

## 7 Spatial Data

### 7.1 Introduction

### 7.2 The Global Geography Database GSHHG

More advanced plotting functions are contained in the *Cartopy* package, which allows alternative versions of this plot to be generated (Fig. 7.1):

We use the function `FixedLocator()` to define the location of the ticks. The GSHHG data set is actually included in *Cartopy* using `coastlines()`:

The data set provided in *Cartopy* also shows the coastlines of the area surrounding Africa.

### 7.3 The 15 Arc-Second Global Relief Model ETOPO 2022

The headers document the size of the data array (e.g., 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).

### 7.4 The 30 Arc-Second Elevation Model GTOPO30

This script reads the data from the tile *e020n40* (without a file extension) at full resolution (i.e., scale factor = 1) in the array `GTOPO30`, which has dimensions of  $6,000 \times 4,800$  cells.

### 7.5 The Shuttle Radar Topography Mission SRTM

```
lon = np.linspace(35,37,2401)
lat = np.linspace(0,1,1201)
LON,LAT = np.meshgrid(lon,lat)
v = np.array([700,800,900,1000,1100,1200,
              1300,1500,2500,3000])
```

### 7.6 Gridding and Contouring

### 7.7 Comparison of Methods and Potential Artifacts

### 7.8 Statistics of Point Distributions

Since the critical  $\chi^2$  of 35.1725 is well above the measured  $\chi^2$  of 18.5000, we cannot reject the null hypothesis and must therefore conclude that our data follow a uniform distribution.

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

The filter calculates a spatial running mean of 3 by 3 elements. We use only the `SRTM[749:850, 699:800]` subset of the original data set in order to reduce computation time.

```
while np.sum(inflowsum)>0:
    for i in range(0,8):
        inflow[:, :, i] = np.roll(inflowsum, N[i, 0], axis=0)
        inflow[:, :, i] = np.roll(inflow[:, :, i], N[i, 1], axis=1)
        inflowsum = np.sum(inflow*flow*grads>0, 2)
    flowac = flowac + inflowsum
```

## 7.10 Geostatistics and Kriging (by R. Gebbers)

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

### 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 **15° west** and **61° east**. This simple map was made using `plot()` with equal axis aspect ratios (data from Wessel and Smith 1996).