Comparison of Open Source Virtual Globes

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sourcepole
Linux & Open Source Solutions

About Sourcepole

> **GIS-Knoppix: first GIS live-CD**

> **QGIS**
>> Core developer
>> QGIS Mapserver

> **OGR / GDAL**
>> Interlis driver
>> schema support for PostGIS driver

> **Ruby on Rails**
>> MapLayers plugin
>> Mapfish server plugin

Overview

> **Multi-platform Open Source Virtual Globes**
>> Installation
>>> out-of-the-box application
>> Adding user data
>> Features
>> Demo movie

> **Comparison**
>> User data
>> Technology

> **Desired Virtual Globe features**

Open Source Virtual Globes

- NASA World Wind Java SDK
- ossimPlanet
- gvSIG 3D
- osgEarth
- Norkart Virtual Globe
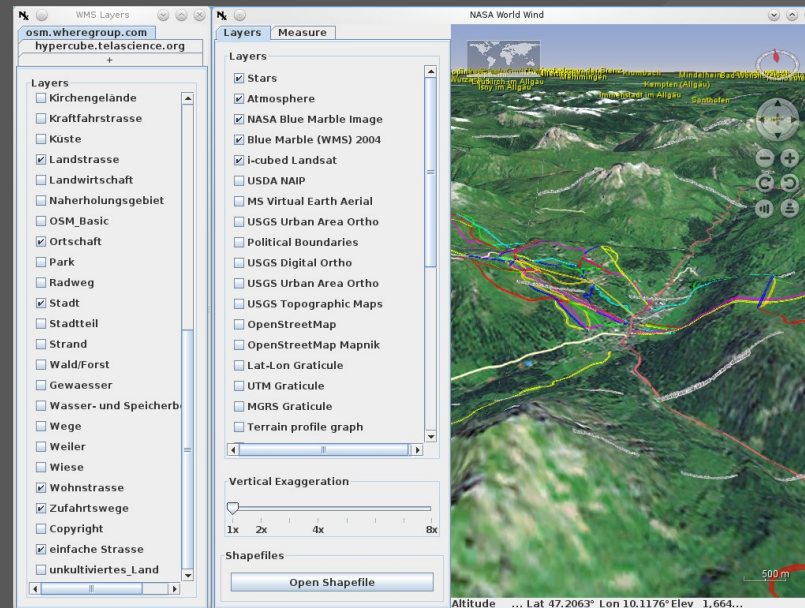- Earth3D
- Marble

- comparison to Google Earth

Test user data

- **Test data of Austrian skiing region Lech**
  - projection: WGS84 (EPSG:4326)
  - OpenStreetMap WMS
  - winter orthophoto
    - GeoTiff, 20cm resolution, 4.5GB
    - KML Tile Cache
  - ski lifts, ski slopes, cable cars and POIs
    - KML
    - Shapefile
  - elevation (ASTER)
    - GeoTiff, ~30m resolution, 445MB

- **created by NASA's Learning Technologies project**
  - now developed by NASA staff and open source community developers

NASA World Wind Java SDK

- **virtual globe SDK**
  - Java application or applet
  - different from NASA World Wind .Net

- **no central application combining all features**

- **lots of example applications for different features**
  - "The goal is 100s of World Winds, not one"

- **no installation**
  - JAVA Web Start
  - applet embedded in website

NASA World Wind Java SDK

- **User data**
  - Demo applications (GUI)
    - WMS
    - Shapefiles (polygons only)
  - Engine
    - WMS
    - World Wind TileService
    - Raster
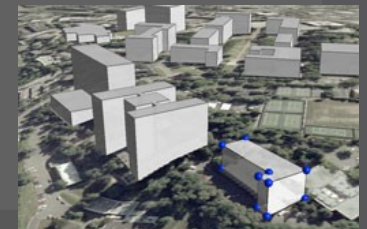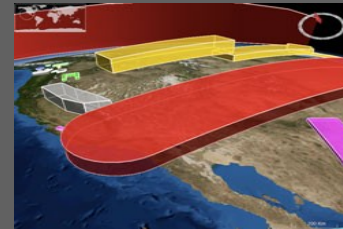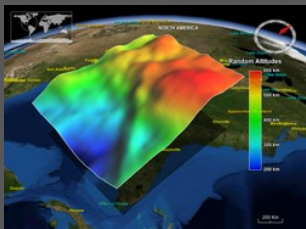   - Vector
    - Elevation using World Wind Server
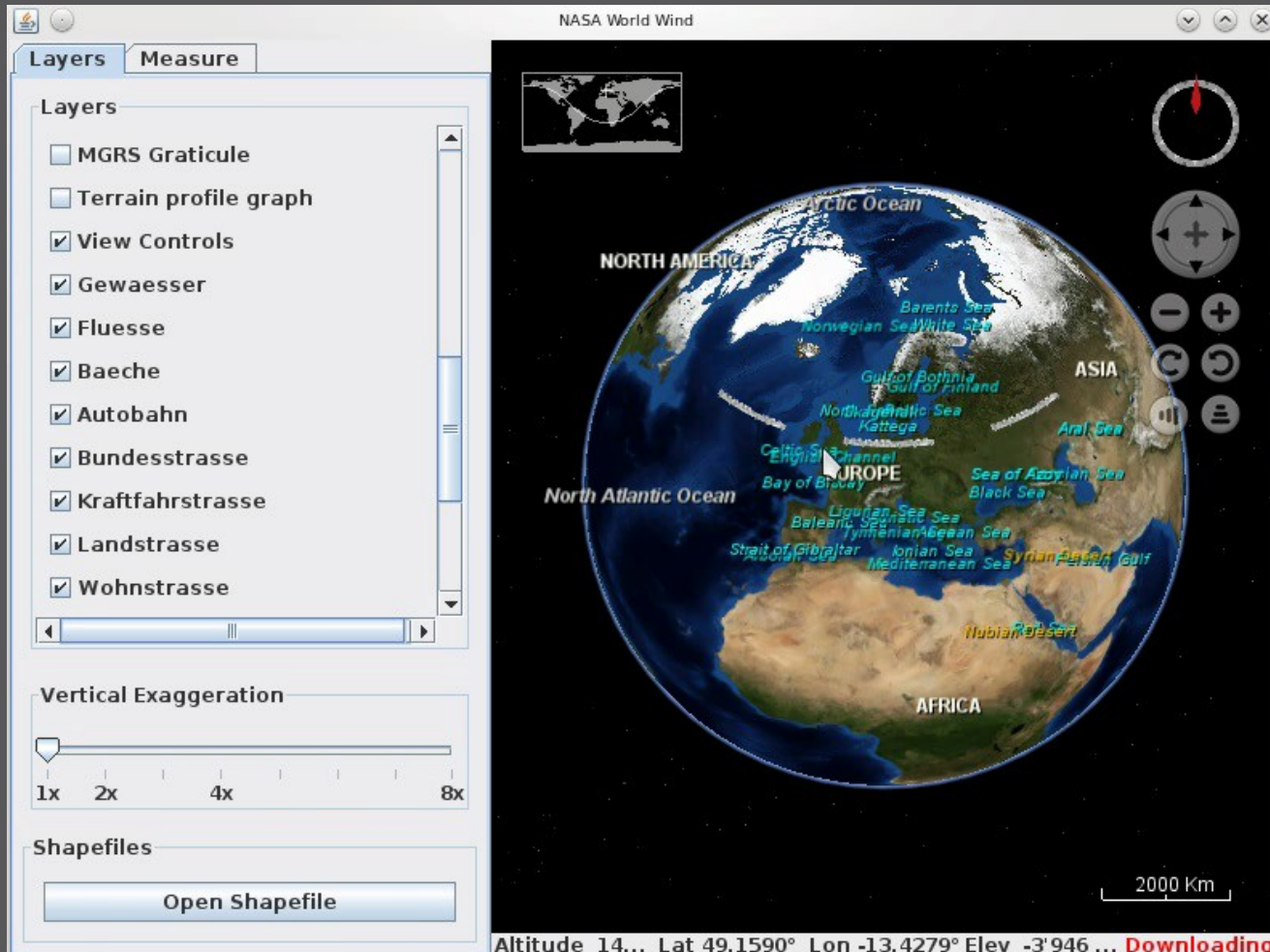   - 3D models

NASA World Wind Java SDK

> **Features**
>> Stars
>> Atmosphere
>> Analytic surfaces
>> Terrain profiler
>> Multimedia annotations
>> Surface objects
>> Surface graticules
>> Airspaces and builder
>> OGC Catalog Service support
>> Runtime statistics

Comparison of Open Source Virtual Globes

NASA World Wind Java SDK

> **Example projects**
>> GeoWind: GeoTools OGC integration
>> JsatTrack: satellite tracking
>> Geoscience Australia's World Wind Viewer
>> many more

> **Links**
>> http://worldwind.arc.nasa.gov/java/demos/
>> http://worldwindcentral.com/wiki/Java
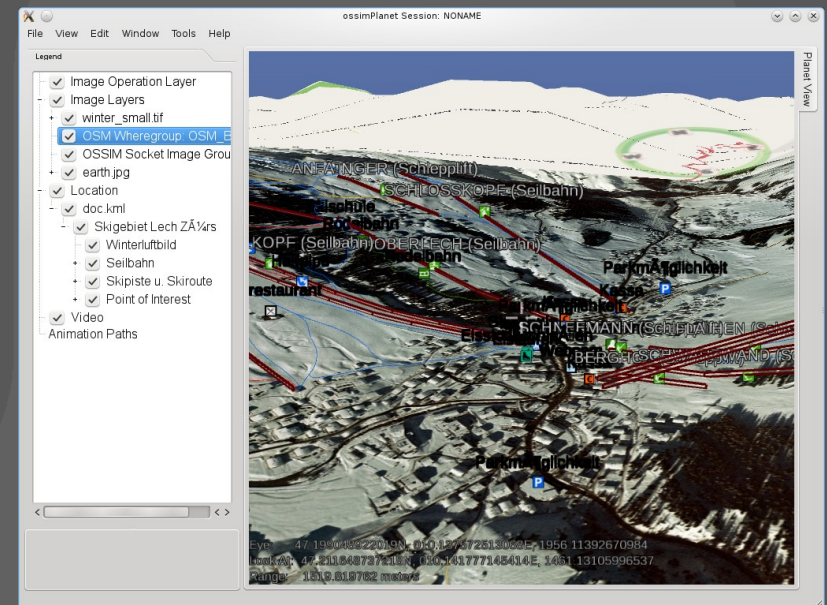
NASA World Wind Java SDK

> **Demo movie**

ossimPlanet

> **OSSIM advanced geo-spatial image processing**

> **OpenSceneGraph based renderer with OSSIM capabilites**

> **Installation**
>> UbuntuGis repositories[1]
>> Windows / Mac installers

ossimPlanet

- **User data**
  - WMS
  - Raster
    - ossim image formats
    - GDAL formats
  - Vector
    - KML
  - Elevation
    - config file
    - ossim data format

ossimPlanet

- **Features**
  - Sessions
  - Ephemeris
  - Remote collaboration
  - Animation path recording
  - Layer operations
    - opacity
    - swipe
    - difference
  - Ruler

ossimPlanet
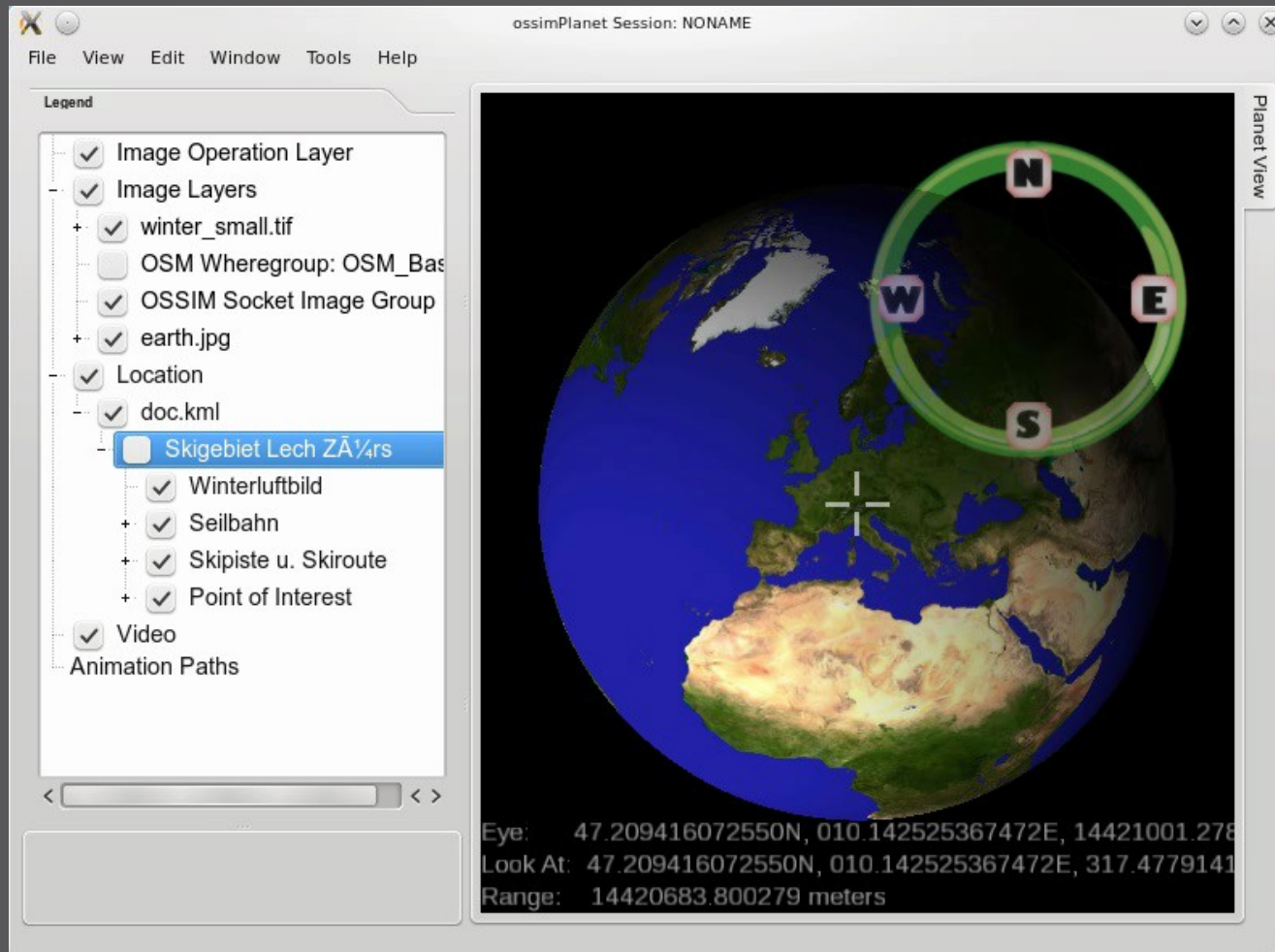
- **Projects**
  - QGIS plugin
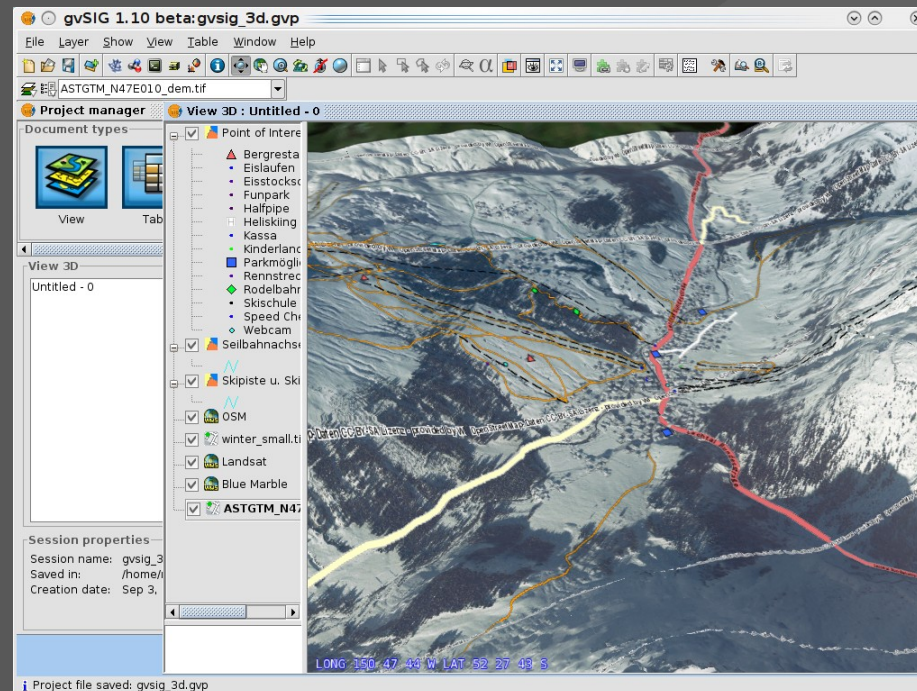   - synchronize QGIS map with planet scene

- **Links**
  - http://www.ossim.org/OSSIM/ossimPlanet.html

ossimPlanet

> **Demo movie**

gvSIG 3D

> **3D extension for gvSIG**

> **osgVirtualPlanets standalone framework**

> **Installation**
> > installers from gvSIG website

gvSIG 3D

- **User data**
  - gvSIG supported formats
    - OGC
    - Raster
    - Vector
    - Elevation
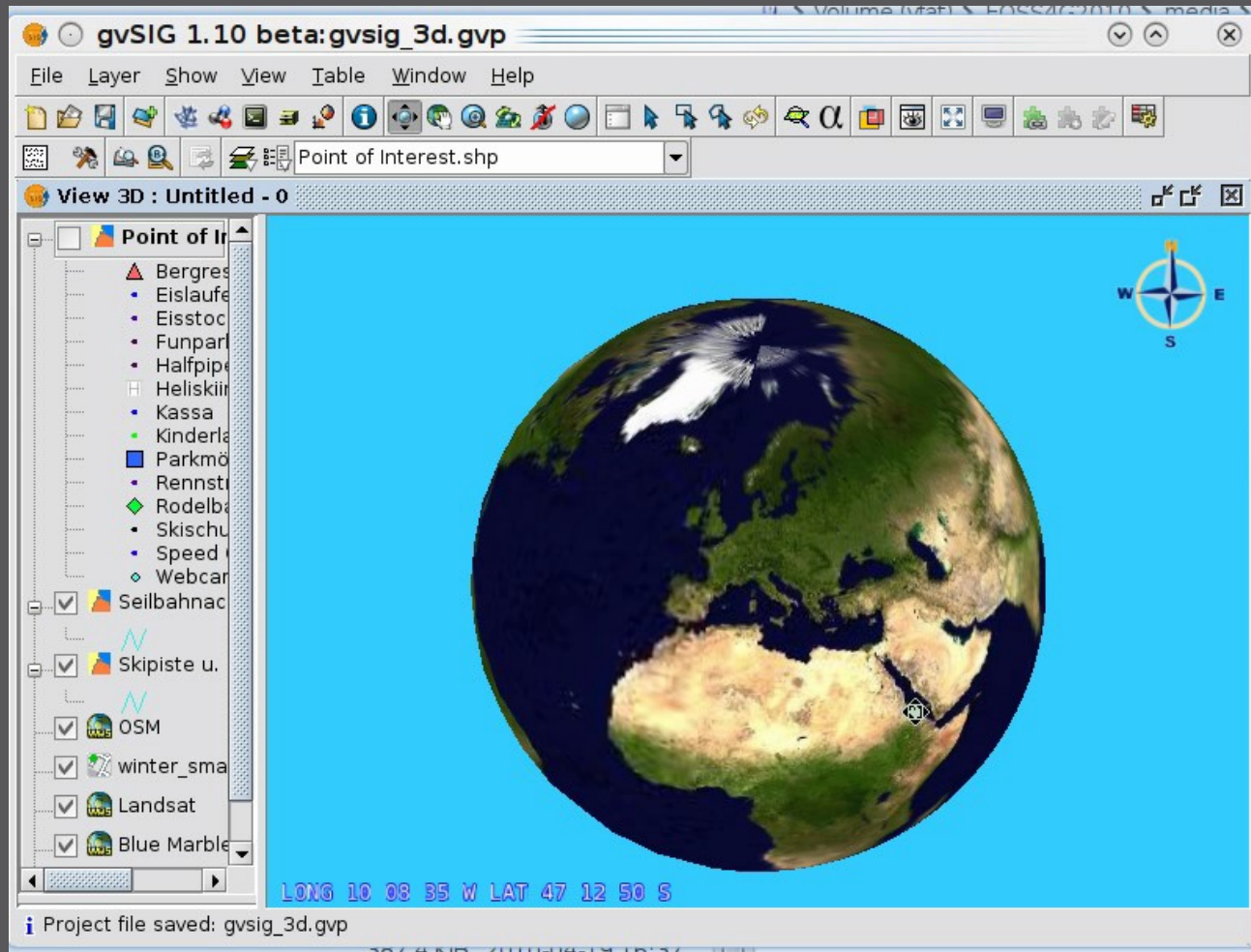 - 3D models
    - OSG

gvSIG 3D

- **Features**
  - full integration into gvSIG desktop GIS
    - data styling
    - data editing
  - 3D models
    - move, rotate, scale
  - animation paths
  - stereo view
  - spherical / flat projection
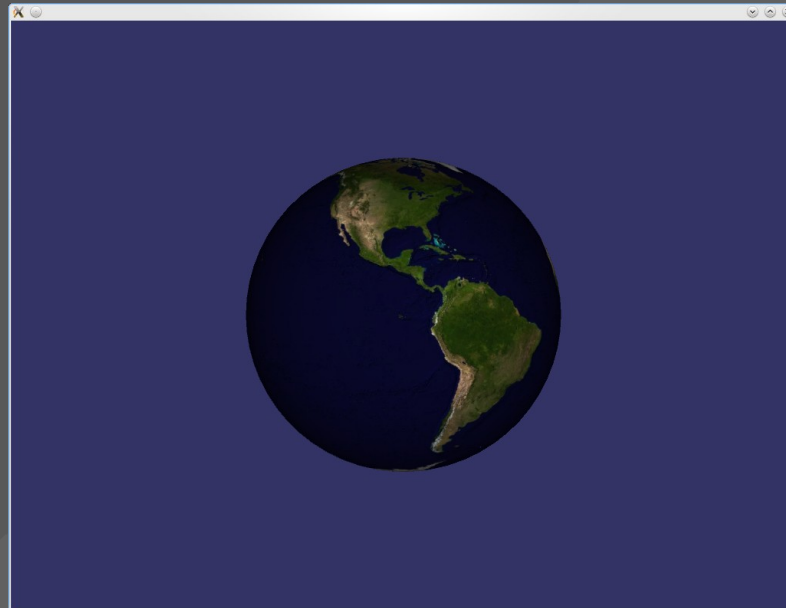
Links

- http://www.gvsig.org
- http://gvsig.org/web/projects/gvsig-desktop/devel/gvsig-3d
- http://gvsig.org/web/projects/gvsig-commons/osgvp
- http://gvsig3d.blogspot.com/

> **Demo movie**

> **scalable terrain rendering toolkit for OpenSceneGraph**
>> developed and maintained by Pelican Mapping

> **Installation**
>> UbuntuGis repositories[1]
>> Windows / Mac build from source only

- **User data using config file**
  - Raster / elevation
    - WMS / WMS-T / WCS / TMS
    - GDAL
    - MetaCarta TileCache
    - NASA World Wind TileService
    - ArcGIS
  - Vector
    - OGR (geometry with offset / draped)
    - AGGLite feature-rasterizing image driver
  - 3D models
    - OSG
  - Virtual Planet Builder (VPB) terrain database

Features

- Renderer only
- Drape vector data on the terrain
- Reproject data on the fly
- Optimized VirtualPlanetBuilder terrains

osgEarth

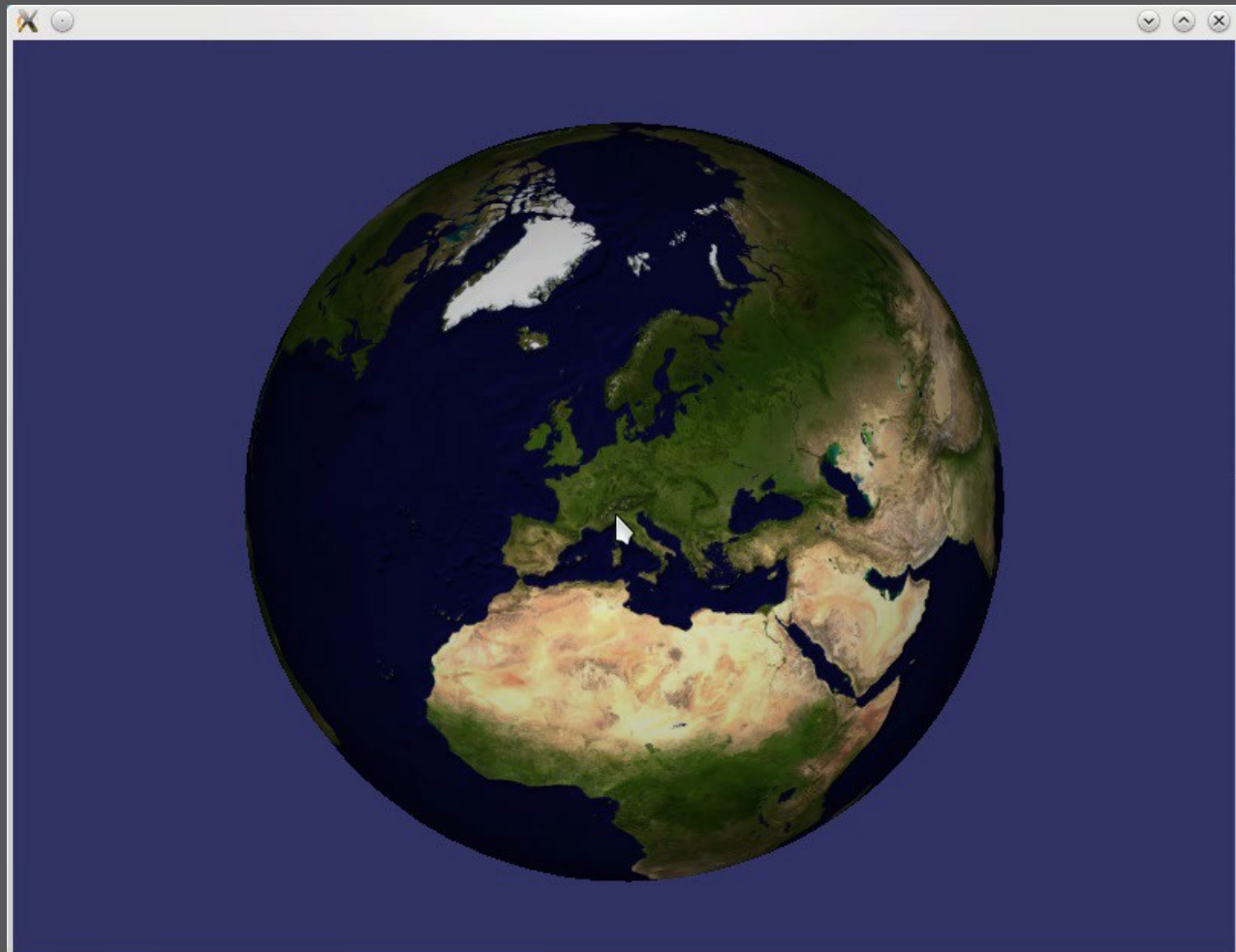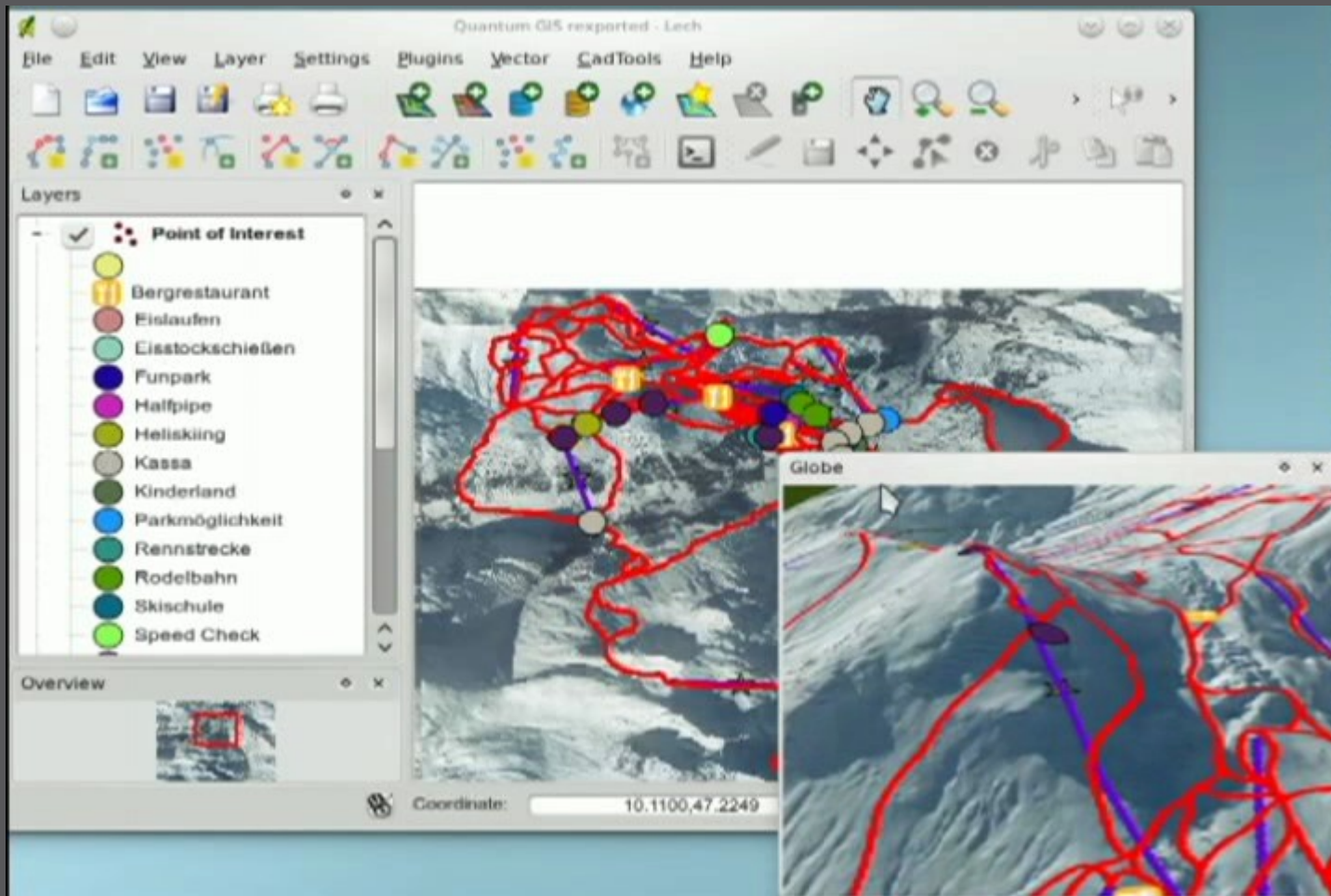- **Projects**
  - QGIS plugin
    - render QGIS map canvas on globe

- **Links**
  - http://osgearth.org/

> Demo movie
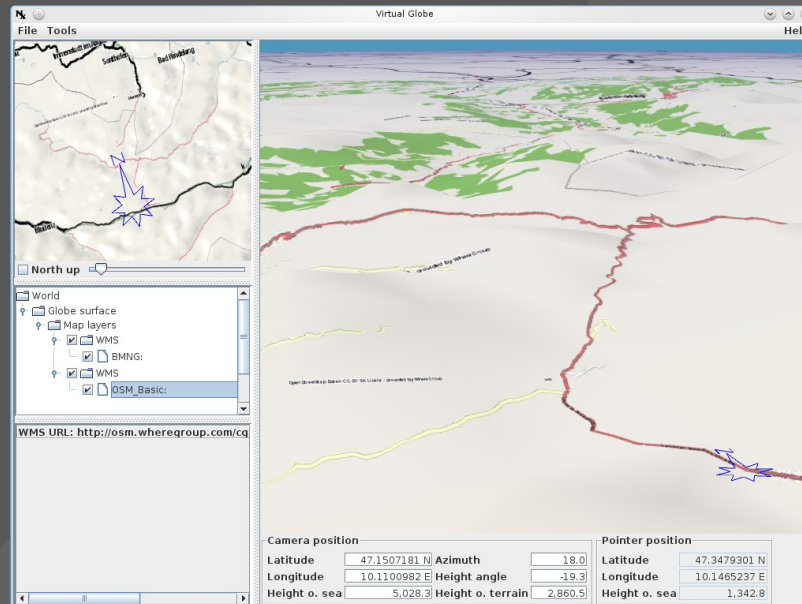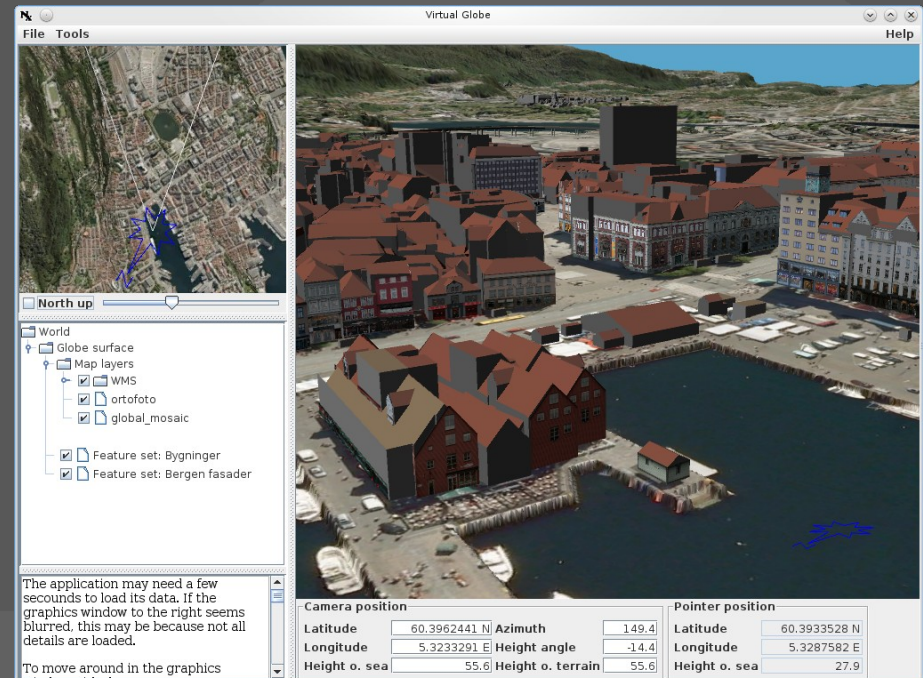
> **QGIS plugin demo movie**

- **initially developed by SINTEF (largest independent research organisation in Scandinavia) (2001)**
  - acquired by Norkart Geoservice (2006)

- **no installation**
  - Java Web Start

User data using config file
- WMS
- 3D models
  - VRML
  - X3D
  - levels of detail
- Billboards
- Viewpoints
- Flight paths

Norkart Virtual Globe

- **Features**
  - Project files
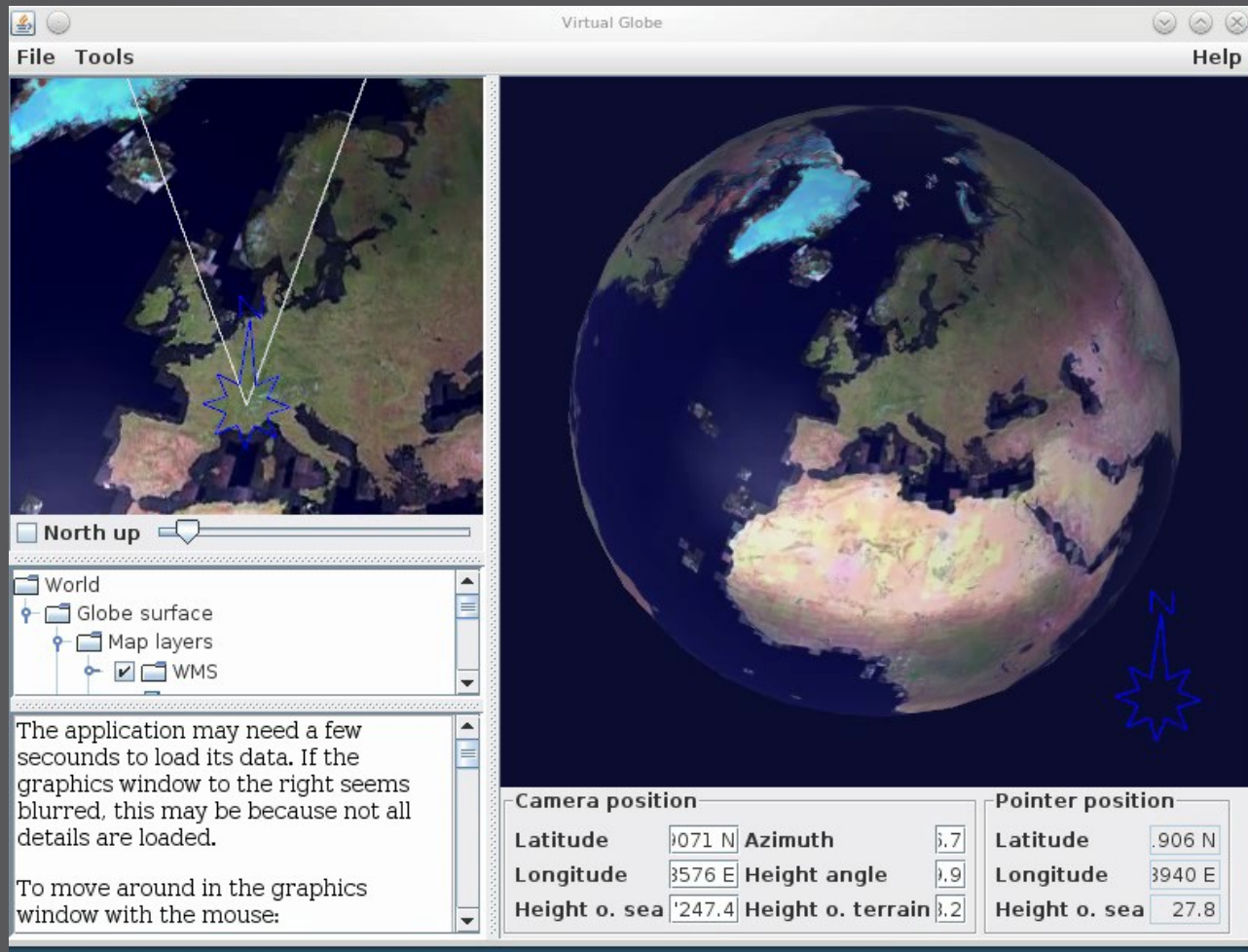 - Animation paths
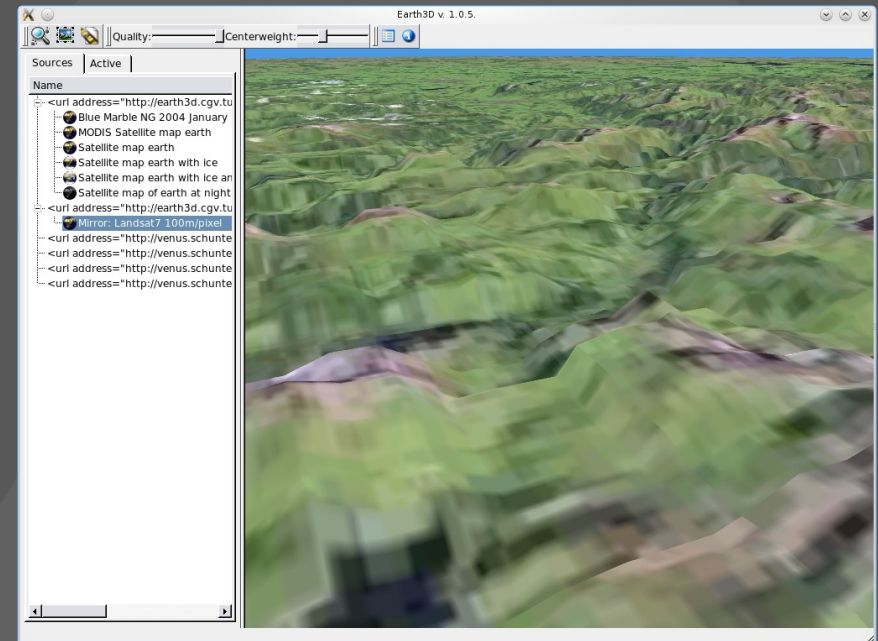 - Viewpoints
  - Placename search

- **Links**
  - http://www.virtual-globe.info/

> **Demo movie**

Earth3D

- **Diploma thesis of Dominique Andre Gunia at Braunschweig University of Technology**
  - Earth3D application
  - Earth3D library

- **Installation**
  - Ubuntu package
  - Windows / Mac installer
  - Java Web Start

Earth3D

- **User data**
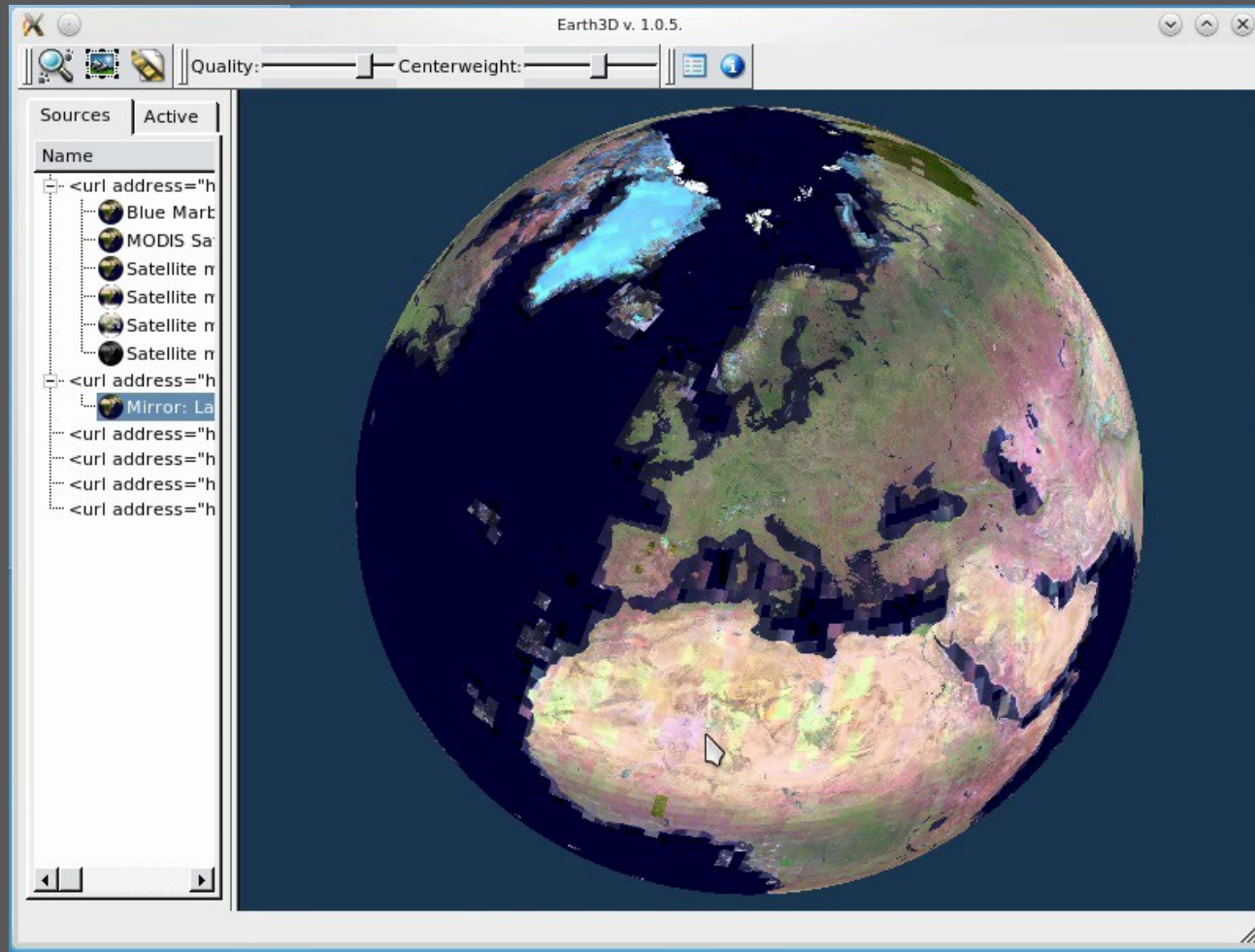 - preprocessing using server software only

- **Features**
  - Marketplace
  - Screenshot
  - Capture movie

- **Links**
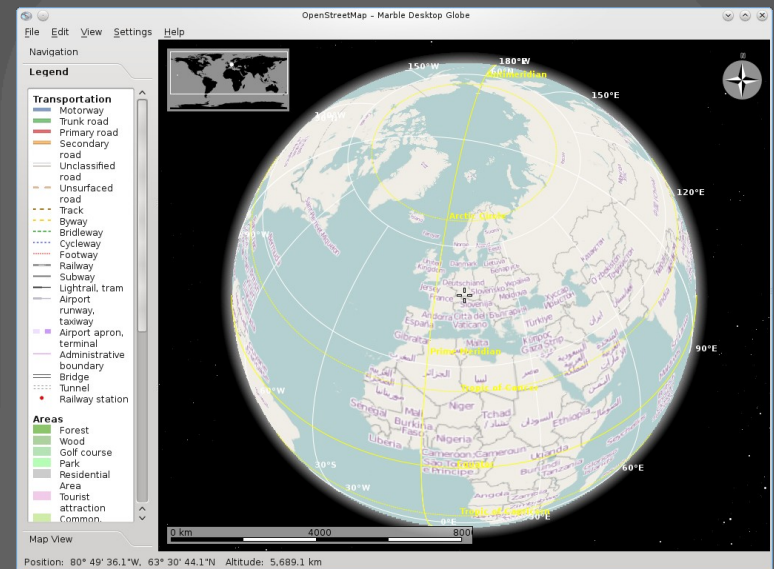 - http://www.earth3d.org/

Earth3D

> **Demo movie**

Marble
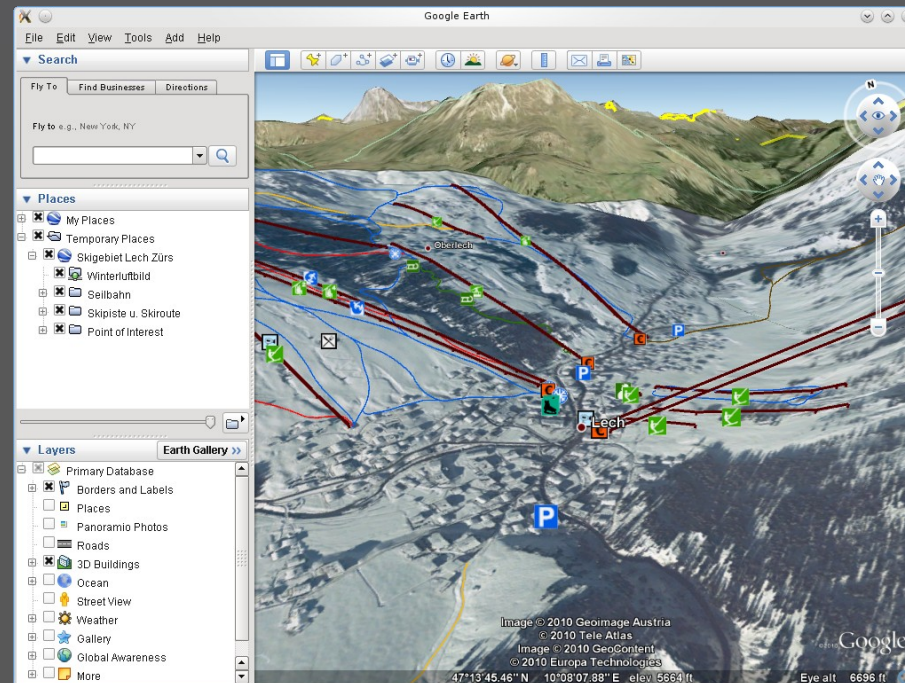
- **KDE Education Project**
  - Marble Desktop Globe
  - Marble Widget

- **limited virtual globe**
  - fixed top-down view, no camera rotation
  - no elevation data
  - not 'real' 3D

- **Installation**
  - Linux Package
  - Windows / Mac installer

- **Links**
  - http://edu.kde.org/marble/

Google Earth

> **Virtual Globe reference application**

> **Links**
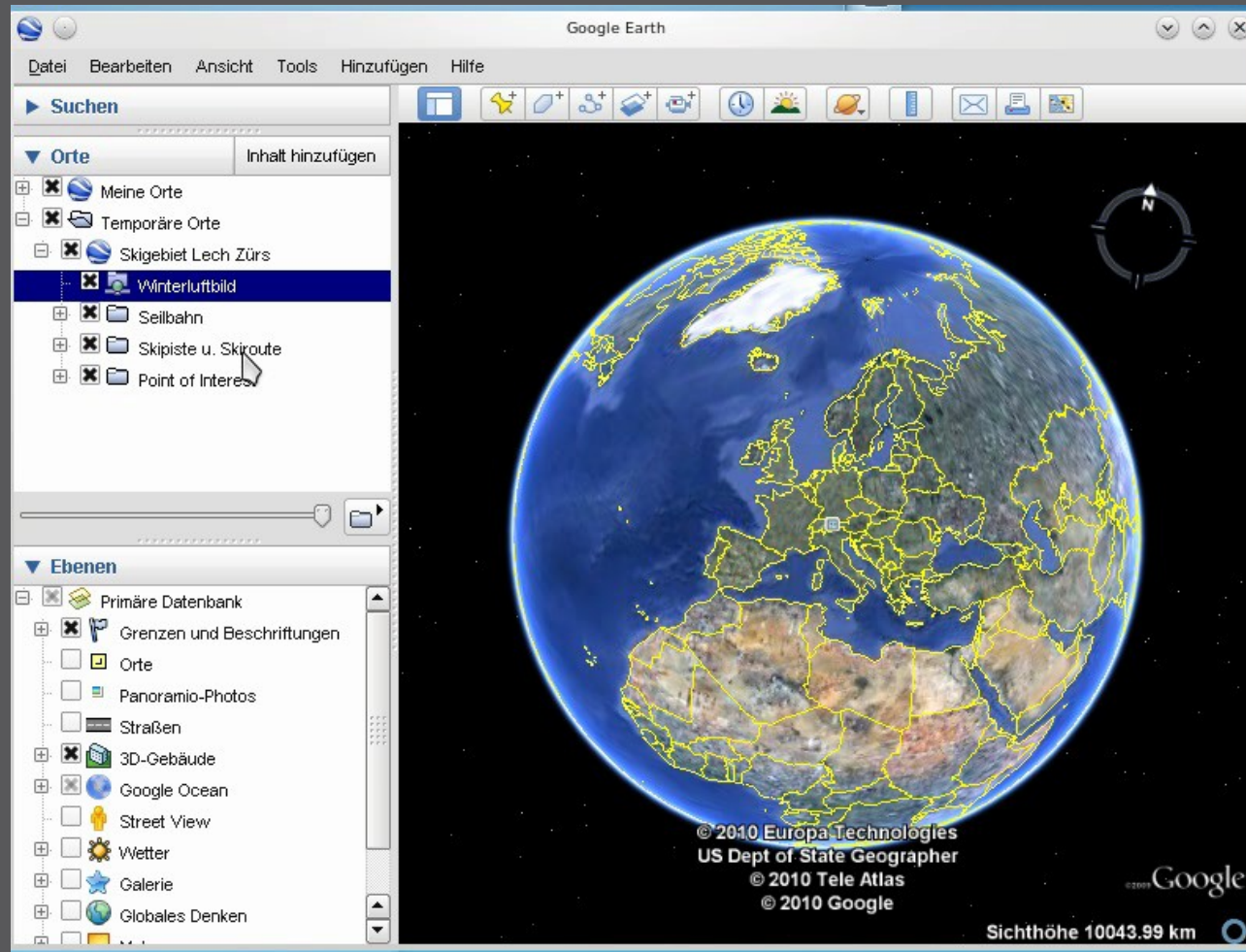>> http://earth.google.com

Google Earth

- **Advantages**
  - huge amount of default data
  - user data
    - Raster KML (image/TileCache)
    - Vector KML
    - 3D models (KML/COLLADA)
    - WMS as image overlay
  - multi-platform
  - does not require 3D hardware
  - features
    - search
    - routing
    - web infos

Google Earth

> **Limitations**
>> closed source
>> no plugins, only mashups
>> limited data usage permissions
>> user data
>>> no elevation

> **Demo movie**

› Adding user data

	WMS	Raster	Vector	Elevation	3D models
NASA World Wind Java SDK	🟩	🟩	🟩	🟨	🟩
ossimPlanet	🟩	🟩	🟩	🟨	
gvSIG 3D	🟩	🟩	🟩	🟩	🟩
osgEarth	🟩	🟩	🟩	🟩	🟩
Norkart Virtual Globe	🟩	🟩			🟩
Earth3D		🟨		🟨	
KDE Marble					
Google Earth	🟩	🟩	🟩		🟩

Comparison

Technology

	Language	Rendering	GIS	GUI
NASA World Wind Java SDK	Java	JOGL (OpenGL)		
ossimPlanet	C++	OSG (OpenGL)	ossim GDAL/OGR	Qt
gvSIG 3D	C++ Java	OSG / JOGL (OpenGL)	gvSIG GDAL/OGR	
osgEarth	C++	OSG (OpenGL)	GDAL/OGR	
Norkart Virtual Globe	Java	JOGL (OpenGL)		
Earth3D	C++ / Java	OpenGL / JOGL		Qt
KDE Marble	C++			Qt
Google Earth	C++ (?)	OpenGL DirectX		

Desired Virtual Globe features

- **Adding user data**
  - support standard formats
    - OGC, GDAL/OGR, KML
  - minimize preprocessing
    - reproject on the fly
  - place models
    - move, rotate, scale
  - caching

- **Data styling**
  - colors
  - visibility ranges
  - opacity

Desired Virtual Globe features

> **Navigation**
>> GUI elements
>> intuitive mouse handling
>> move to dataset
>> viewpoints

> **GIS tools**
>> 3D measurements
>> terrain profiling

> **Image and movie export**
>> animation paths

Links

> **[1] UbuntuGis repositories for ossimPlanet and osgEarth**

> > https://launchpad.net/~ubuntugis/+archive/ppa

> > https://launchpad.net/~ubuntugis/+archive/ubuntugis-unstable

> **Test data**

> > KMZ

> > > http://www.winterbergbahnen.at/3dwinter/KMZ/23_Lech_Zuers.kmz

> > WMS

> > > http://osm.wheregroup.com/cgi-bin/osm_basic.xml?

> > ASTER DEM

> > > http://asterweb.jpl.nasa.gov/gdem.asp

Thank you!

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