

# Digital Elevation Model Data - ASTER GDEM

He Zhang

University of Exeter

## 1 Introduction

The Advanced Spaceborne Thermal Emission and Reflection Radiometer Global Digital Elevation Model (ASTER GDEM or ASTGDEM) is a product of the Ministry of Economy, Trade, and Industry (METI) in Japan and the National Aeronautic and Space Administration (NASA) in United States. The source data were collected by the Advanced Spaceborne Thermal Emission and Reflection Radiometer on the NASA spacecraft **Terra**. The ASTGDEM version 1 was released on 2009 and the ASTGDEM version 2 (ASTGDEMv2) was released on 2011. The **ASTGDEMv2** is used in our applications.

## 2 Data Characteristics

1. The ASTGDEMv2 is comprised of 22,702 tiles covering land surfaces in the range of [83°N, 83°S]. Each tile is a  $1^\circ \times 1^\circ$  block of each surface that contains at least 0.01% land area. Thus, tiles that only contain ocean area are not included.

**Remark:** The advantage of using  $1^\circ \times 1^\circ$  tiles is that its much more efficient for geographic data processing, compared with using DEM data of a relatively large scale.

2. The ASTGDEMv2 is distributed in **GeoTIFF (.tif)** image/data format. The data are posted on a **1 arc-second (~30m at the equator)** grid. The size of each tile is  $1^\circ \times 1^\circ$  or **3601" × 3601"**.

**Remark:** The four edges of each tile are overlapped with its four adjacent tiles. Users should remove overlapped elements and merge the related tiles when more than one tile is used.

3. The ASTGDEMv2 data are referenced in **WGS-84 GCS**. In this case, the **[column, row]** of image/data array of the tile represents the **[longitude, latitude]** of a specific location on the Earth.

**Remark:** The WGS-84 GCS uses a reference ellipsoid to approximate the global surface of the Earth. However, it might be not accurate in local

regions. Thus, we transform WGS-84 GCS to OSGB-36 GCS, which uses another reference ellipsoid to accurately describing locations in Britain.

4. The data package (.zip) is named as, e.g., ASTGTM2\_N51W001.zip, where "N51" and "W001" denote the approximated latitude and longitude of the bottom-left (southwest) corner of the tile. Each package includes three files: A readme file (.pdf), a dem file (\*\*\_dem.tif) which contains the elevation data, and a quality assessment file (\*\*\_num.tif).

**Remark:** The file name only provides **approximated** latitude and longitude of bottom-left corner. Users should use the latitude and longitude recorded in the **GeoTransform parameters** of DEM file.

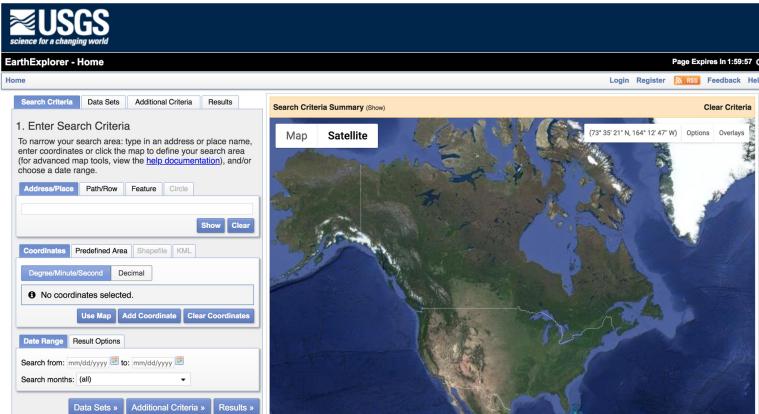
**Summary:** The ASTGDEMv2 has **high resolution (~30m)**, **high accuracy (<20m)**, and **great land coverage (~80% of the Earth)**. Thus, its a good choice in DEM based applications.

### 3 Data Download

The ASTGDEMv2 data can be downloaded from EarthExplorer<sup>1</sup> (suggested) or from NASA Earthdata Search<sup>2</sup>.

#### 3.1 EarthExplorer User Guide

1. Open the web page of EarthExplorer. Register an account and log in.

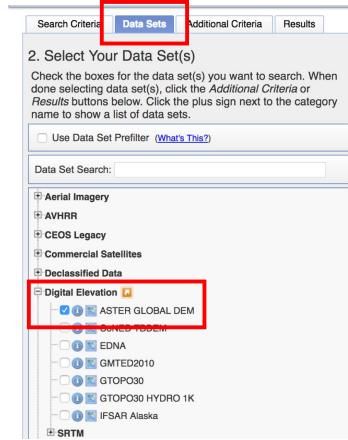


<sup>1</sup><https://earthexplorer.usgs.gov/>

<sup>2</sup><https://search.earthdata.nasa.gov/search?q=ASTGTM%20V002>

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2. Click the "Data Sets" tag. Then, search or select the "Digital Elevation" category and select the "ASTER GLOBAL DEM" on the list.

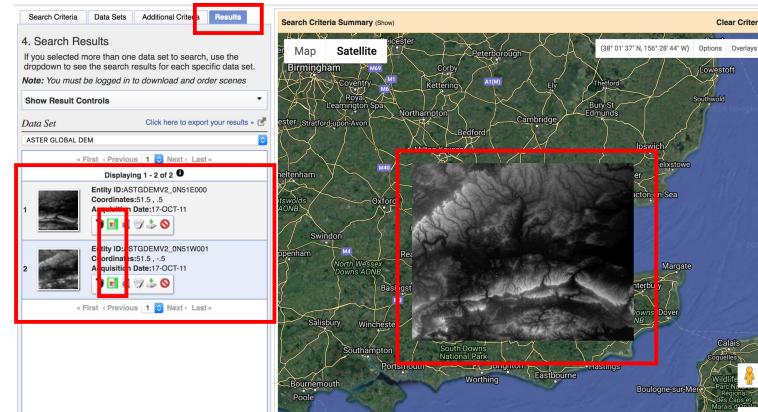


3. Set the data filtering criteria under the "Additional Criteria" tag<sup>3</sup>. For example, to download DEM data of London, set the first filtering criteria as below. Then, click the "Results" button on the bottom.

The screenshot shows two side-by-side interfaces. On the left is the 'Additional Criteria' interface, which has a red box around its tab. It shows a dropdown menu set to 'ASTER GLOBAL DEM' and a list of selected data sets: 'Entity ID' with entries 'ASTGDEMv2\_0N51W001' and 'ASTGDEMv2\_0N51E000'. A 'Clear' button is at the bottom. On the right is the 'ASTER GLOBAL DEM' results interface, which lists the same Entity IDs. At the bottom of this interface is a 'Results >' button, which is also highlighted with a red box.

<sup>3</sup>See official dictionary for details: [https://lta.cr.usgs.gov/DD/ASTER\\_GDEM.html](https://lta.cr.usgs.gov/DD/ASTER_GDEM.html)

- The ASTGDEM data files will be listed under the "Results" tag. Click the "Show Browse Overlay" button to view 2D image of the related tile in Web Mercator PCS on the right windows. Click "Download Options" button to download data files.



## 4 Data Usage

See detailed tutorial on GitHub<sup>4</sup> and do not forget to star the repository.

## Statement

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<sup>4</sup><https://github.com/HeZhang1994/digital-elevation-model-tool-tutorial>