ErSE394 Geo-Environmental Modeling & Analysis
Assignment 1

Student Name: Zheng Cong
Department: KAUST EnSE

January 30, 2025

1 Introduction

The topographical elevation map presented in Figure 1 illustrates the distinct physiographic characteristics of the Jeddah region, Saudi Arabia. This visualization is derived from Shuttle Radar Topography Mission (SRTM) data, with a spatial resolution of approximately 30 meters. The map reveals a dramatic elevation gradient from the coastal plains of the Red Sea in the west (shown in dark purple, near sea level) to the foothills of the Hijaz Mountains in the east (shown in green, reaching elevations up to 800 meters above sea level).

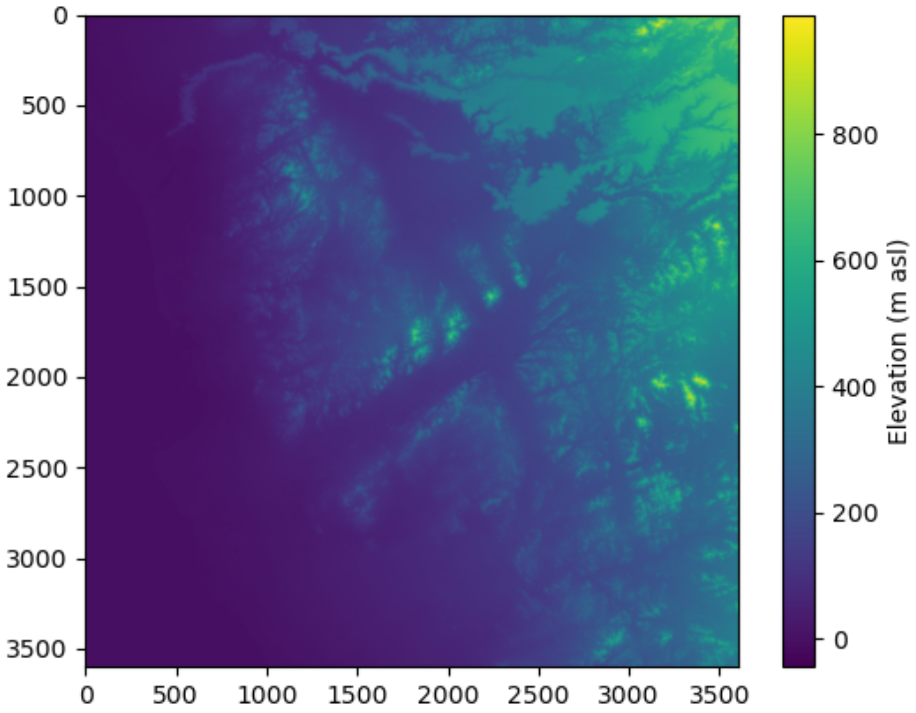

Figure 1: Topographical elevation map of the Jeddah region derived from SRTM data. The color scale represents elevation in meters above sea level (m asl).

2 Data Processing

The analysis utilizes SRTM GL1 (Global 1 arc-second) data, processed using Python programming language with the following key libraries:

- **NumPy** – for numerical computations
- **Xarray** – for handling netCDF data
- **Matplotlib** – for visualization

The complete Python code for data processing can be found in the GitHub repository: `https://github.com/zcong0202/geo_env`.

3 Dataset Description

The dataset used in this study consists of SRTM data with detailed specifications as shown in Table 1. The data structure and variables were examined using Xarray's built-in functions in Anaconda environment:

Category	**Parameter**	**Specification**
General Information	Data Source	SRTM Global 1 arc-second DEM
	Format	NetCDF4
	Size	52 MB
Spatial Properties	Latitude Range	3601 points (22.0°N – 21.0°N)
	Longitude Range	3601 points (39.0°E – 40.0°E)
	Spatial Resolution	$0.000\,277\,8°$ (≈ 30 m)
Data Variables	SRTMGL1_DEM Type	float32
	Valid Range	[-32767, 32767] meters
	CRS	Coordinate Reference System (—S1)
Coordinate System	Grid Mapping	Latitude-Longitude
	Prime Meridian	0°
	Semi-major Axis	6 378 137 m
	Inverse Flattening	298.257223563
	Reference System	WGS 84

Table 1: Complete Dataset Specifications