

## Lecture 3.2. Topography databases.

Photogrammetry

Synthetic aperture radar

Bathymetry converted from satellite altimetry  
gravity

Gravity associated heights

Levelling/GPS

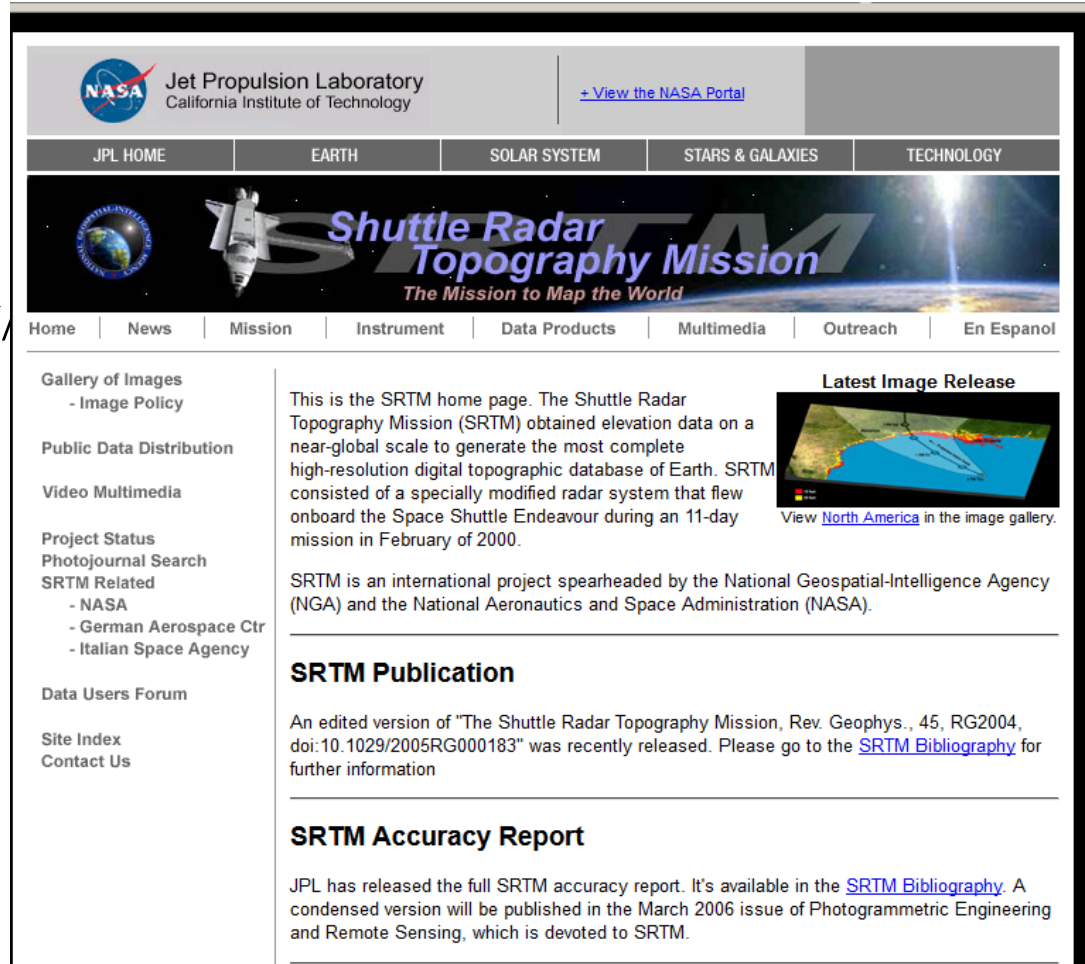
Airborne LIDAR

## Topography databases.

- Photogrammetry
- GRAVSOF example: data/nmdtm
- 31.49166667 34.98333333 -107.99166667 -105.00000000 0.00833333  
0.00833333 2290 2290 2330 2320 2230 2190 2290 2270 2240 2160  
2080 2070 2050 2020 2020 2010 2010 2010 2010 2010 2010 2010  
2010 2010 2020 2040 2080 2130 2130 2130 2100 2080 2070 2060  
2050 2030 2020 2010 2010 2010 1940 1990 1940 1950 1950 1950  
1950 1980 1980 1950 1910 1880 1880 1920 2040 1990 1880 1870  
1850 1830 1830 1830 1830 1820 1870 1880 1880 1900 1890 1890  
1850 1840 1890 1890 1890 1890 1870 1810 1770 1770 1750 1740  
1730 1710 1710 1710 1710 1710 1700 1700 1700 1700 1690 1690  
1690 1690 1690 1690 1690 1700 1700 1700 1700 1700 1710 1710  
1700 1700 1710 1710 1710 1710 1680 1670 1660 1650 1650 1660  
1670 1680 1650 1630 1610 1600 1600 1590 1580 1580 1590 1600  
1620 1630 1640 1660 1690 1740 1730 1710 1710 1700 1680 1660  
1650 1650 1650 1650 1640 1650 1630 1590 1570 1540 1510 1490  
1490 1490 1490 1490 1490 1490 1530 1580 1620 1610 1620 1620  
1600 1600 1600 1610 1610 1620 1620 1630 1640 1650 1670 1690

# Topography databases: SRTM.

http://  
www2.jpl.nasa.gov/  
Only topography !



The screenshot shows the homepage of the Shuttle Radar Topography Mission (SRTM). At the top, there is a NASA logo and the text "Jet Propulsion Laboratory California Institute of Technology" with a link to "View the NASA Portal". Below this is a navigation bar with links for "JPL HOME", "EARTH", "SOLAR SYSTEM", "STARS & GALAXIES", and "TECHNOLOGY". The main banner features the SRTM logo and the text "Shuttle Radar Topography Mission The Mission to Map the World". Below the banner is a secondary navigation bar with links for "Home", "News", "Mission", "Instrument", "Data Products", "Multimedia", "Outreach", and "En Espanol". The left sidebar contains links for "Gallery of Images - Image Policy", "Public Data Distribution", "Video Multimedia", "Project Status", "Photojournal Search", "SRTM Related" (with links to NASA, German Aerospace Ctr, and Italian Space Agency), "Data Users Forum", "Site Index", and "Contact Us". The main content area includes a "Latest Image Release" section with a thumbnail of North America and a link to "View North America in the image gallery.", a "SRTM Publication" section with a link to "SRTM Bibliography", and a "SRTM Accuracy Report" section with a link to "SRTM Bibliography".

# Topography databases: SRTM PLUS.

[http://  
topex.ucsd.edu/  
WWW\\_html/  
srtm30\\_plus.html](http://topex.ucsd.edu/WWW_html/srtm30_plus.html)

Topography and  
bathymetry.

Scripps Institution Of Oceanography, University of California San Diego, 9500 Gilman Drive, La Jolla, 92093-0225

GLOBAL TOPOGRAPHY

**SRTM30\_PLUS: SRTM30, COASTAL & RIDGE MULTIBEAM, ESTIMATED TOPOGRAPHY**

**NEW!** [SRTM30\\_PLUS V8.0 Bathymetry used in Google Earth and Google Maps](#) February 2, 2012

**NEW!** [FTP SRTM30\\_PLUS\\_entire\\_grid\\_V8.0](#) October 23, 2012

**NEW!** [Get Overlays Google Earth\\_V8.0](#) October 23, 2012

**NEW!** [Get ASCII XYZ-file\\_region\\_V8.0](#) October 23, 2012

**OLD** [SRTM30\\_PLUS Bathymetry used in Google Earth V5.0 and Google Maps](#) February 2, 2008

Reference, sounding data: [Becker, J. J., D. T. Sandwell, W. H. F. Smith, J. Braud, B. Binder, J. Depner, D. Fabre, J. Factor, S. Ingalls, S-H. Kim, R. Ladner, K. Marks, S. Nelson, A. Pharaoh, R. Trimmer, J. Von Rosenberg, G. Wallace, P. Weatherall, Global Bathymetry and Elevation Data at 30 Arc Seconds Resolution: SRTM30\\_PLUS, Marine Geodesy, 32.4, 355-371, 2009.](#)

Reference, gravity data: [Sandwell, D. T., and W. H. F. Smith, Global marine gravity from retracted Geosat and ERS-1 altimetry: Ridge Segmentation versus spreading rate, J. Geophys. Res., 114, B01411, doi:10.1029/2008JB006008, 2009](#)

This data consists of 33 files of global topography in the same format as the [SRTM30](#) products distributed by the USGS EROS data center. The grid resolution is 30 second which is roughly one kilometer. In addition the global data are also available in a single large file ready for GMT.

**Land data** are based on the 1-km averages of topography derived from the USGS SRTM30 grided DEM data product created with data from the [NASA Shuttle Radar Topography Mission](#). [GTOPO30](#) data are used for high latitudes where SRTM data are not available.

**Ocean data** are based on the Smith and Sandwell global 1-minute grid between latitudes +/- 81 degrees. Higher resolution grids have been added from the [LDEO Ridge Multibeam Synthesis Project](#), the [JAMSTEC Data Site for Research Cruises](#), and the [NGDC Coastal Relief Model](#). Arctic bathymetry is from the International Bathymetric Chart of the Oceans ([IBCAO](#)) [Jakobsson et al., 2003].

The pixel-registered data are stored in 33 files with names corresponding to the upper left corner of the array shown below. The data are also merged into a single large (1.9 Gbyte, 2-byte integer) file as well as smaller 1-minute and 2-minute netcdf versions. Matching files of source identification number are available for determining the data source for every pixel.

**Quick Contents:**

> [FTP SRTM30\\_PLUS from Sandwell Lab digital grided data](#)

**Interactive Maps**

The map below has been sectioned into 33 clickable regions. Clicking on a particular region will open a new window showing the zoomed in region in more detail.

# Bathymetry from satellite gravity

[https://  
scripps.ucsd.edu/  
news/1871](https://scripps.ucsd.edu/news/1871)

<http://>

[www.space.dtu.dk/](http://www.space.dtu.dk/)

[english/Research/  
Scientific\\_data\\_  
and\\_models/  
Global\\_  
Bathymetry\\_  
Model](http://www.space.dtu.dk/english/Research/Scientific_data_and_models/Global_Bathymetry_Model)



The screenshot shows a web browser displaying a news article from the Scripps Institution of Oceanography. The browser's address bar shows the URL <https://scripps.ucsd.edu/news/1871>. The page header includes the Scripps Institution of Oceanography logo and navigation links for ABOUT, NEWS, RESEARCH, EDUCATION, SHIPS, RESOURCES AND FACILITIES, GIVING, and PEOPLE. The article title is "Google Earth Ocean Terrain Receives Major Update", dated Feb 02, 2012. The sub-headline reads: "Data from Scripps, NOAA sharpen resolution of seafloor maps, correct 'discovery' of Atlantis". A media contact box lists Robert Monroe with phone and email details. Below is a bathymetric map of the seafloor showing depth variations in shades of blue and green. The article text discusses the update to Google Earth's ocean data, mentioning that it reflects new bathymetry data from Scripps, NOAA, and other groups. It also notes that the newest version of Google Earth includes more accurate imagery and that the original version had many errors.

Google Earth Ocean Terrain Receives Major Update

Data from Scripps, NOAA sharpen resolution of seafloor maps, correct "discovery" of Atlantis

Feb 02, 2012

Media Contact: Robert Monroe | Phone: 858-534-3624 | Email: [scrippsnews@ucsd.edu](mailto:scrippsnews@ucsd.edu)



Internet information giant Google updated ocean data in its Google Earth application this week, reflecting new bathymetry data assembled by Scripps Institution of Oceanography, UC San Diego, NOAA researchers and many other ocean mapping groups from around the world.

The newest version of Google Earth includes more accurate imagery in several key areas of ocean using data collected by research cruises over the past three years.

"The original version of Google Ocean was a newly developed prototype map that had high resolution but also contained thousands of blunders related to the original archived ship data," said David Sandwell, a Scripps geophysicist. "UCSD undergraduate students spent the past three years identifying and correcting the

## Gravity databases.

- Example: file data/nmfa

```
9667 34.8053 -107.7366 2385.0 39.40
9665 34.7906 -107.6903 2338.0 36.90
9666 34.8006 -107.6433 2230.0 27.10
9597 34.7856 -107.4538 1776.0 6.20
9598 34.8108 -107.0291 1558.0 -44.00
9563 34.8073 -106.8906 1627.0 -37.00
9562 34.8134 -106.7583 1508.0 -51.20
9561 34.8083 -106.7333 1488.0 -53.30
9560 34.7976 -106.5864 1594.0 -44.50
9516 34.8104 -106.3288 2294.0 79.20
9513 34.7973 -106.2529 2049.0 46.50
9515 34.8121 -106.1481 1919.0 14.10
9514 34.8119 -106.0781 1881.0 5.90
```

## Topography databases.

GPS/  
levelling:

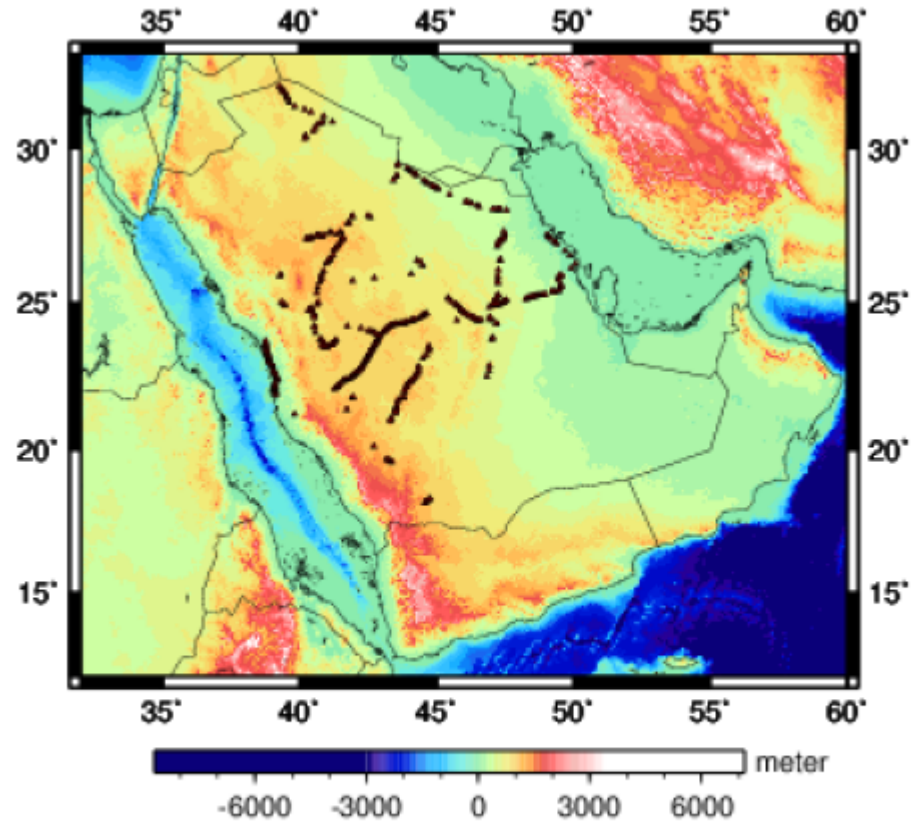
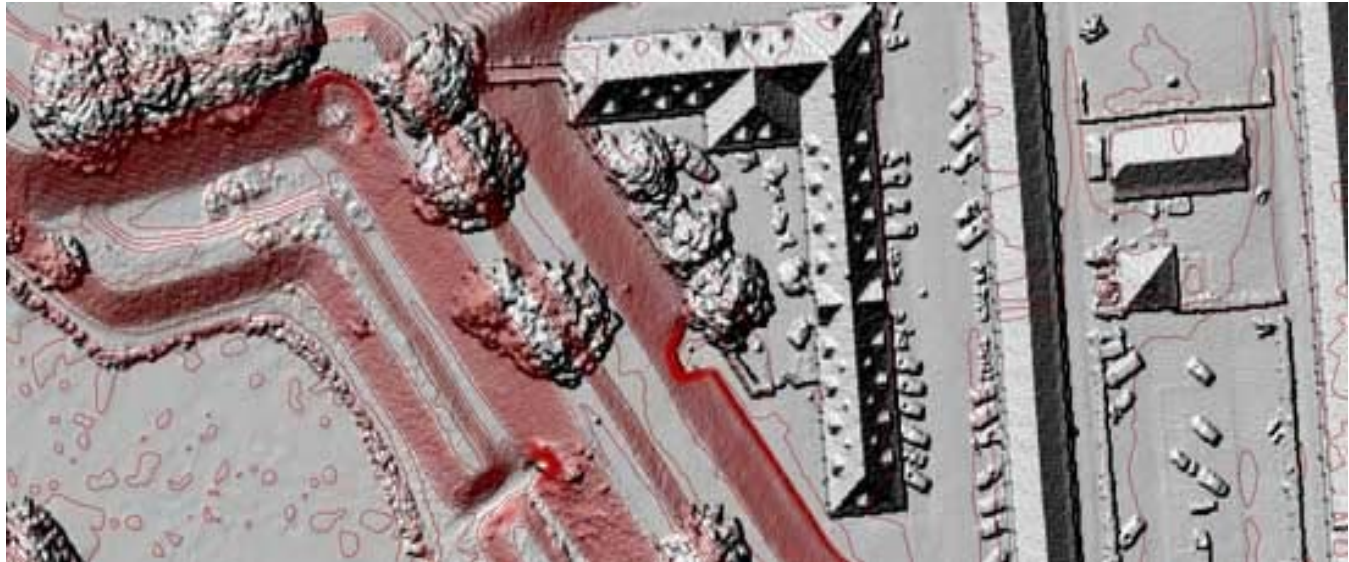


Figure 2: Location of the GPS/BM stations used in the test campaign (T campaign). The topography and bathymetry are shown as well.

## Topography databases, LIDAR.



**<http://www.niras.dk/Forretningsomraader/Kortlaegning/Opmaaling-fra-fly/Laserscanning.aspx>**