

7 Spatial Data

7.1 Introduction

Chapter 7.2 introduces vector data using coastline data as an example. The acquisition and handling of raster data are then illustrated using digital topographic data in **Chaps.** 7.3 to 7.5. The availability and use of *digital elevation models (DEMs)* have increased considerably since the early 1990s.

7.2 The Global Geography Database GSHHG

7.3 The 15 Arc-Second Global Relief Model ETOPO 2022

The headers document the size of the data array (e.g., there are 1,801 columns and 2,401 rows in our example), the coordinates of the lower-left corner (e.g., approximately $x=30$ and $y=-20$), and the cell size (e.g., $\sim 0.0167=1/60$ of a degree latitude and longitude, or 1 arc minute).

```
[A,R] = readgeoraster('exportImage.tiff');
```

7.4 The 30 Arc-Second Elevation Model GTOPO30

7.5 The Shuttle Radar Topography Mission SRTM

This script opens a new Figure and generates both a shaded relief map (using interpolated shading) and a gray colormap (which is displayed in an overhead view).

```
[LON,LAT] = meshgrid(35:1/1200:37,0:1/1200:1);

figure('Color',[1 1 1],...
      'Position',[50 50 1200 600]);
a1 = axes('Visible','off',...
      'Units','centimeters',...
      'FontSize',8);
hold(a1)
surf(LON,LAT,SRTM,...
      'SpecularExponent',20,...
      'FaceLighting','phong',...
      'FaceColor','interp',...
      'EdgeColor','none');
light('Parent',a1,...
      'Style','local',...
      'Position',[145 70 900000]);
set(a1,'View',[25 20])
daspect([1 1 20000])
```

```

colormap(flipud(hsv))

figure('Color',[1 1 1],...
      'Position',[50 50 1200 600]);
a2 = axes('Visible','off',...
      'Units','centimeters',...
      'FontSize',8);
hold(a2)
surf(LON,LAT,SRTM,...
      'SpecularExponent',20,...
      'FaceLighting','phong',...
      'FaceColor','interp',...
      'EdgeColor','none');
light1 = light('Parent',a2,...
      'Style','local',...
      'Position',[145 70 900000]);
set(a2,'View',[25 20])
daspect([1 1 20000])
contour3(LON,LAT,SRTM,v,...
      'Color','w')
demcmap(SRTM)

```

7.6 Gridding and Contouring

Surface estimation (or *gridding*) is typically carried out in two major steps (Fig. 7.5):

7.7 Comparison of Methods and Potential Artifacts

Another very useful MATLAB gridding method is *splines with tension (tsplines)* by Wessel and Bercovici (1998), which is available for download from the website of the recently deceased first author:

7.8 Statistics of Point Distributions

7.9 Analysis of Digital Elevation Models (by R. Gebbers)

The *right*-hand-side plot presents the kriging variance,

7.11 Exporting 3D Graphics to Create Interactive Documents

Recommended Reading

Figure Captions

Fig. 7.1 Shoreline display from the GSHHS data set. The map shows an area between latitudes *40° south* and *40° north* and between longitudes *30°* and *60° east*. This simple map was made using *plot* with equal axis aspect ratios (data from Wessel and Smith 1996).