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Leveraging GOS Map and Data Services for Search and Rescue Operations using NASA WorldWind Open Source 3D Visualization Platform

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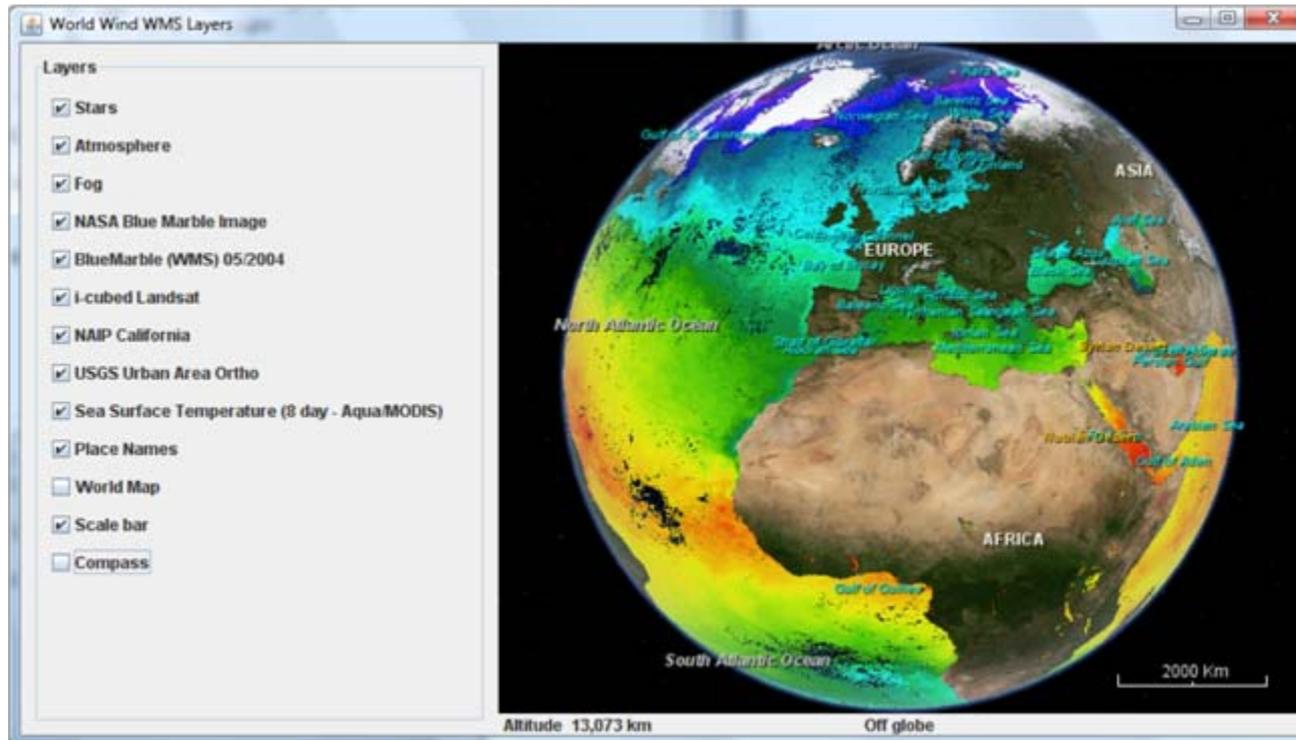
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Proposal

- Goal
 - Enhance the NASA Goddard Search and Rescue (SAR) Mission Office's Decision Support Tools (already under development under a different contract)
- Technical Objectives
 - Discover SAR relevant data via the GOS portal catalog
 - Access, exploit and visualize discovered data in WorldWind's 3D environment
 - Subscribe to and use GeoRSS to alert the SAR decision maker regarding latest relevant resource updates from GOS

What is NASA WorldWind?

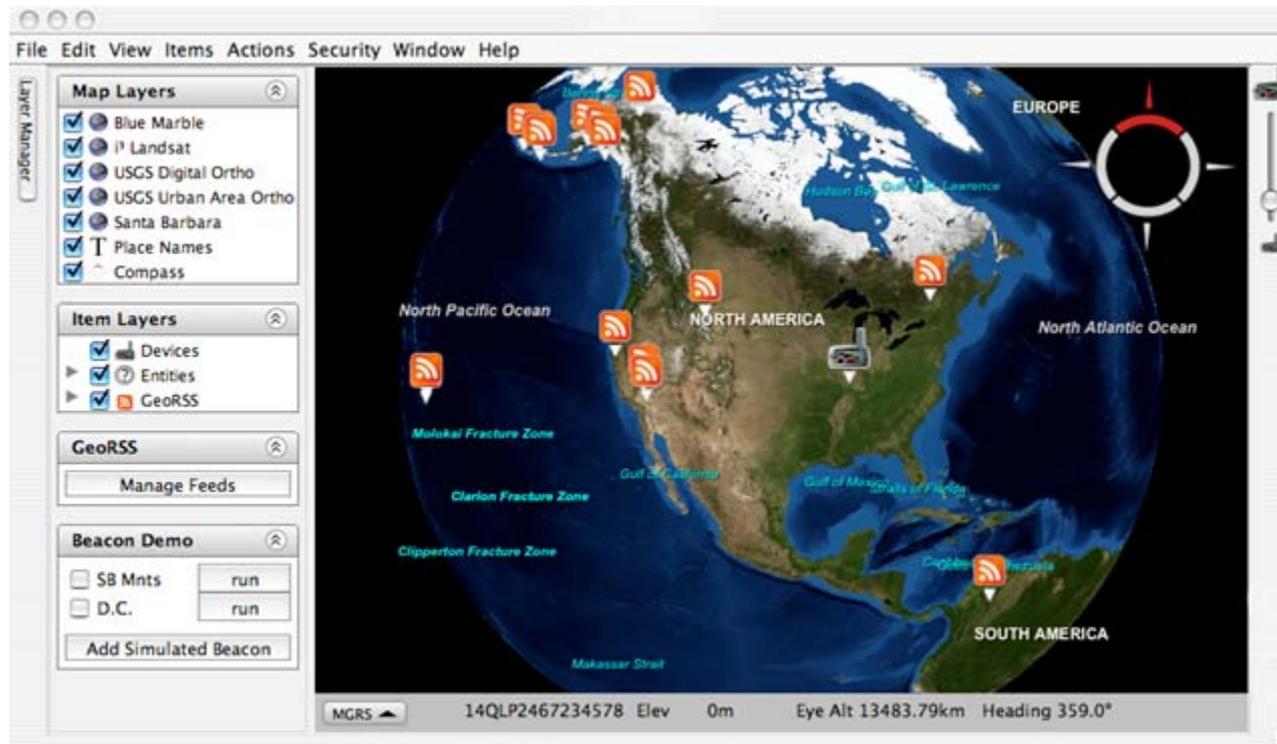
- ▶ **3D Geospatial Information Visualization SDK**
 - Easily visualize distributed satellite imagery and products.
 - Zoom from satellite view to any place on Earth.
 - Explore data in a visually rich 3D as if you were really there.



What is NASA WorldWind?

▶ API-Centric Architecture of SDK

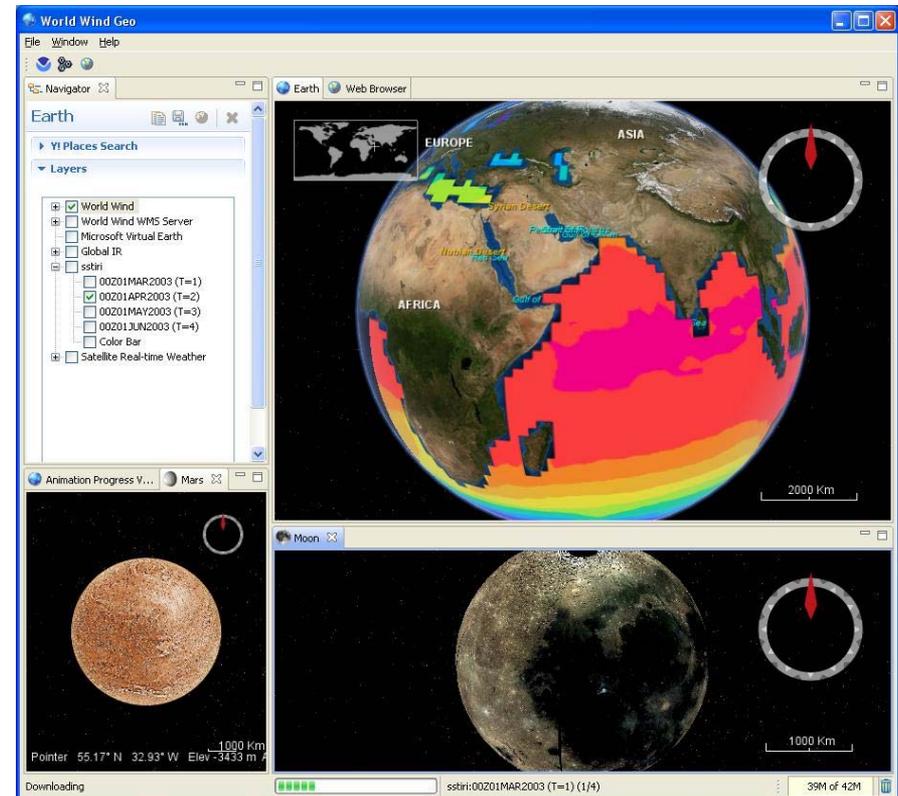
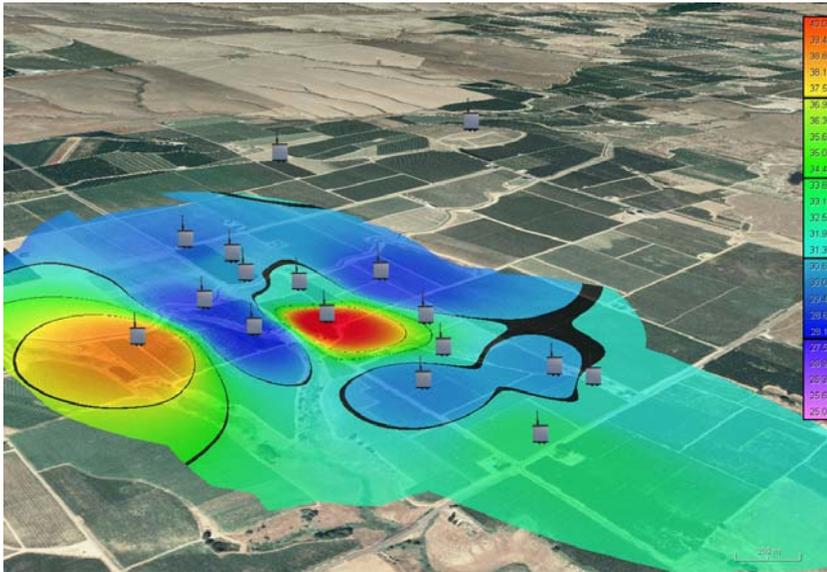
- Suite of modular components embeddable as part of any application.
- Incorporate virtual globe technology in support of any Earth science objective.



What is NASA WorldWind?

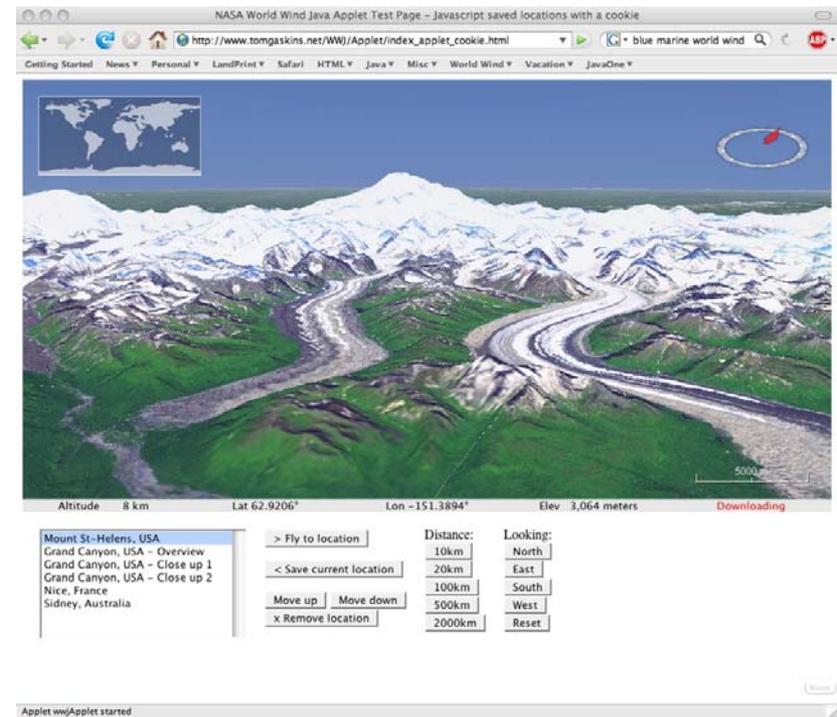
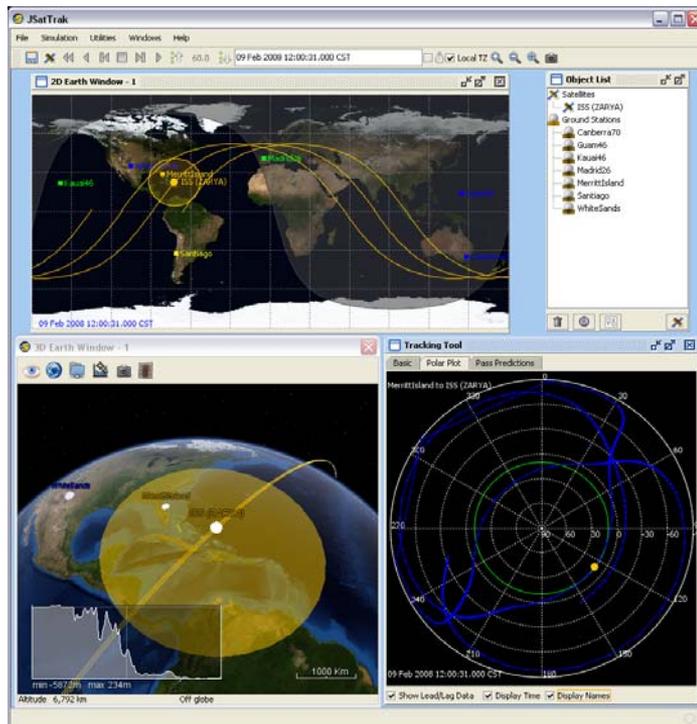
▶ NASA Open Source

- Anyone can advance the technology without being constrained by vendor features or proprietary lock-in.



WorldWind Goals

- ▶ Advanced Open Source components and alignment with international standards to further the infrastructure necessary for accelerated innovation and maximum interoperability of information and intelligence.





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NASA Search and Rescue Laboratory

- NASA participates in the National Search and Rescue Committee NSARC
 - NASA provides research and development to provide SAR tools for the SAR forces
 - The Cospas-Sarsat satellite system that detects and locates transmitting distress beacons worldwide resulted from R&D by NASA

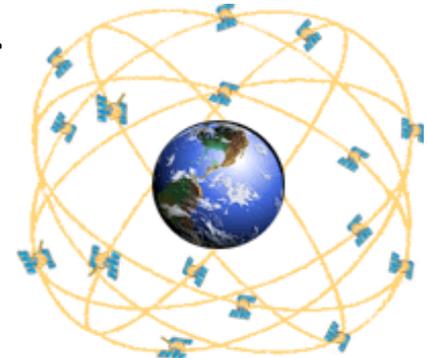


- Distress Alerting and Satellite System (DASS)
 - Current R&D project to prove the concept of using Mid-Earth-Orbit satellite constellations to provide the same detection and location of transmitting distress beacons but in a near instantaneous mode (2-3 hours)
 - SAR Visualization Software for Search Planners

SAR Planning

Visualization using WorldWind

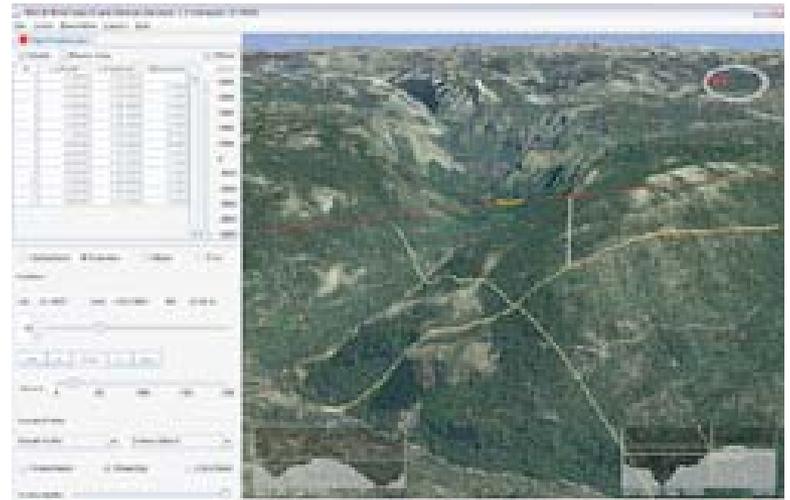
- Purpose
 - Aid a Search Planner to visualize conditions a missing pilot may have confronted and determine places to search
- Final goal
 - Automated determination of high probability places to search
- Current status
 - Under development; version almost ready for community



SAR Planning

Visualization using WorldWind

- Capabilities
 - Supports 3D terrain visualization (NAIP, USGS aerial, Landsat)
 - Provides capability to view aircraft tracks in the air and their subtrack on the ground including radar acquired tracks
 - Provides capability to view cloud ceilings, cloud cover both visible and IR
 - Provides capability to show all possible crash locations in challenging terrain for a chosen altitude
 - Provides capability to extend track to estimate pilot possible actions beyond last known point





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Interest in other types of data

- Aeronautical sectional maps (runways, nav aids, etc)
- Weather data
- Precipitation data
- Clouds
- Local data/county data (crash sites)
- Other high resolution imagery and base data



Technical Approach

- 1. Develop search user interface for discovery of data and services in GOS**
 - a) Simple search option (keyword and geographic extent)
 - b) Advanced search option (GOS data category, publisher, time frame, type of resource, etc)
- 2. Exercise the CSW 2.0.2 to perform the search against the GOS catalog**
- 3. Display returned results in sortable table format**
 - a) Based on information about each resource (e.g. publisher, data category, date)
 - b) Enable clickable access to entire FGDC metadata record in separate window
- 4. In the case of web services returned**
 - a) Associate a different icon for different types of services (WMS, WFS, WCS, etc)
 - b) Enable complete listing of layers/features/coverages (via GetCapabilities) via a simple button click
 - c) Support 3D visualization of data layers served via WMS
 - d) Support visualization of time-series data in 3D (already in scope for SAR)
 - e) Provide the user with meaningful feedback when a service/layer fails
- 5. Support the subscription to GOS GeoRSS feeds to alert decision maker of new or updated data (e.g. weather) related to specific criteria**
 - a) Display alert when received



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Team

- Nadine Alameh
 - Project manager and standards expert
- Patrick Hogan
 - WorldWind project manager
- David Collins
 - WorldWind programmer
- Dave Affens
 - Director of NASA SAR Lab



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Outcomes of the Work

- Catalog + 3D visualization + Open Source SDK = powerful combination
 - None of the other virtual globe technologies support as many standards as WorldWind
 - International standards such as WMS and CSW = sustainability, more users, easier integration within applications, etc
 - Think the Google effect of discovery but based on actual international standards!
- CSW = opening new doors for connections
 - Opportunity to connect to ESA's FedEO catalogs
 - JAXA is setting up CSW catalogs
 - NGA also has CSW catalogs (internally)
- FGDC = Federal government reach
 - WorldWind's open source proposition will create amazing exposure into new markets and domains
 - No other virtual globe technology enables access to the US NSDI

Expanding Universe of Opportunities

▶ Contact Information

- Nadine Alameh, Ph.D. nadinesa@mobilaps.com
- Patrick Hogan patrick.hogan@nasa.gov

▶ WorldWind resources

- Code: worldwind.arc.nasa.gov/java
- Demos: worldwind.arc.nasa.gov/java/demos
- Forums: forum.worldwindcentral.com/forumdisplay.php?f=37

