

Mapping Toolbox 2.1

Analyze and visualize geographic information

The Mapping Toolbox provides a comprehensive set of functions and graphical user interfaces for building map displays and performing geospatial data analysis in MATLAB. You can create map displays that combine data from multiple modalities and display them in their correct spatial relationships. The toolbox supports standard analyses, such as line-of-sight calculations on terrain data or geographic computations that account for the curvature of the Earth's surface. Most of the functions in the Mapping Toolbox are written in the open MATLAB language. This means that you can inspect the algorithms, modify the source code, create your own custom functions, and automate frequently performed tasks.

The toolbox supports key mapping and geospatial data analysis, manipulation, and visualization tasks that are useful in applications such as earth and planetary scientific research, oil and gas exploration, environmental monitoring, insurance risk management, aerospace, defense, and security.

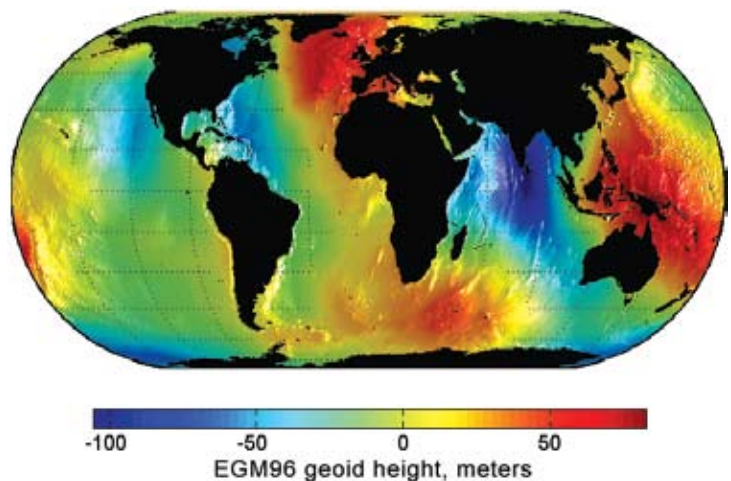
Importing Map and Geospatial Data

The Mapping Toolbox supports a wide range of standard GIS and geospatial formats, as well as specific data products and simple ad-hoc data files. You can work with vector map data as simple coordinate vectors (X-Y or latitude-longitude) or data structures that include nonspatial properties and attributes. The toolbox supports georeferenced imagery and other raster data grids, including orthoimagery, satellite swath data, digital terrain elevation models, and various global data grids.



KEY FEATURES

- Imports data from standard formats and specific data products
- Organizes, extracts, combines, and otherwise manipulates map data
- Includes more than 60 of the most popular and important map projections
- Creates 2-D and 3-D map displays
- Analyzes map and geospatial data
- Displays and analyzes terrain data

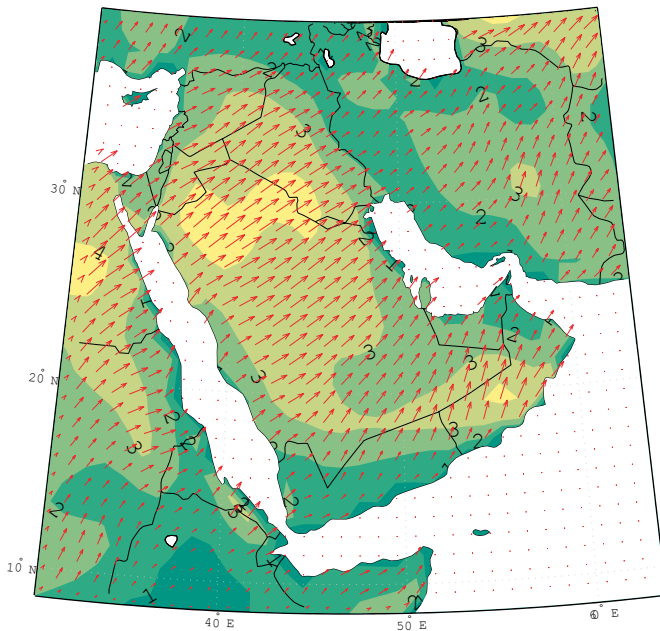


MATLAB display of an EGM96 geoid height raster with lighting and shading in ocean areas and a vector mask in land areas. With the Mapping Toolbox, you can create displays with vector and raster data in more than 60 different map projections.

Supported file formats and data products include:

- Standard file formats, such as ESRI shapefiles, GeoTIFF, Arc ASCII Grid, worldfiles, and SDTS raster profile
- Gridded terrain and bathymetry data, such as USGS DEM, NIMA DTED, and GTOPO30
- Vector map products, such as VMAP0, DCW, TIGER, and GSHHS

Wind velocity vectors and wind speed contours at a height of 10 meters, created from Global Data Sets for Land-Atmosphere Models, ISLSCP Initiative 1, NASA Goddard DAAC Science Data Series.



Organizing and Manipulating Map and Geospatial Data

The Mapping Toolbox helps you organize and manipulate map and geospatial data for map displays and computational analyses. Toolbox functions for handling vector coordinate data let you:

- Extract structure fields and coordinates from variables in the MATLAB workspace and from ESRI shapefiles
- Increase (interpolate) or reduce the density of points in coordinate vectors
- Convert among units and formats for length, angle, and time
- Split, merge, or join line and polygon segments
- Trim vector data to a specific region

- Compute line or polygon intersection points
- Compute buffer zones

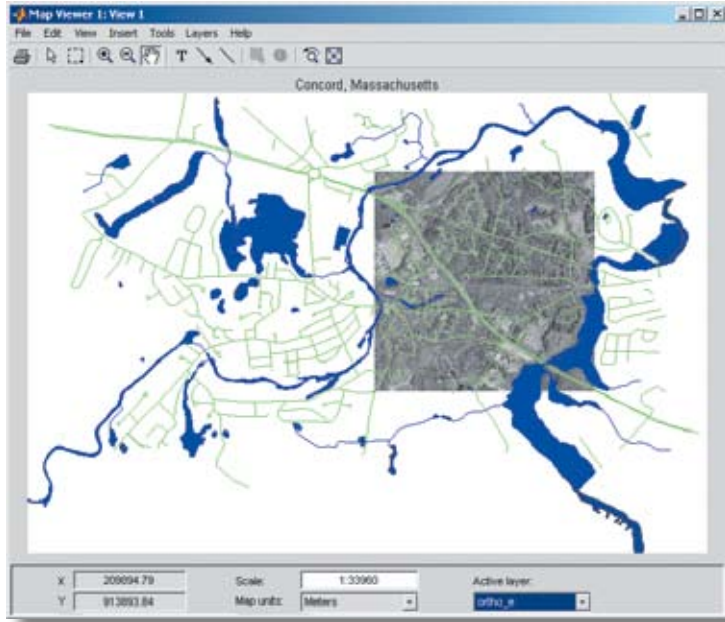
With Mapping Toolbox functions for handling georeferenced imagery and gridded data, you can:

- Convert subscripts of data arrays and images to or from absolute geographic or map coordinates
- Convert geolocated data arrays to or from regular data grids
- Trim data to a specific region
- Resize or resample data grids and images

Projecting Map and Geospatial Data

The Mapping Toolbox contains more than 60 of the most popular and important map projections, including equal-area, equidistant, conformal, and compromise projections in the cylindrical, conic, and azimuthal classes. It also supports projections in the popular PROJ.4 library. Specific support is included for the UTM/UPS systems. Many projections support both spherical and ellipsoidal models of the Earth and other bodies.

With the Mapping Toolbox, you can apply forward and inverse transformations of positions and direction angles or azimuths. You can also explore the properties of your projection by calculating distortion parameters at a point or visualizing map distortions as Tissot Indicatrices or as scale-distortion contours.



Display of vector and image data for Concord, Massachusetts. The interactive Map Viewer includes coordinate and scale readouts; panning, zooming, and other navigational controls; annotation tools; and easy management of multiple map layers, including order, visibility, and symbolization.

Displaying Map and Geospatial Data

The Mapping Toolbox includes extensive support for constructing 2-D and 3-D map displays. These can be simple or sophisticated, and can be tuned to your application. You can readily combine data sets of different scales and modalities in the same display. For example, you can display images and data grids in their correct positions—regardless of cell size, pixel size, or area covered—and then overlay vector map features.

With the map display functions in the toolbox, you can:

- Use the interactive Map Viewer and other GUIs to explore your data and modify your maps
- Convert automatically from latitude-longitude to your selected map projection
- Interactively determine mouse positions in latitude-longitude
- Create thematic maps (stem maps, as well as 2-D and 3-D comet and quiver plots)
- Control the latitude-longitude grid and meridian/parallel labels
- Annotate your map with a scale ruler, a north arrow, or contour labels and legends
- Apply special colormaps for contour maps, terrain and bathymetry grids, and political maps
- Specify rules to control the graphic display properties of vector map features based on their nonspatial attributes (for example, display roads as lines using a road class attribute to control line width and color)

Analyzing Map and Geospatial Data

The Mapping Toolbox provides numerous capabilities for geographic analysis, including functions and tools for geometric, navigational, and statistical analysis.

The geometric functions let you:

- Trace a great circle or rhumb line given a starting point, starting direction (azimuth), and distance
- Find the great circle or rhumb line distance or azimuth between two points
- Find intersections between great and small circles
- Use interactive tools to construct tracks and small circles
- Calculate elevation angles, quadrangle areas, and polygon areas

The navigation functions let you:

- Perform dead reckoning and cross-fix positions
- Determine drift velocities and drift-corrected headings
- Use waypoints

The statistics functions let you:

- Convert between latitude-longitude and equal-area coordinates
- Calculate the mean location and standard distance or deviation for collections of points
- Generate histograms for geographic points with equal-area or equirectangular bins

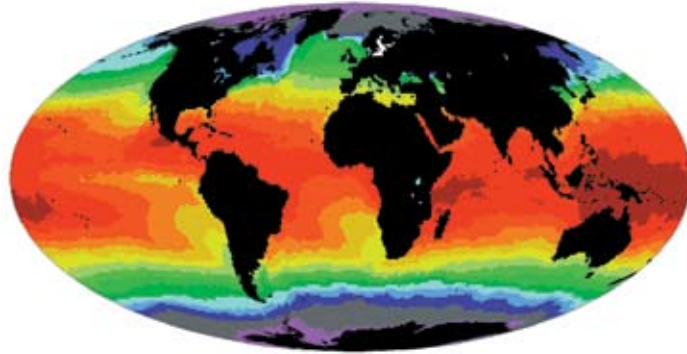
The Mapping Toolbox also lets you analyze georeferenced imagery and gridded data. For example, you can:

- Construct data profiles and cross-sections
- Determine the geographic or map locations of gridded data features, such as extrema and contours
- Determine the geographic or map locations of image features as revealed by algorithms in the Image Processing Toolbox (available separately)

Visualizing and Analyzing Terrain Data

In addition to supporting a variety of gridded terrain and bathymetry formats and data products, the Mapping Toolbox provides the following specialized capabilities for terrain visualization and analysis:

- Elevation profiles
- Perspective views
- Contour maps
- Lighting, shading, and texture-mapping
- Colormaps for terrain and bathymetry
- Gradient, slope, and aspect calculations
- Line-of-sight visibility (point-to-point) and viewshed calculations



AVHRR sea surface temperature product, displayed using a Mollweide equal-area pseudocylindrical projection.

Required Products

MATLAB

Related Products

Statistics Toolbox. Apply statistical algorithms and probability models.

Database Toolbox. Exchange data with relational databases.

Image Processing Toolbox. Perform image processing, analysis, and algorithm development.

For a complete list of related products, visit www.mathworks.com/products/mapping

Platform and System Requirements

The Mapping Toolbox is available for Windows 98/ME/NT/2000/XP. For additional information and system requirements, visit www.mathworks.com/products/mapping

Resources and Support

ONLINE USER COMMUNITY

www.mathworks.com/matlabcentral

DEMOS

www.mathworks.com/demos

THIRD-PARTY PRODUCTS AND SERVICES

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