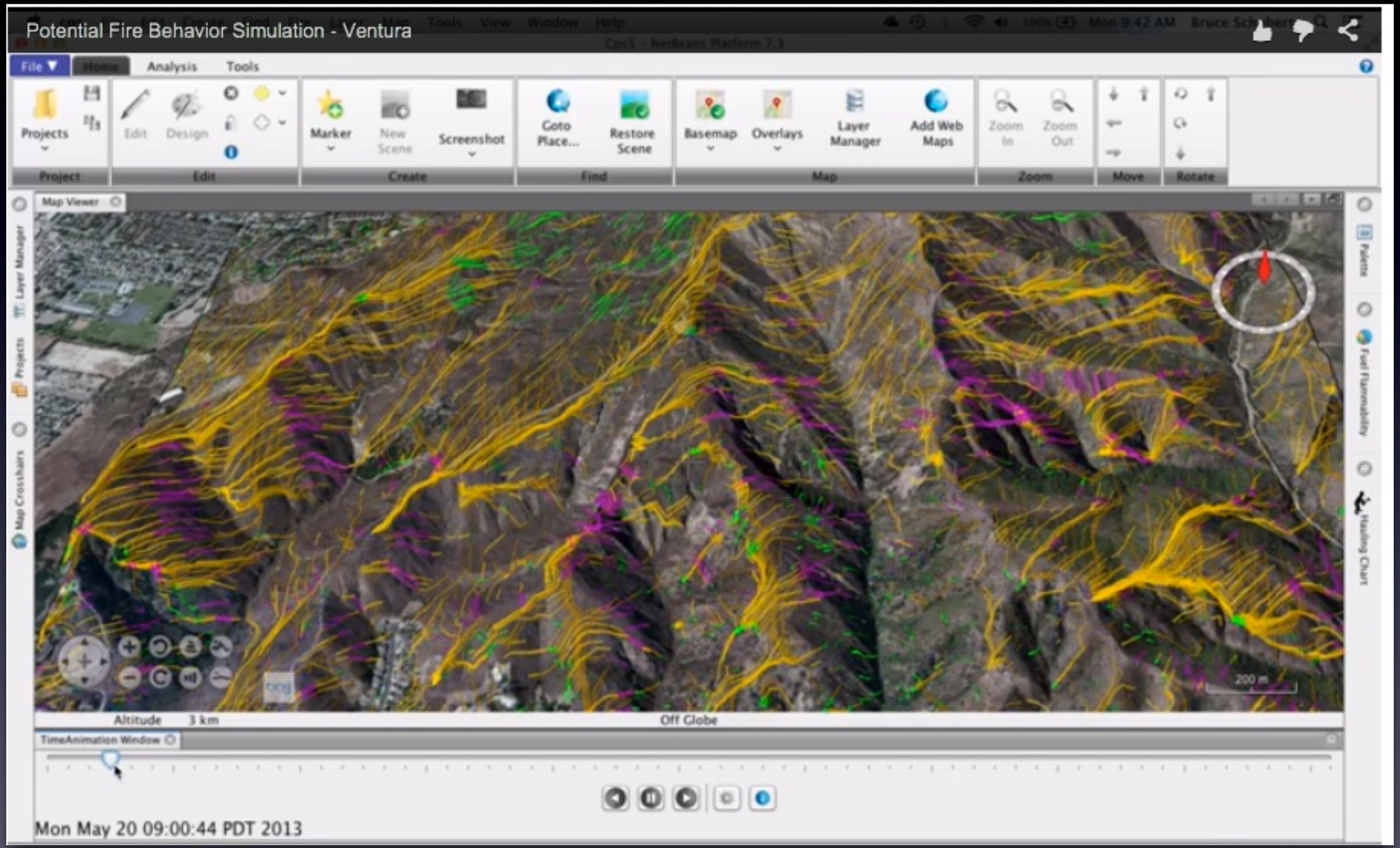
tx rx Audio Alert On: All Alerts

Security Filter: High

2010-03-16 15:46:07 UTC

NESAT-3D FAA Surveillance and Broadcast Services Monitor (SBSM) - NextGen Enterprise Surveillance Analyis Tool-3D
File Layers Help
WMS
Eye Alt 105,070 ft
Eye Pitch 74.11°
Eye Heading 1.03°
Cursor Coords
Latitude 35.2138°
Longitude -97.5650°
Ground Elev 1,184 ft
Center Coords
Latitude 35.4400°
Longitude -97.5304°
Ground Elev 1,200 ft
A50E2A
A50638
A50508
A50D75
A50C31
A509D1
A506A6
A50FAB
A505EE
A0065B
A50614
A008D2
A004D3
A00D96
Edmond
Norman
Dibble
Purcell
Lexington
PURCELL-SHEPHARD (303)
5 Nautical mile(s)
03-25-2015 21:10:59 UTC

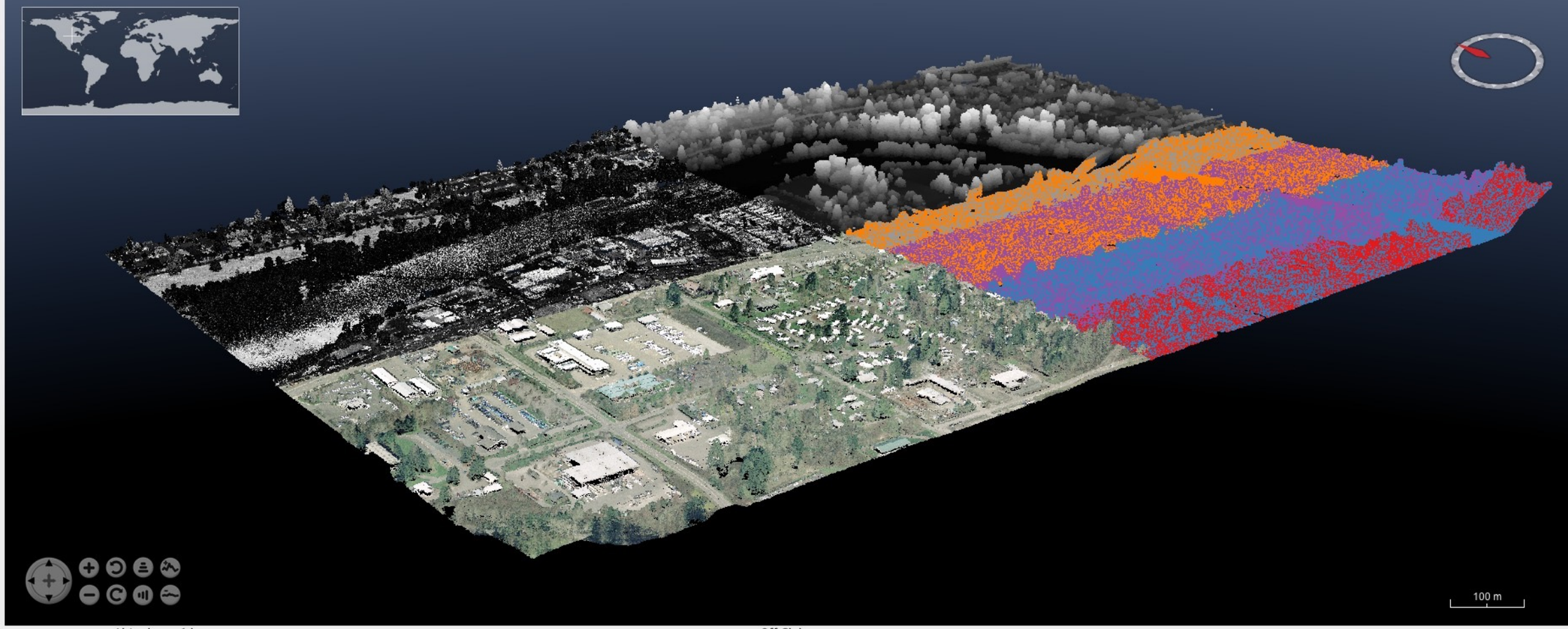
Potential Fire Behavior Simulation - Ventura



D09, D10, C09, C10, D09-00, D10-01, C09-02, C10-03

Layers

- [x] Stars
- [x] Atmosphere
- [x] NASA Blue Marble Image
- [ ] Blue Marble (WMS) 2004
- [ ] i-cubed Landsat
- [ ] USDA NAIP
- [ ] USDA NAIP USGS
- [ ] MS Virtual Earth Aerial
- [ ] USGS Topographic Maps 1:250K
- [ ] USGS Topographic Maps 1:100K
- [ ] USGS Topographic Maps 1:24K
- [ ] USGS Urban Area Ortho
- [ ] Political Boundaries
- [ ] Place Names
- [x] World Map
- [x] Scale bar
- [x] View Controls
- [x] D09
- [x] D09-00
- [x] D10
- [x] D10-01
- [x] C09
- [x] C09-02
- [x] C10
- [x] C10-03
- [x] Compass



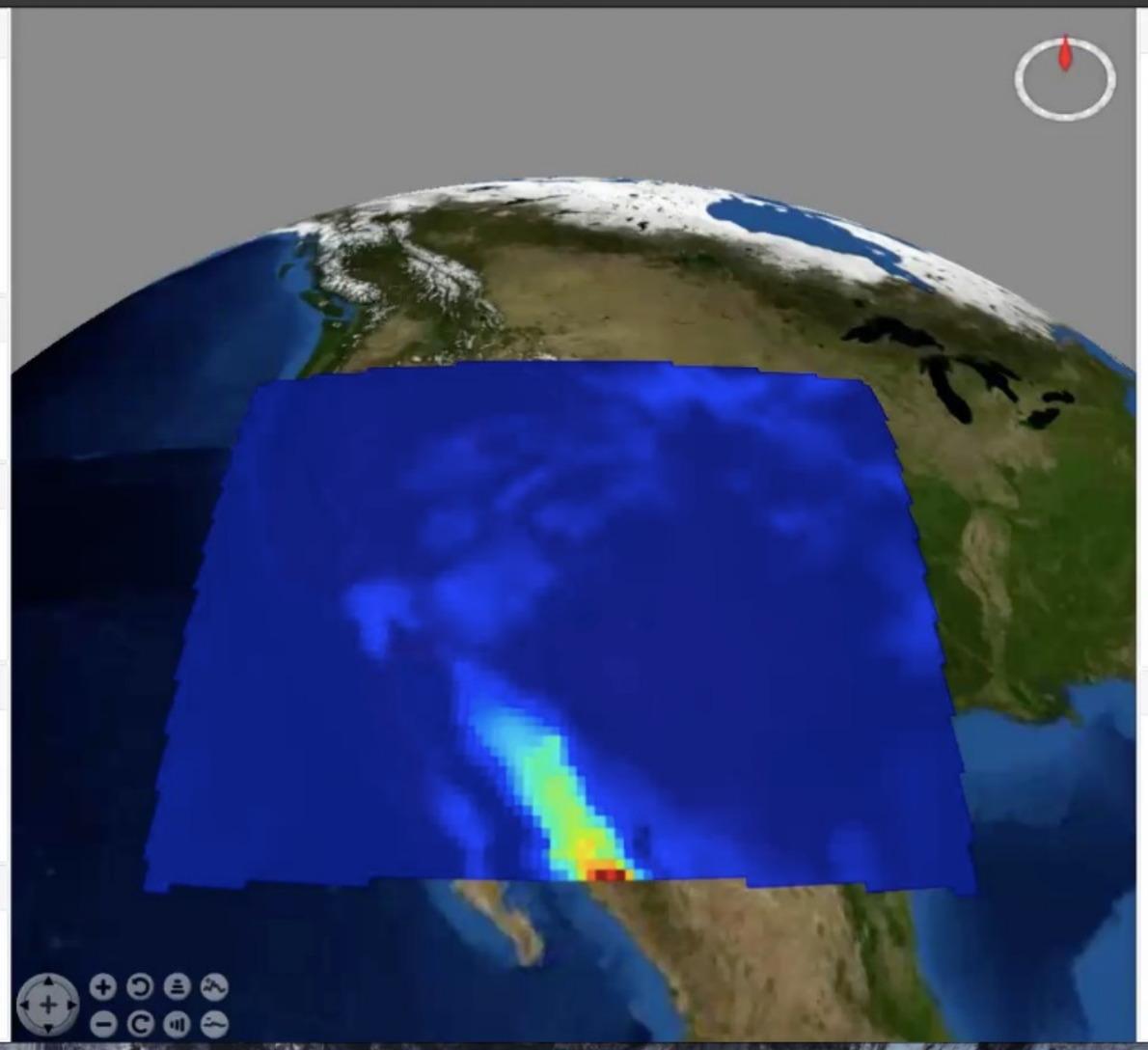
Altitude 1 km

Off Globe

Operations ▾ [x] Create Point Cloud [x] Create Elevation Model

UNIVERSITY of DENVER

GeoSim - Cloud-based 5D-GeoVisualization with Web World Wind



Layer Control

Base Layer: Blue Marble

Data Layer
- [ ] 2D Dust Layer
- [x] 2D Dust Animation Layer
- [ ] 3D Dust Animation Layer

2D Dust Layer Data Properties

Display Variable: acp

Opacity 0.9

2D Animation Control

Time point: 24

3D Animation Control

Time point: 0

Place Marker

Lat	Long	Alt (m)	
0	0	0	Add

Cloud Configuration

Server Region

Amazon EC2 Region: US East (N. Virginia)

Machine Configuration

Instance Type: m3.xlarge

Resources Allocation

Number of Processors: 4

Start Application

Data Source

Data on Server

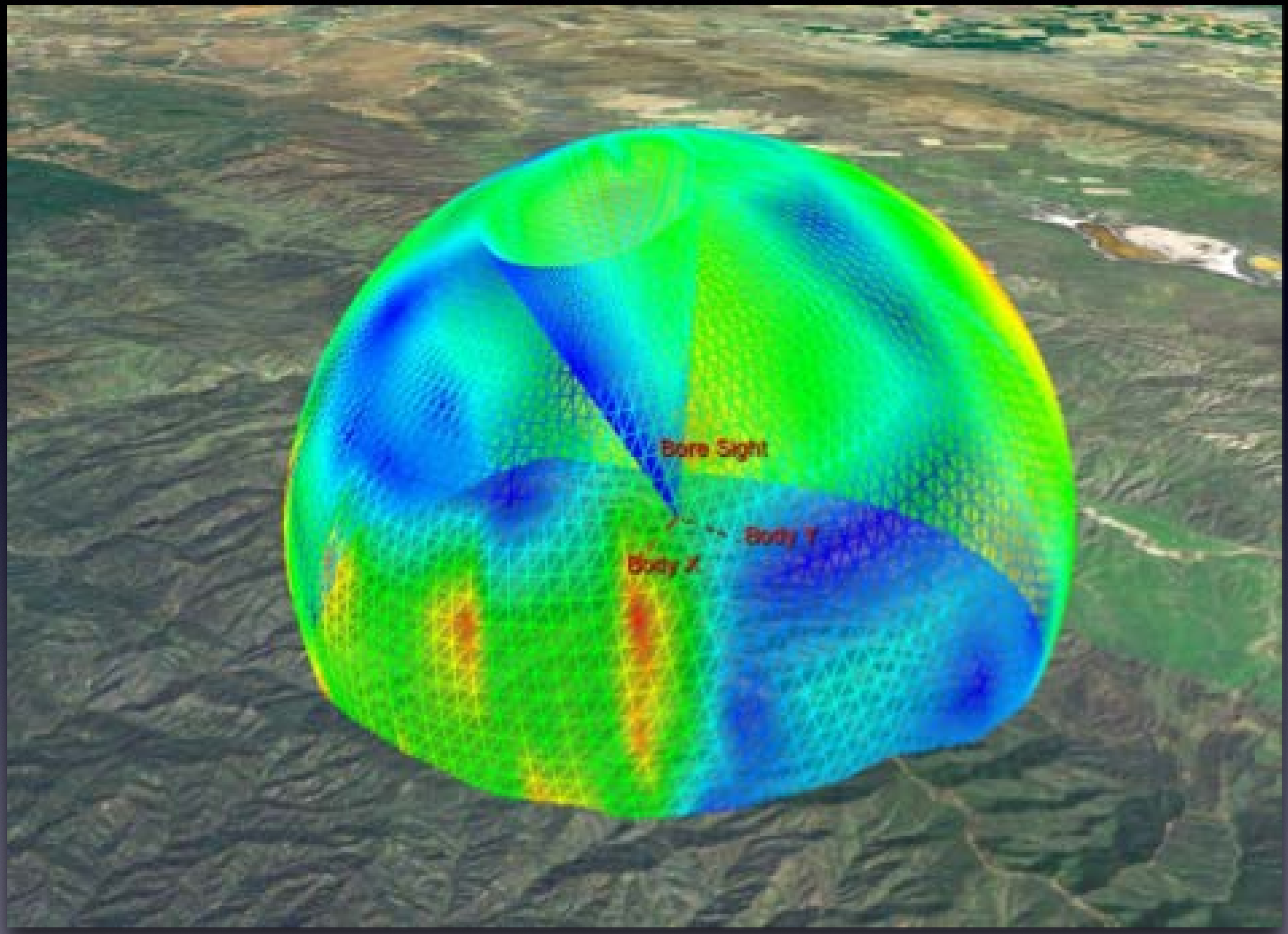
/root/data/ dust2d.nc

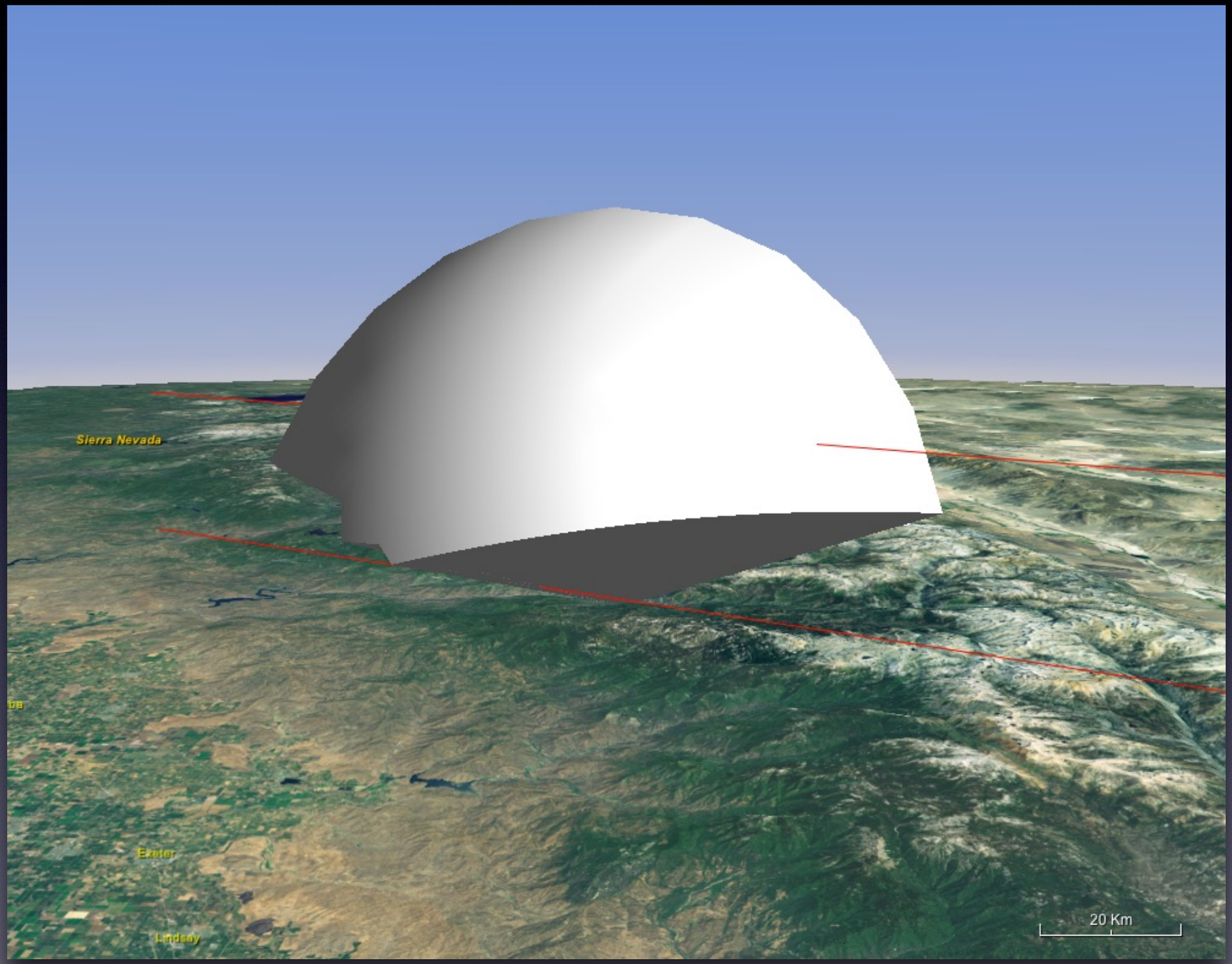
OPeNDAP Server - NASA

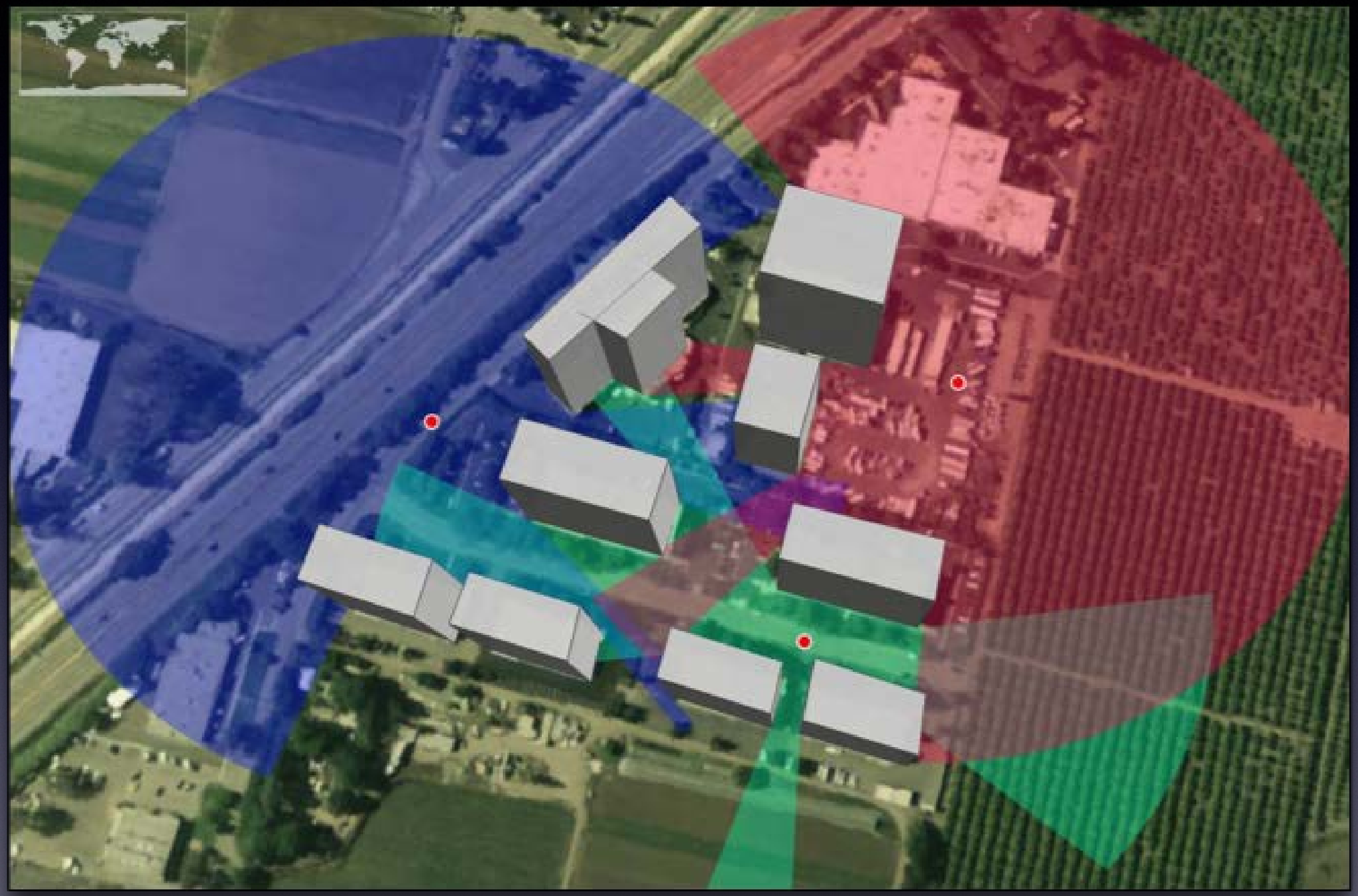
Upload Data

Load Data

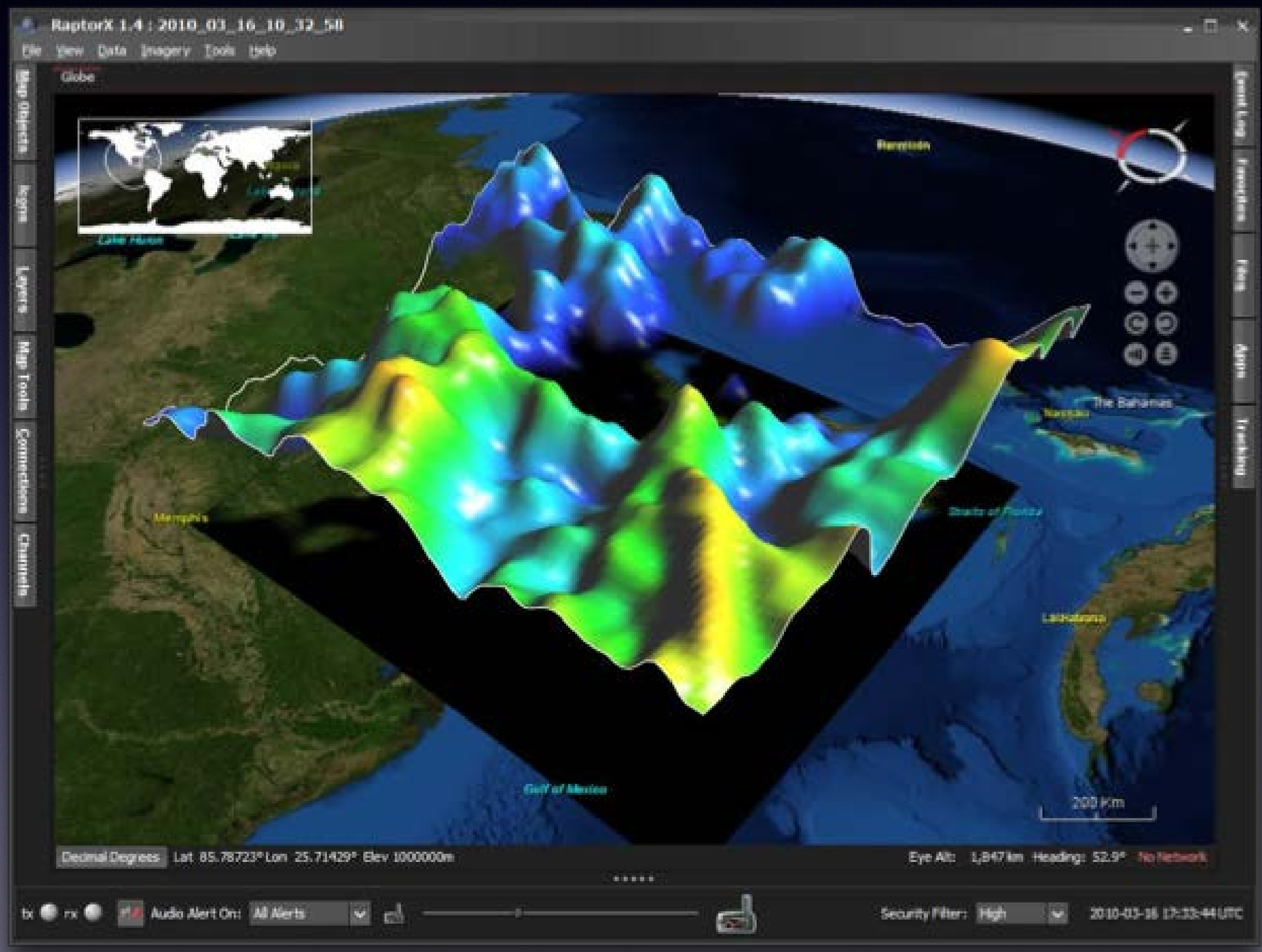
Zapopan
Morelia
Aguascalientes
Ecatepec
Toluca
San Luis Potosí
Torreón
Culiacán
Saltillo
San Nicolás de los Garzas
Gulf of California
Chihuahua
Hermosillo
El Paso
Lubbock
Albuquerque
Amarillo
100 Km


Boresight
Body Y
Body X

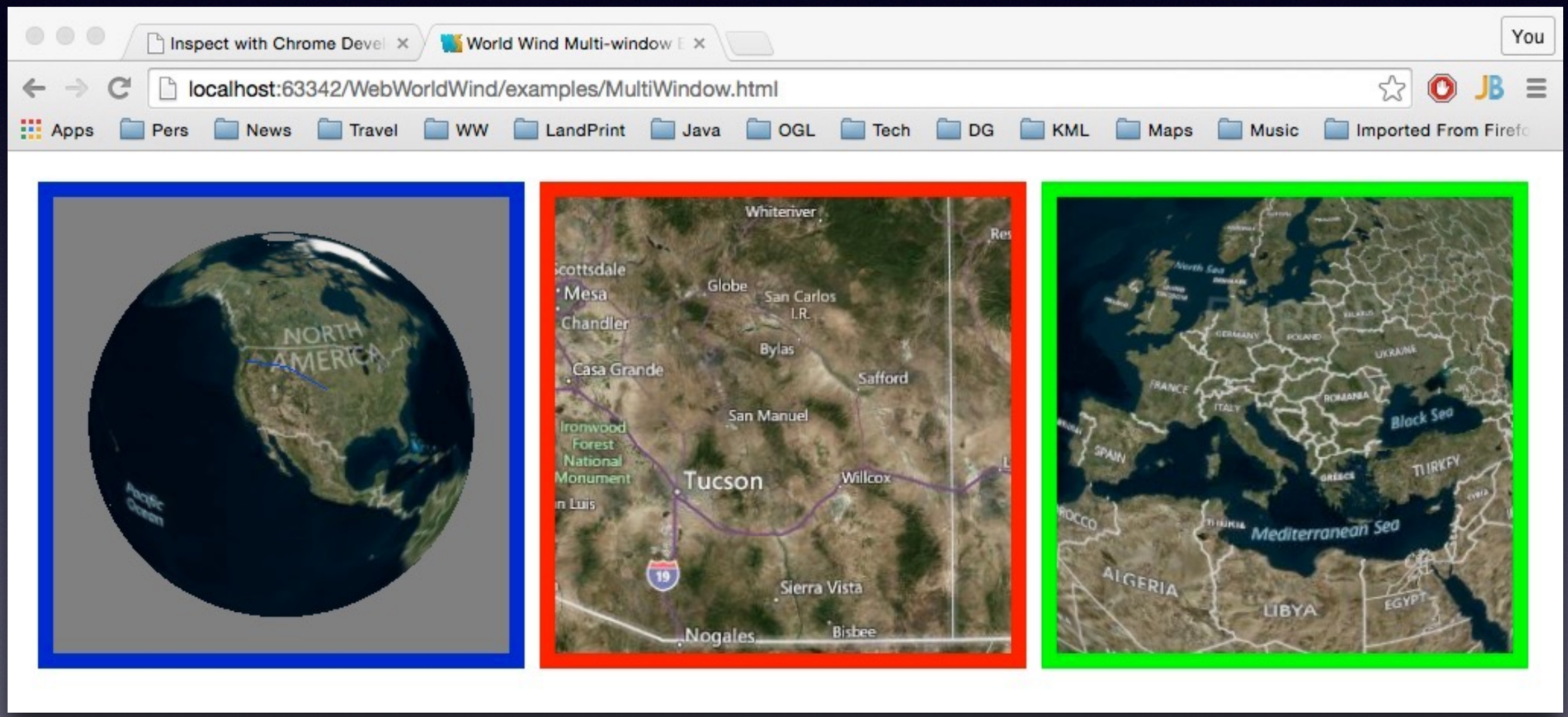

Sierra Nevada
Exeter
Lindsay
20 Km

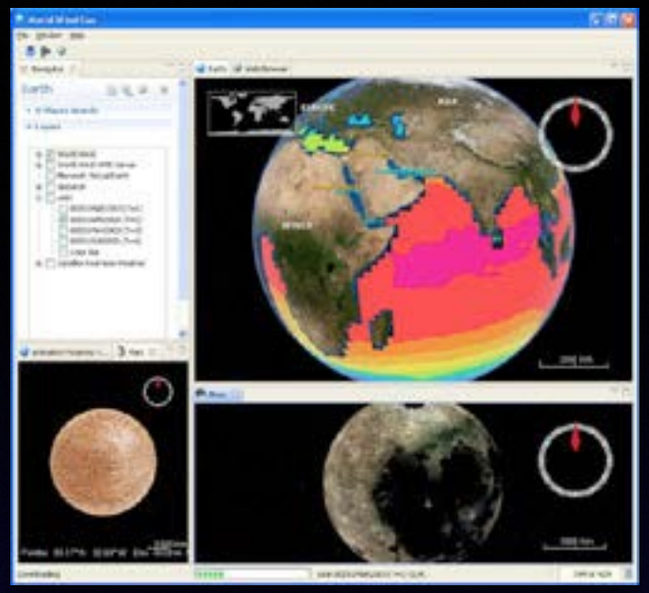


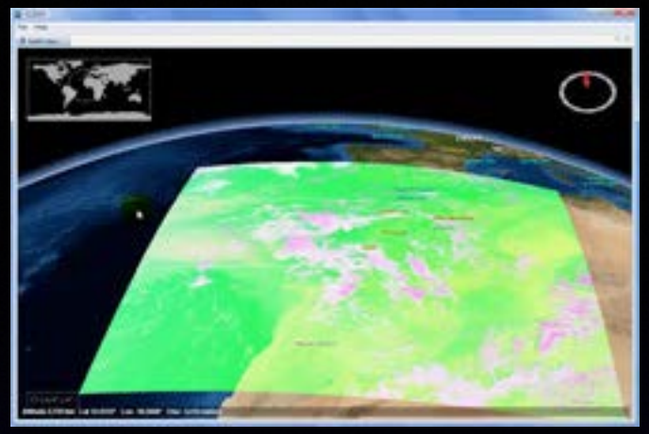
Analysis Applications



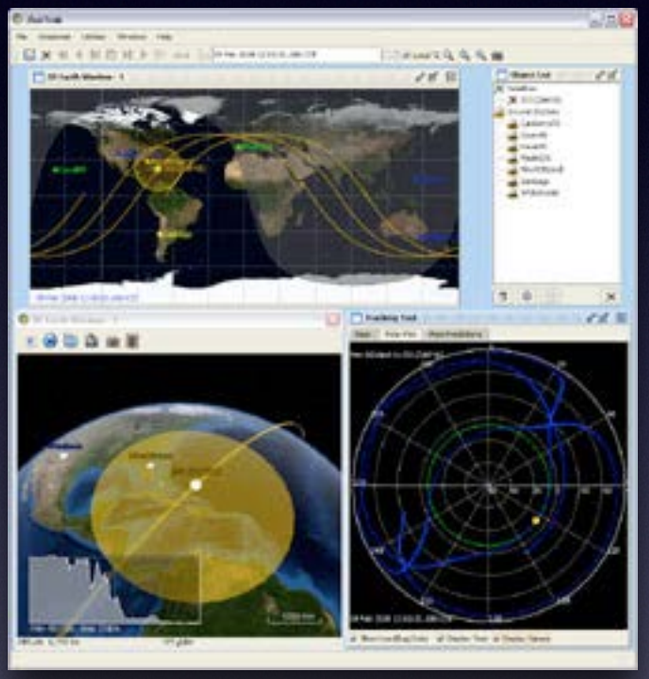
Multi-Window

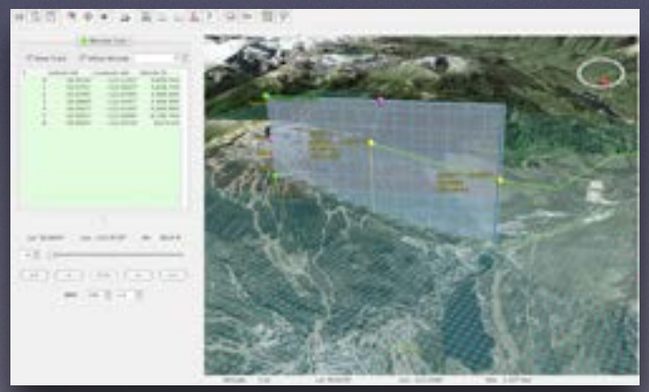


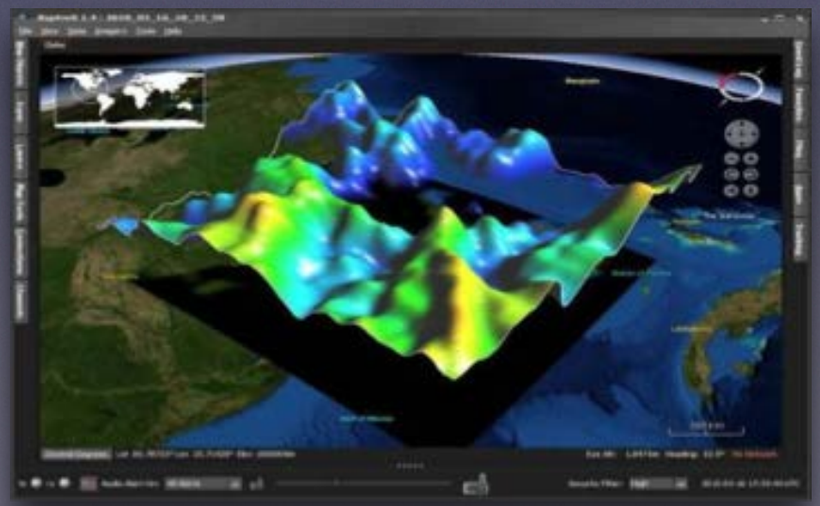




~7.2 km
~40 sq km
0.15 m GSD

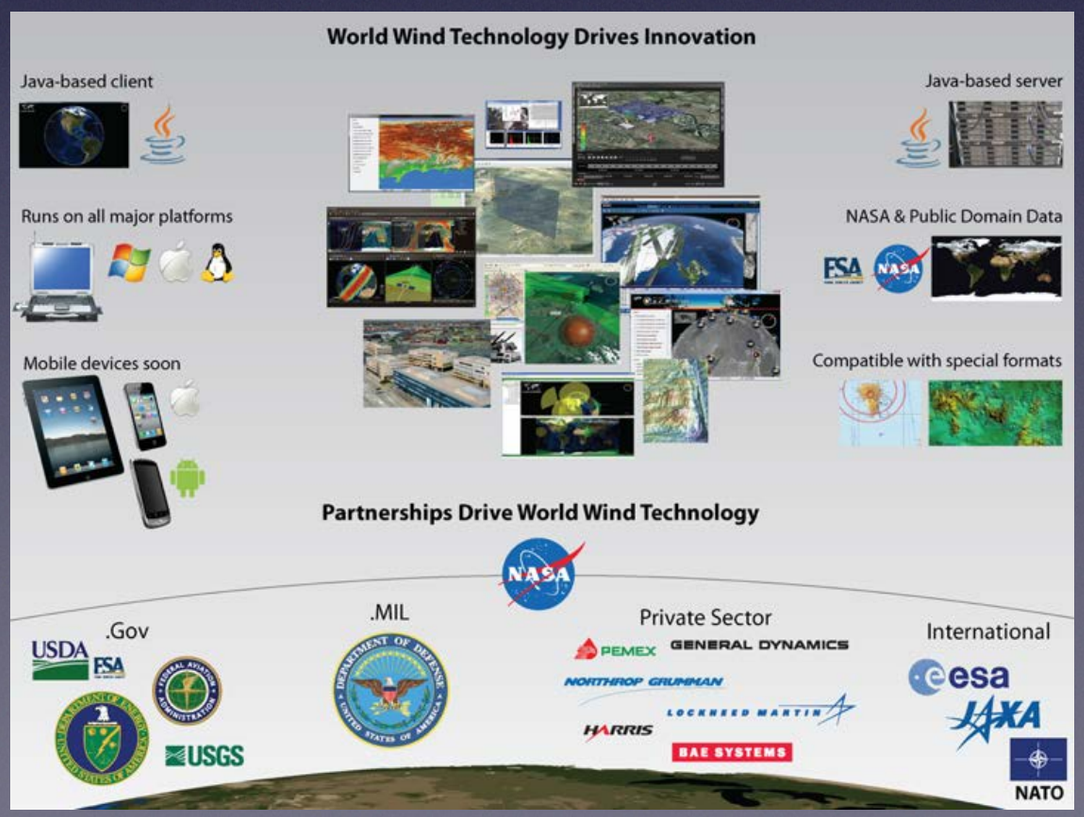






World Wind Users

- DOE
- DOD
- FAA
- Homeland Security



- Commercial
- Research
- Space

Features

- 3D Virtual Globe
- 2D Map with Projection Choices
- Imagery & Elevation Import
- Picking
- Extensible
- Data Retrieval via REST, WMS, WCS, WFS, Bing, User Defined
- Placenames
- KML Import
- Shapefile Import
- Decluttering
- Measurement
- Line of Sight
- Subsurface Visualization

Sub-Surface Soon

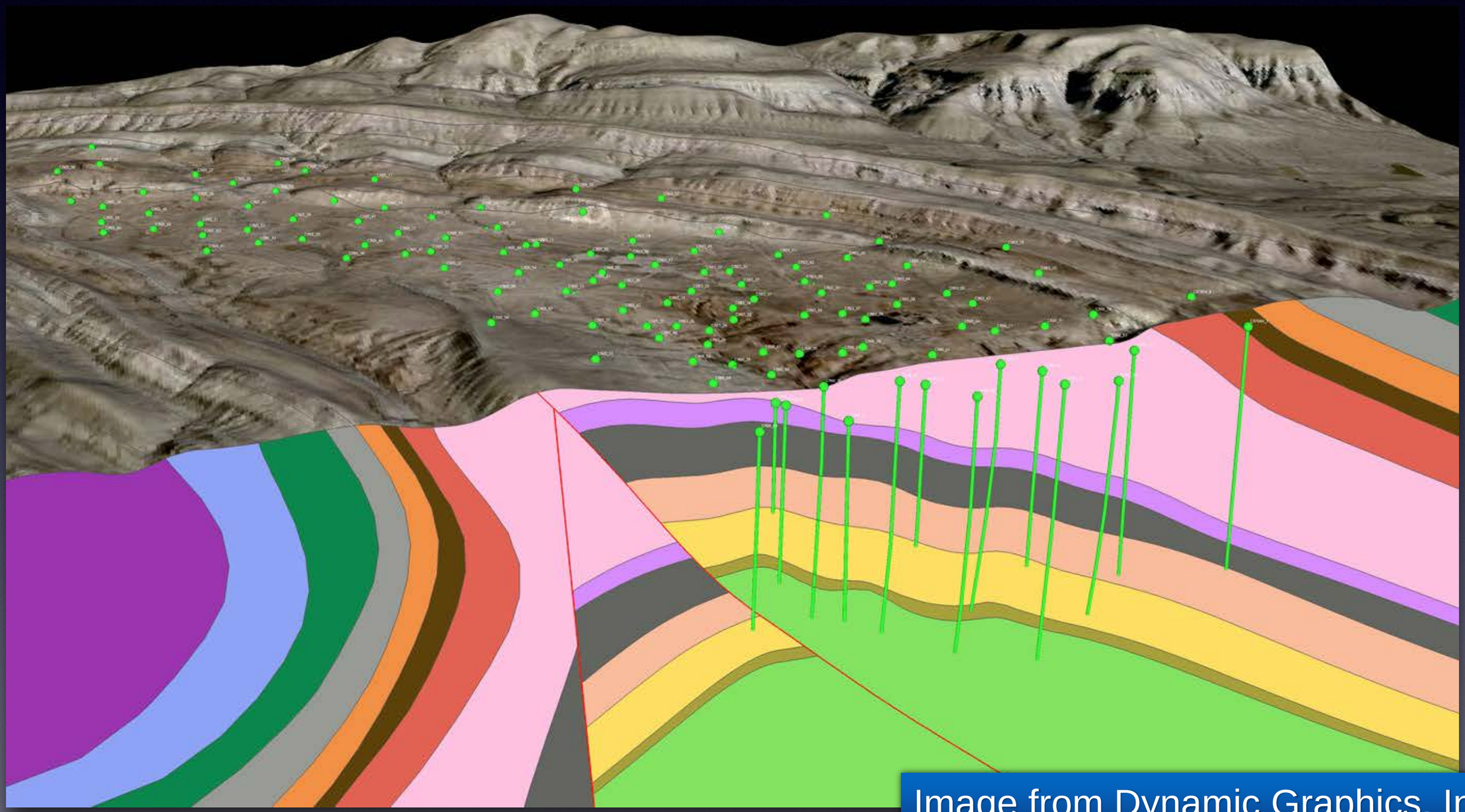
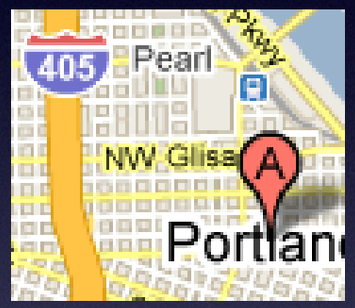


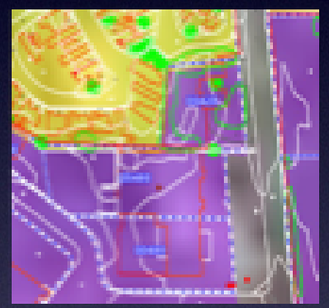
Image from Dynamic Graphics, Inc.

Data Types

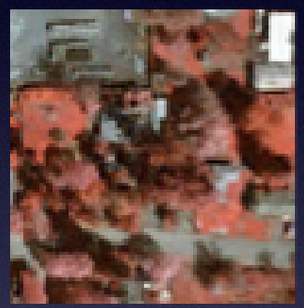
Maps



Geometry



Imagery

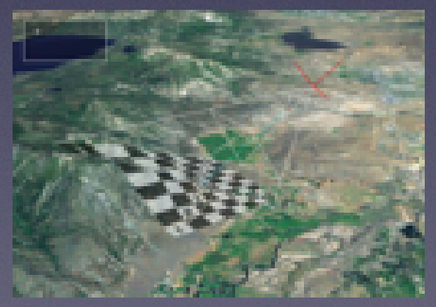


Structures

Terrain

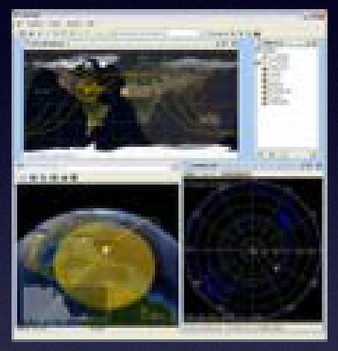
Shapes

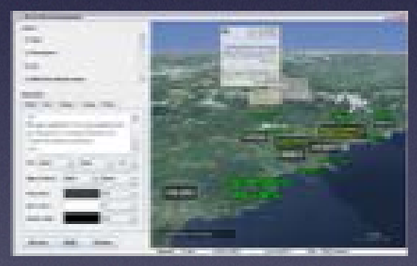
Video

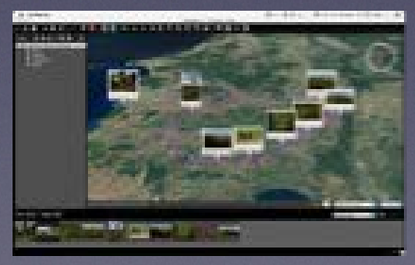


GeoTIFF	KML	Collada	NITF
PNG	Shapefile	GeoRSS	RPF
JPEG (+2k)	GML	DWG	VPF
GeoJSON	DTED	NMEA	…

Data Sources







OGC Web Services

Database Services

File System

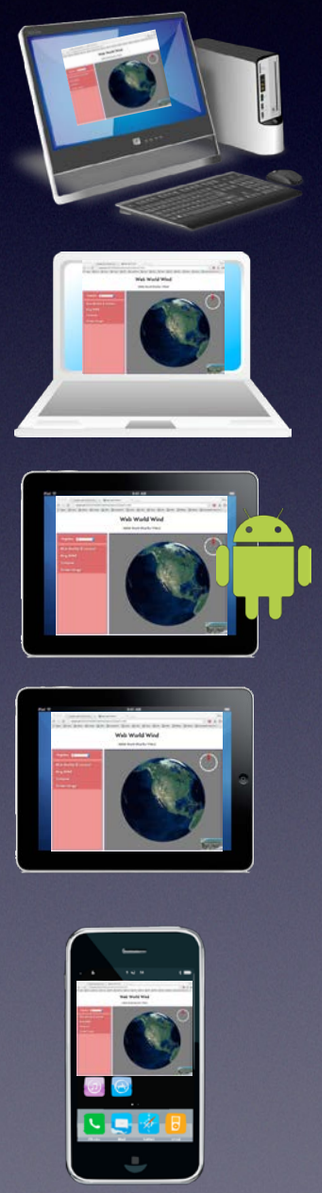
Proprietary Services

User Entry

Platforms

- Windows
- OS X
- Linux
- iOS
- Android OS

- Desktop
- Laptop
- Android
- iPad
- iPhone



- Internet Explorer
- Firefox
- Chrome
- Safari

Other Tools

- Google Earth
- OpenLayers
- Cesium
- Google Maps API
- Layerscape
- Unity Game Engine
- NOAA NeoViz
- ESRI Products
- Earth Vision
- GPlates

Documentation

User's Guide

API Docs

Examples

Forum

World Wind Summary

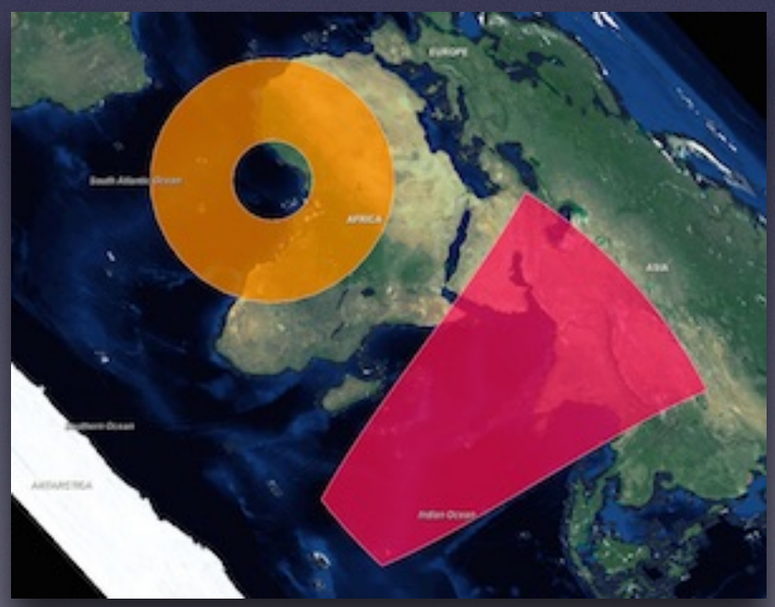
- Geographic Context for Information Visualization
- Component with API Rather than an App
- Quickly Learned and Incorporated
- Extensible so you can add your own functionality
- Open Source, Free and Unencumbered

Questions?

Thank You!

Shapes

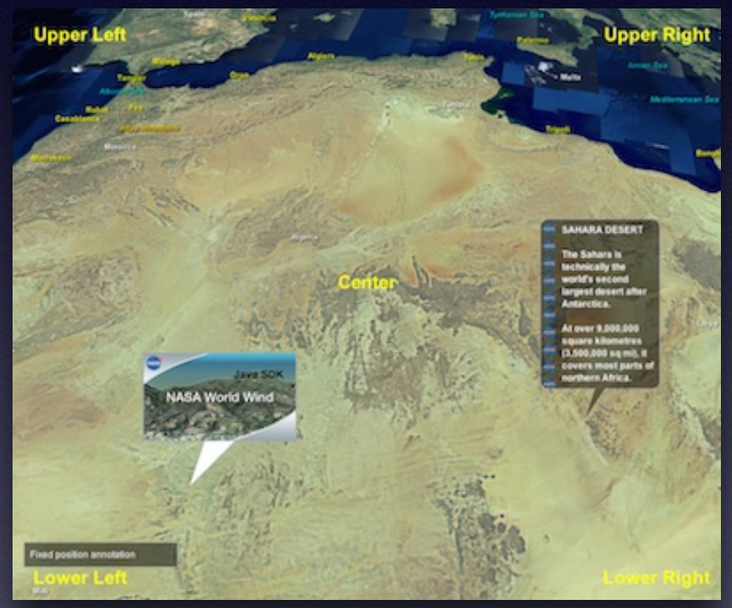
- Placemark
- Path
- Polygon
- Extruded Polygon

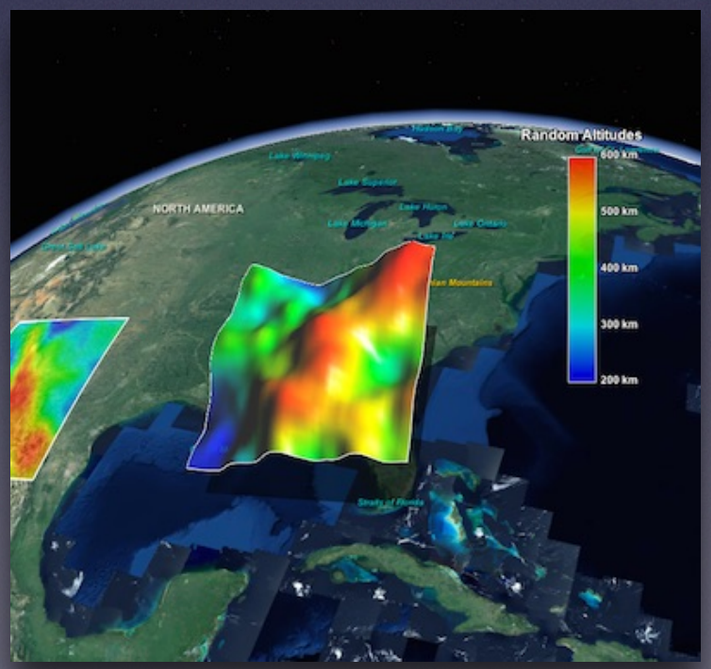


Surface Shapes

Shapes

- Geographic Text
- Balloon
- Analytic Surface



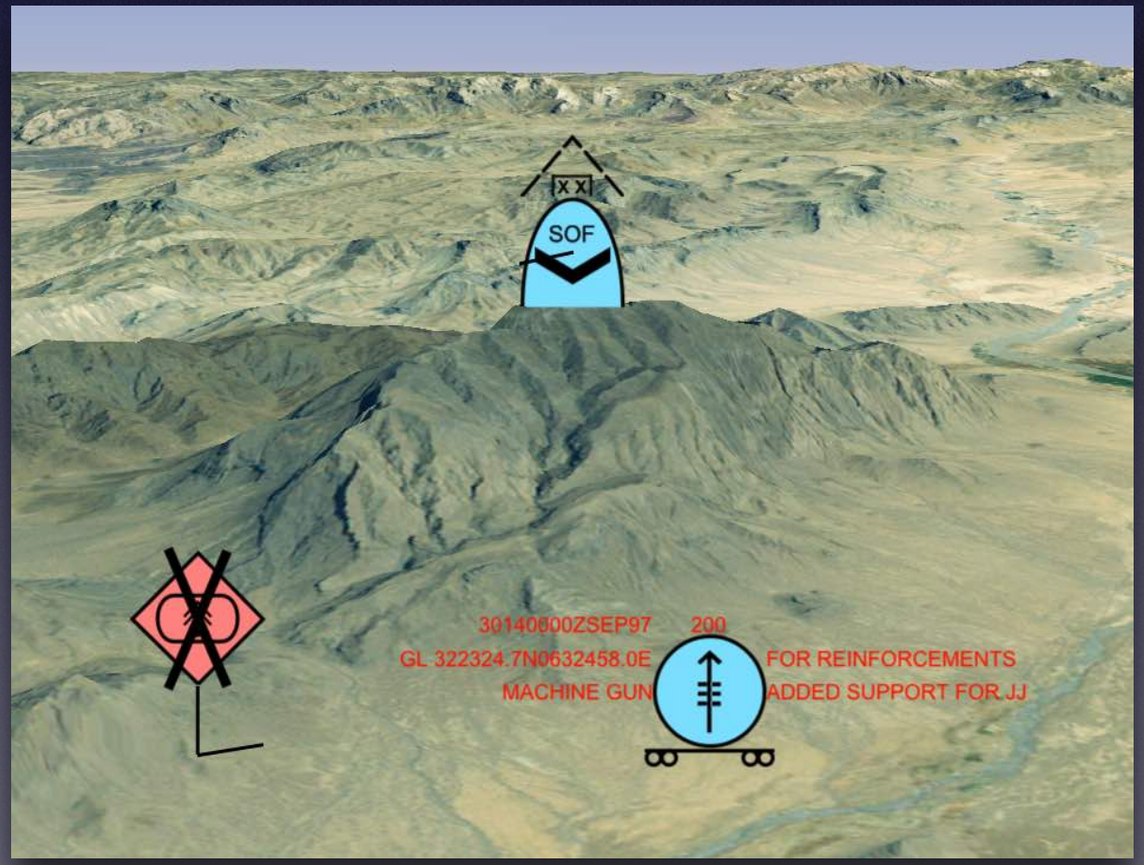


Airspaces

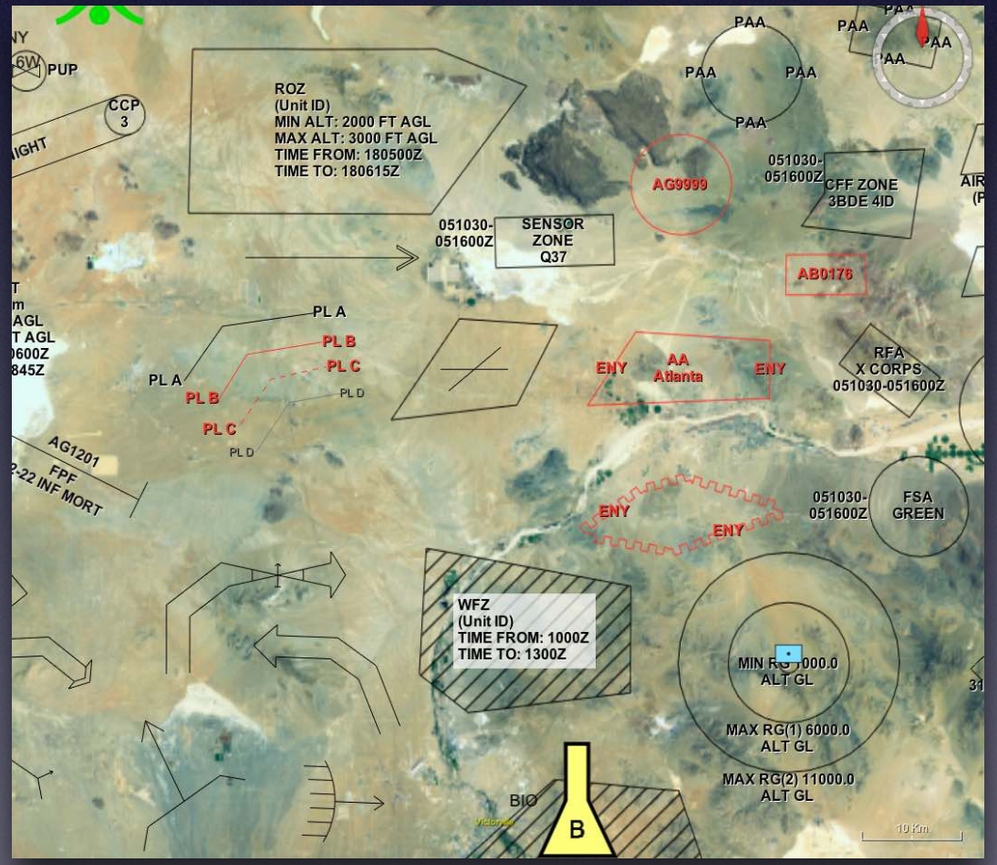
Hudson Bay
Lake Winnipeg
Lake Athabasca
Great Slave Lake
Great Bear Lake
Lake Huron
Lake Michigan
Lake Erie
Appalachian Mountains
NORTH AMERICA
Gulf of Mexico
Cascade
Sierra Nevada

Mil-Std 2525

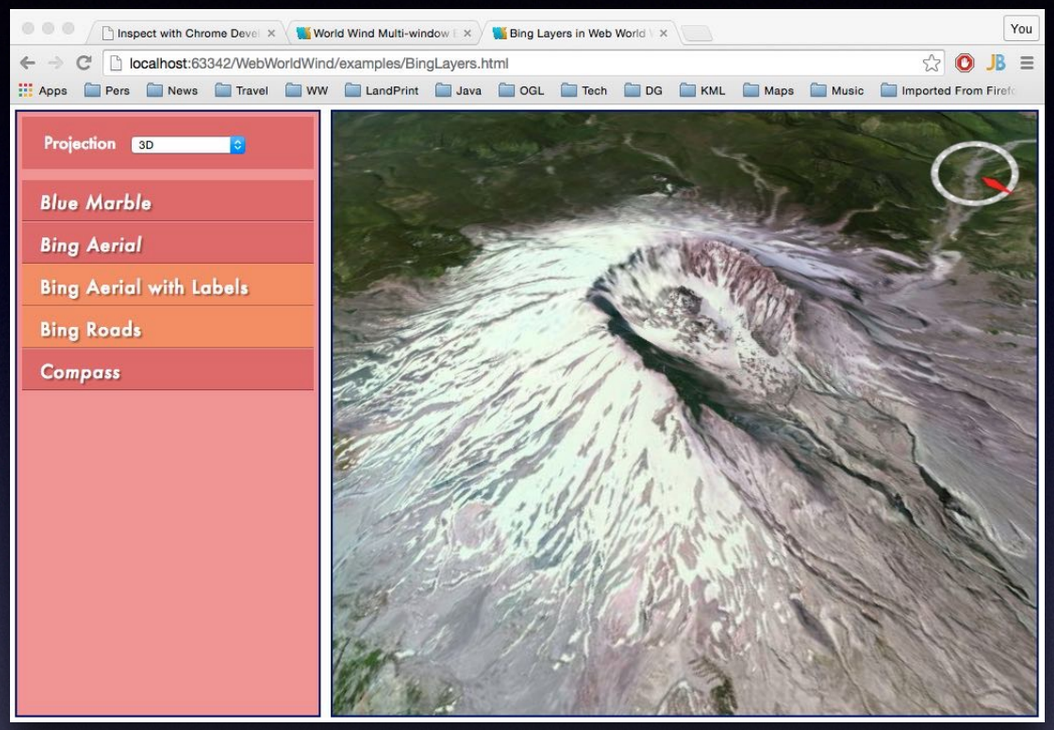
Tactical Symbols

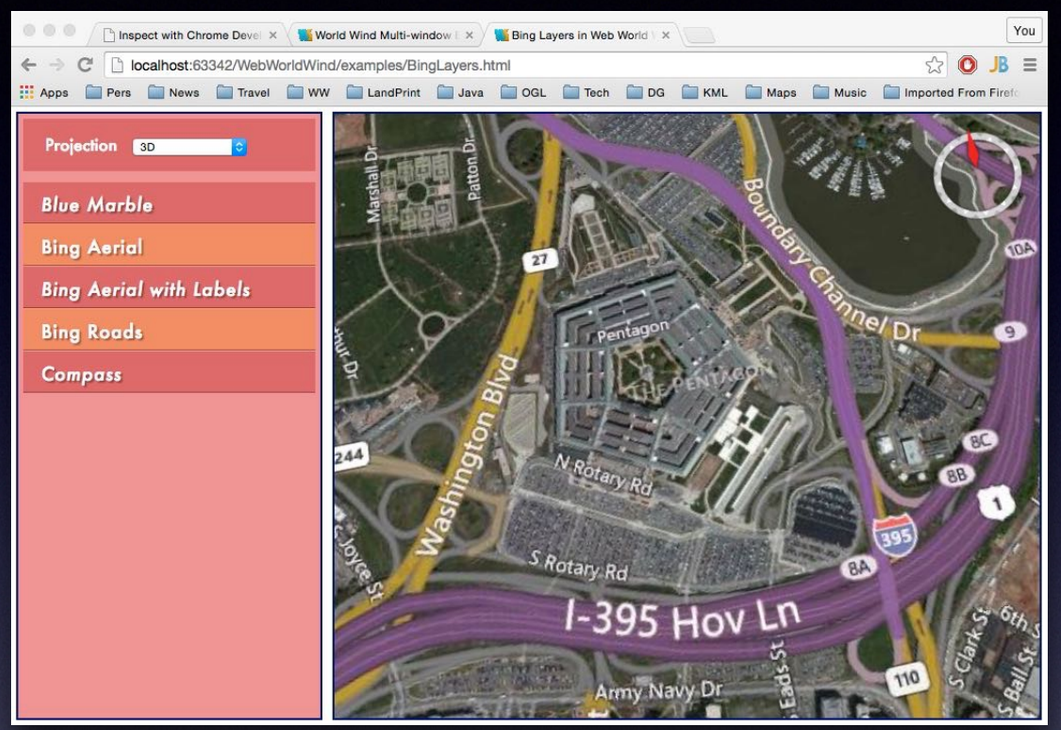


Tactical Graphics

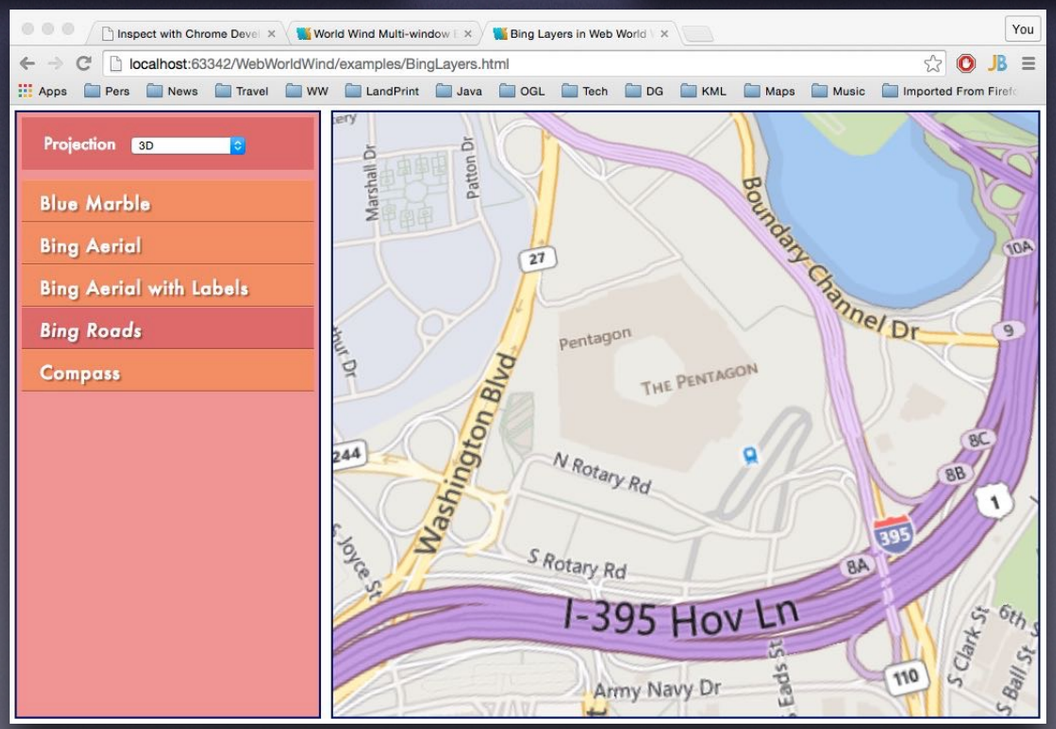


Bing Maps

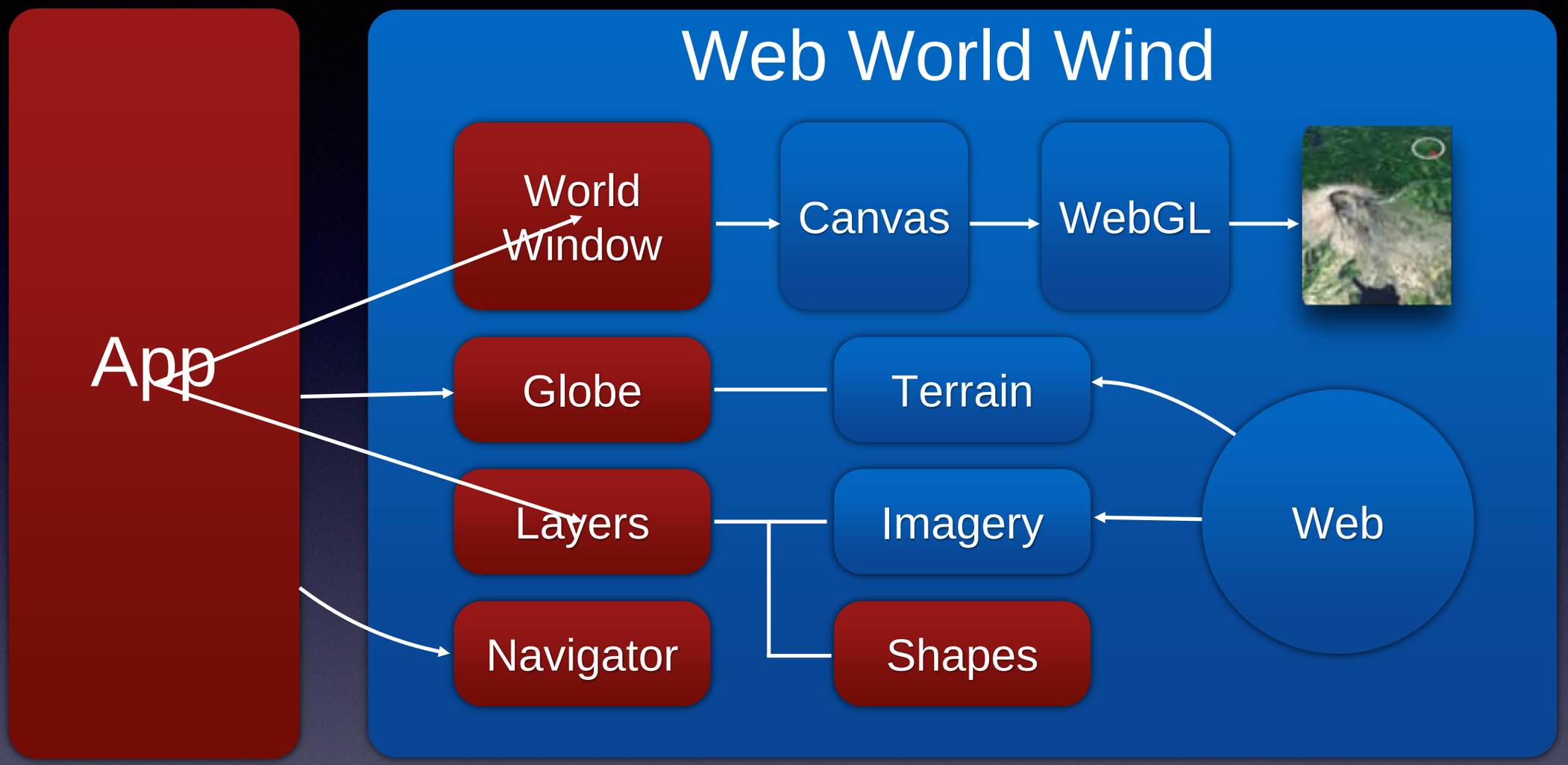




Aerial
Aerial + Roads
Roads



Deployment Options



Architecture

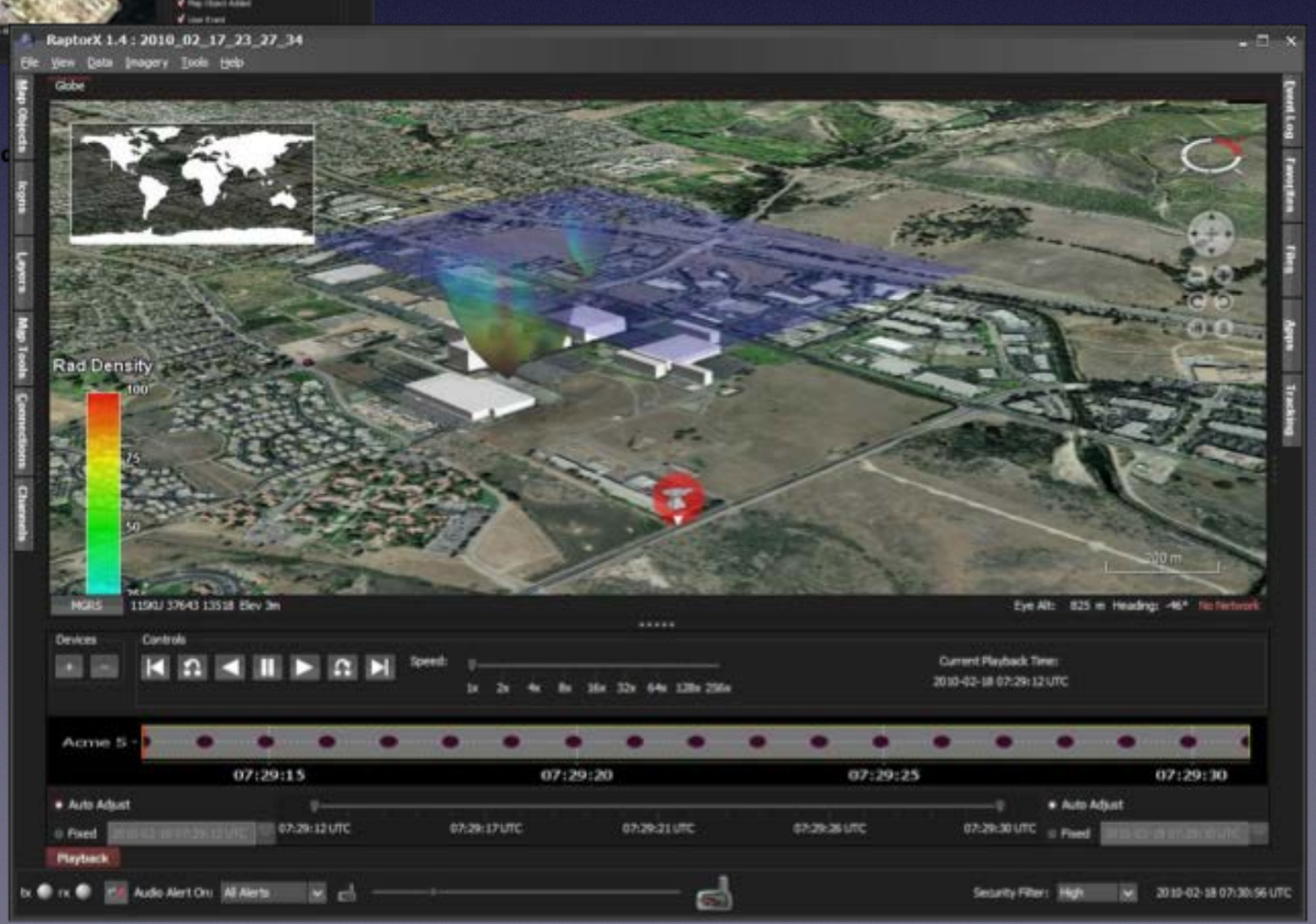
World Wind Provides the Geographic Context

```
<!DOCTYPE html>
<html>
<head lang="en">
    <meta charset="UTF-8">
    <title>World Wind Example</title>
    <script src="../worldwindlib.js" type="text/javascript"></script>
</head>
<body>
<div style="position: absolute; top: 50px; left: 50px;">
    <canvas id="canvasOne" width="1024" height="768">
   </canvas>
</div>
<script>
    window.addEventListener("load", eventWindowLoaded, false);

    function eventWindowLoaded() {

        var wwd = new WorldWind.WorldWindow(“canvasOne");

       wwd.addLayer(new WorldWind.BingAerialWithLabelsLayer());
        wwd.addLayer(new WorldWind.CompassLayer());
        wwd.addLayer(new WorldWind.ViewControlsLayer(wwd));
        wwd.redraw();
    }
</script>
</body>
</html>
```

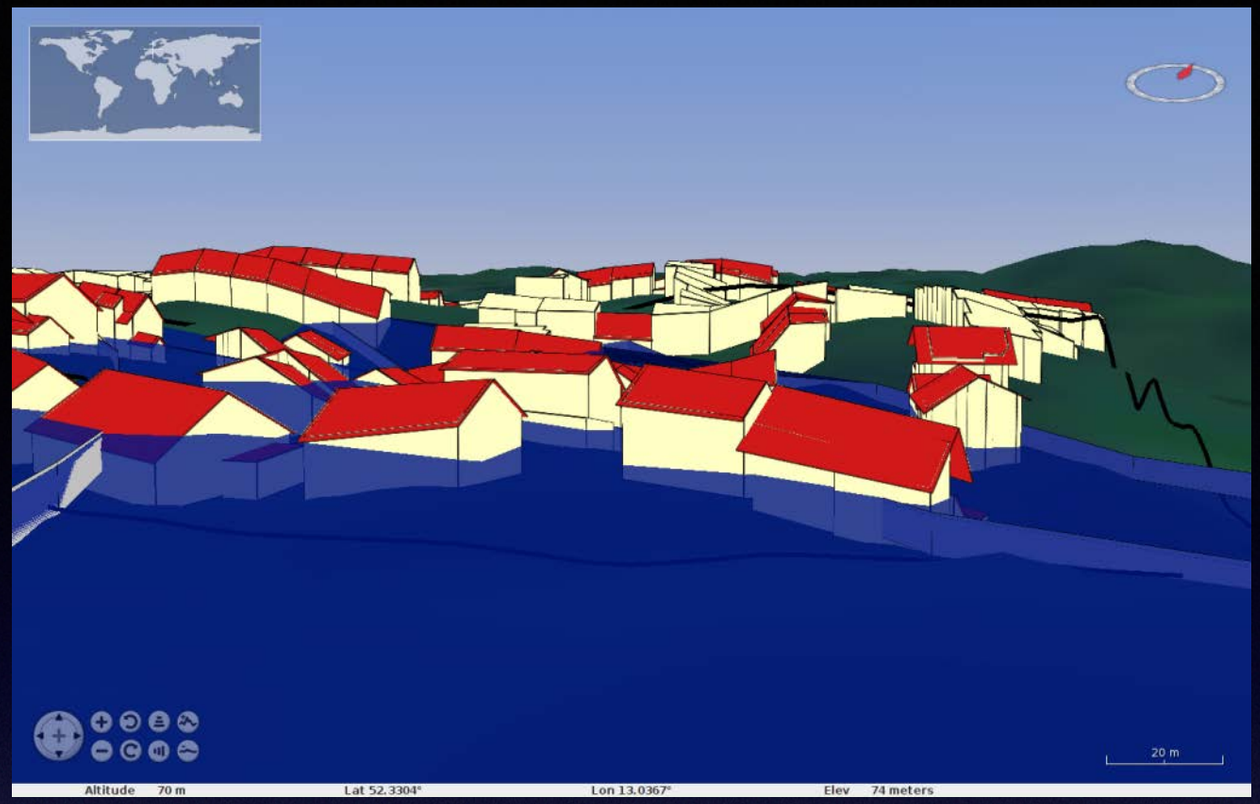
Examples

- Basic Example
  http://worldwindserver.net/webworldwind/examples/BasicExample.html
- Bing Layers
  http://worldwindserver.net/webworldwind/examples/BingLayers.html
- Placemarks and Picking
  http://worldwindserver.net/webworldwind/examples/PlacemarksAndPicking.html
- Pick All Shapes in Region
  http://worldwindserver.net/webworldwind/examples/PickAllShapesInRegion.html
- Paths
  http://worldwindserver.net/webworldwind/examples/Paths.html
- Surface Shapes
  http://worldwindserver.net/webworldwind/examples/SurfaceShapes.html
- Multi-Window
  http://worldwindserver.net/webworldwind/examples/MultiWindow.html
- Geographic Text
  http://worldwindserver.net/webworldwind/examples/GeographicText.html
- Surface Image
  http://worldwindserver.net/webworldwind/examples/SurfaceImage.html
- Screen Image
  http://worldwindserver.net/webworldwind/examples/ScreenImage.html

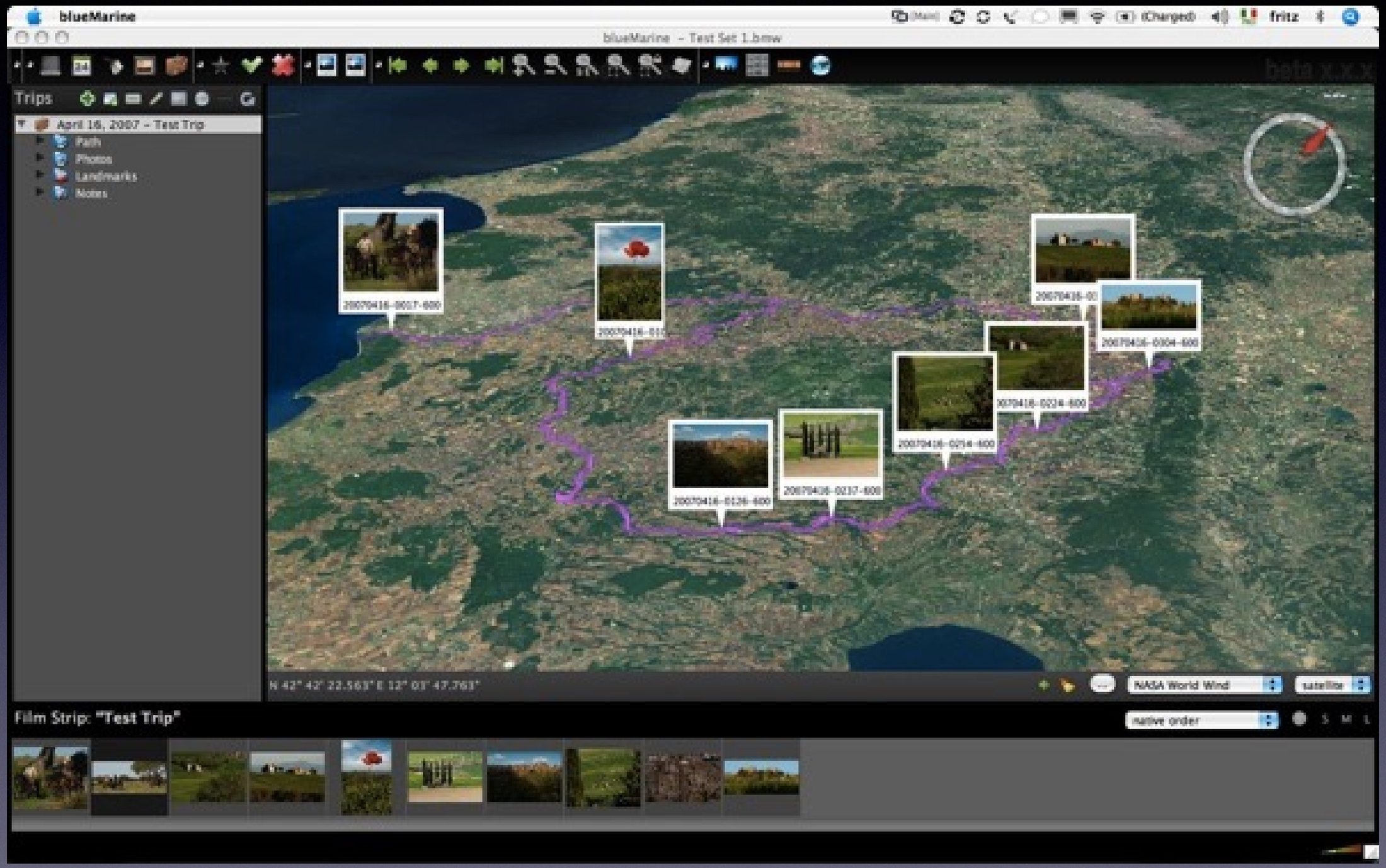
Sensor Command & Control



http://worldwind.arc.nasa.gov/temp/faa/NESAT3DDemo.mp4


20 m
Altitude 70 m
Lat 52.3304°
Lon 13.0367°
Elev 74 meters

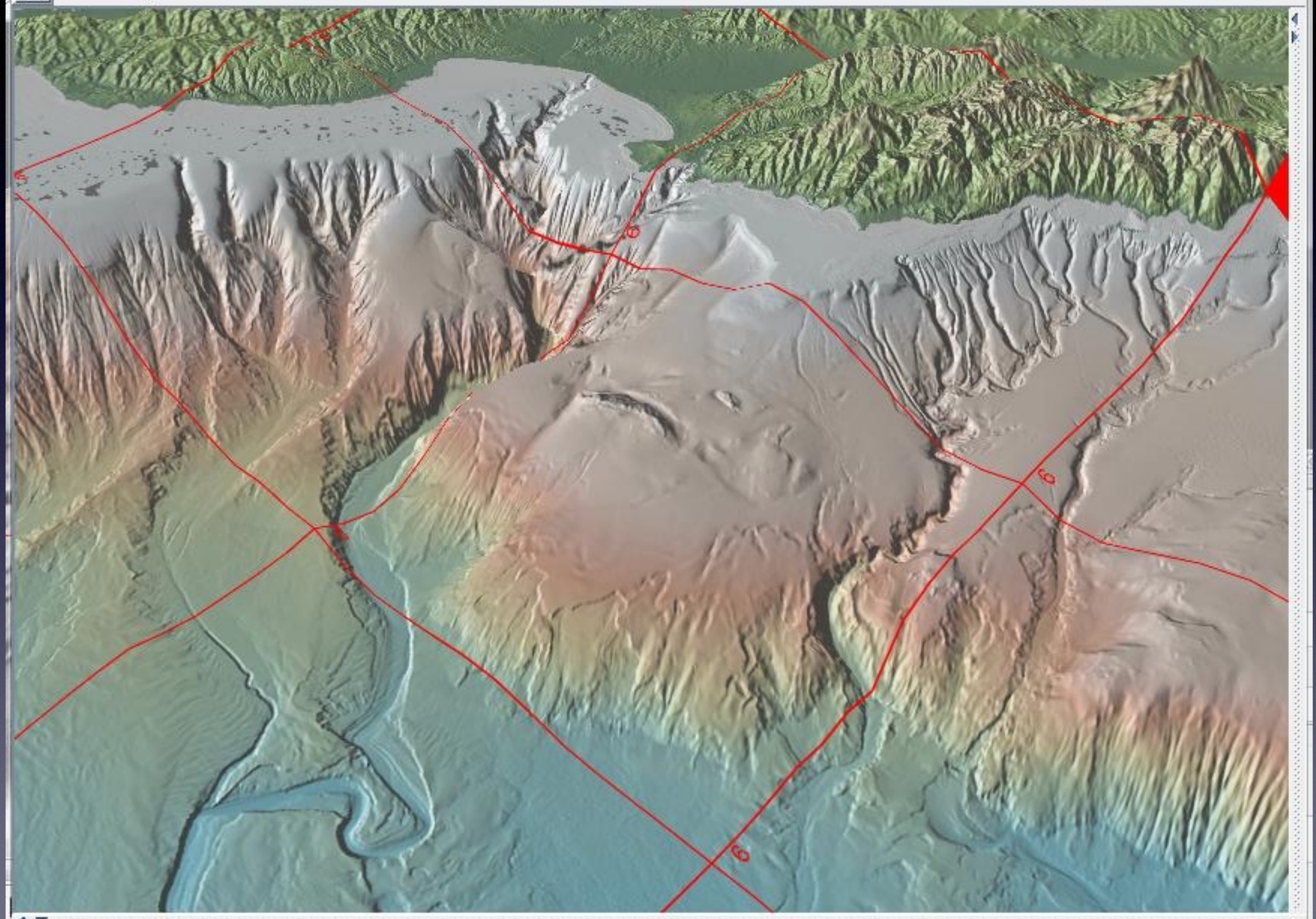
50 m
Altitude 1 km
Off Globe


blueMarine
blueMarine – Test Set 1.bmw
Trips
April 16, 2007 – Test Trip
Path
Photos
Landmarks
Notes
N 42° 42' 22.563" E 12° 03' 47.763"
NASA World Wind
satellite
Film Strip: "Test Trip"
native order

GeoMapApp 1.6.0

File Available Data View Places Help

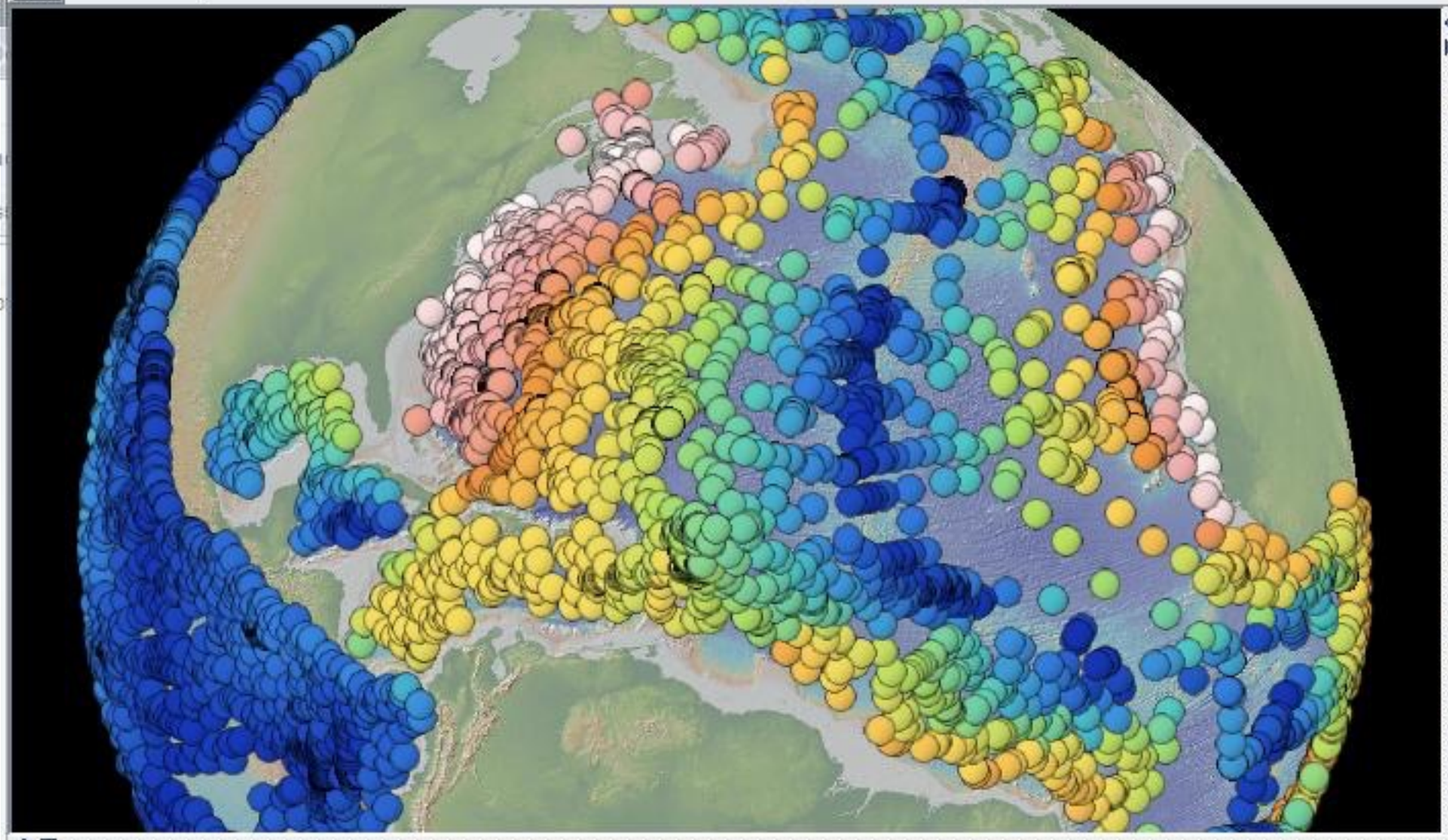
Lat: 36.009° Lon: -121.480° Elev: 902m Alt: 95km



GeoMapApp 1.6.0

File Available Data View Places Help

Lat: 24.150° Lon: -39.211° Elev: 0m Alt: 12132km



Import Data (Tables)

close

Global Heat Flow Da...

Save

Load

Dispose

Bookmark

Configure

Graph

Color Symbols

Scale Symbols

Plot/Refresh

Thumbs

Global Heat Flow Data - Abbott | Symbol Color - age | Symbol Size - None Selected

lat	lon	epoch	label	depth	age	bot_water_t...	data_quality	pub_heat_fl...	recalc_heat...
0.983333	321.833	-3.36163E8	V15-3	-4137.0	63.900002	0	8	63.799999	NaN
0.2	320.1	-3.36099E8	V15-4	-4111.0	85.599998	0	8	46.599998	46.684799
2.5	319.083	-3.36008E8	V15-5	-4285.0	60.099998	0	8	56.200001	NaN
5.06667	318.983	-3.35922E8	V15-6	-4544.0	53.900002	0	8	79	81.008003
6.98333	318.933	-3.35836E8	V15-7	-4636.0	52.099998	0	8	92.099998	NaN
10.75	318.65	-3.35715E8	V15-8	-5002.0	4.2	0	8	151	157.892059
11.7	307.667	-3.35426E8	V15-9	-4984.0	60.400002	1.82	0	NaN	NaN
14.2333	302.9	-3.35267E8	V15-10	-5002.0	74.5	0	5	0	NaN
17.35	294.817	-3.34986E8	V15-12	-4303.0	99.449997	4.28	8	48.599998	NaN
20.817	293.583	-3.34273E8	V15-13	-5413.0	106.199997	2.03	8	63.599998	NaN

File Edit View Items Actions Security Window Help

Map Layers

- Blue Marble
- Landsat
- USGS Digital Ortho
- USGS Urban Area Ortho
- Santa Barbara
- Place Names
- Compass

Item Layers

- Devices
- Entities
- GeoRSS

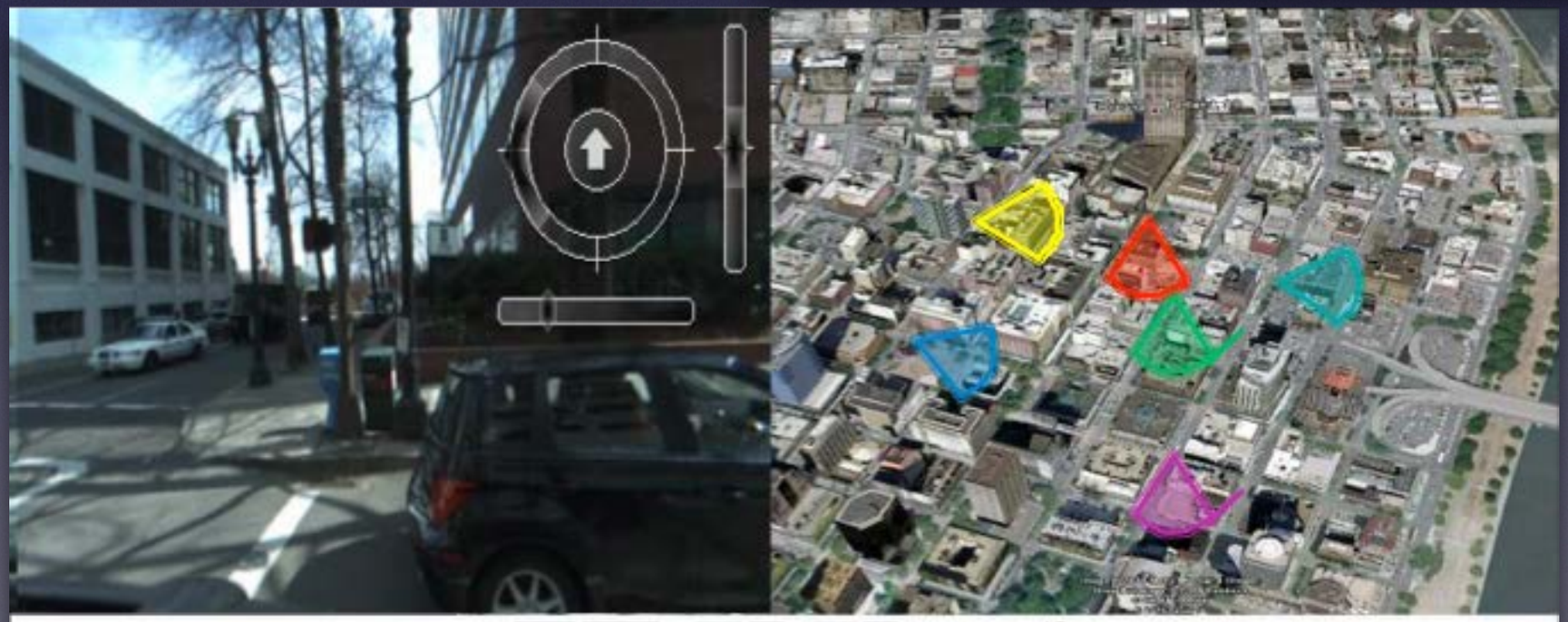
GeoRSS

Manage Feeds

Beacon Demo

- SB Metro — N/A
- D.C. — N/A

Add Simulated Beacon



Connect Disconnect kBps: 50 Set fps: 3 Set slow path:

Price List

- World Wind Client
  - Single-user license $ 0
  - 2 – 200 Users $ 0
  - Enterprise (over 200 users) $ 0
  - Source Code $ 0
  - Support (email & forum) $ 0
- World Wind Server
  - WMS Server, unlimited license & source code $ 0
  - Primary Imagery (Blue Marble, I3, NAIP, etc.) $ 0
  - Merged Elevations (NED 10, SRTM, Aster) $ 0