# S1 Text: Global land cover maps and digital elevation models

Supporting information for

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# Global land cover maps

There exist various moderate-resolution global land cover maps, such as two 1 km global land cover maps for 1992–1993 [[1](#_ENREF_1)]: the International Geosphere–Biosphere Programme Data and Information System (IGBP-DIS) DISCover [[2-4](#_ENREF_2)] and the University of Maryland (UMd) map [[5](#_ENREF_5)]. Both are based on data from the US National Oceanic and Atmospheric Administration (NOAA) Advanced Very High Resolution Radiometer (AVHRR), but use different classification schemes and algorithms. DISCover uses the IGBP 17-class land classification scheme whereas UMd uses a modifed version of this. GLC2000 (global land cover map 2000) is based on the UN Food and Agricultural Organization (FAO) Land Cover Classification Scheme (LCCS) [[6](#_ENREF_6)]. GLC2000 is also a 1 km resolution map and is based on SPOT VEGETATION data. The LCCS was also used for the GlobCover 2006 and 2009 300 m land cover maps. GlobCover uses data from the Medium Resolution Imaging Spectrometer (MERIS) on board the European Space Agency’s (ESA) Envisat satellite [[7](#_ENREF_7)]. Finally, Collection 5 of the Moderate-resolution Imaging Spectroradiometer (MODIS) delivers a 500 m annual land cover product (MCD12Q1). This uses five different classification schemes, including the IGBP and UMd ones, but not LCCS [[8](#_ENREF_8)].

# Digital elevation models

There is a long history of using photogrammetric methods to compile DEMs using cameras mounted on aircraft [[9](#_ENREF_9)]. DEMs may also be compiled from satellite data. Four currently available products that cover large areas of the globe are: GTOPO30, the ASTER Global DEM (GDEM), the Shuttle Radar Topography Mission (SRTM) DEM [[10](#_ENREF_10)] and the Global Land One-km Base Elevation project (GLOBE). GTOPO30, completed in 1997, was compiled from multiple data sources by the United States Geological Survey (USGS) [[11](#_ENREF_11)] (<http://www.eorc.jaxa.jp/JERS-1/en/GFMP/AM-3/docs/html/gtopo30.htm>). GTOPO30 covers the globe with a grid spacing of 30 arc seconds (approximately 1 km). The SRTM was flown in February 2000 and carried the carried the spaceborne imaging radar (SIR-C) [[12](#_ENREF_12)]. The data have been processed using synthetic appeture radar (SAR) interferommetry to produce a DEM with a 3 arc-second spacing (approximately 90 m) for the global landmass from 56° S to 60° N. Successive versions have sought to remove errors and fill voids. NASA released their most recent version (version 3.0) on 20 November 2013 [[13](#_ENREF_13)], which uses the ASTER GDEM2 to fill voids. The most recent version of GDEM is version 2.0 (GDEM2) [[14](#_ENREF_14)], which uses stereo data from the the nadir and aft-looking infrared cameras collected since 2001. GDEM2 covers the land surface between 83° S to 83° N with a 1 arc-second spacing (approximately 30 m). The verticle accuracy is quoted as being between 10 and 25 m (root mean square error) [[14](#_ENREF_14)]. The validation report [[15](#_ENREF_15)] states that, overall, the accuracy is better than version 1 and comparable to SRTM for the conterminous USA. Various comparisons of GDEM and the SRTM DEM have been published [e.g., [10](#_ENREF_10),[16](#_ENREF_16),[17](#_ENREF_17)], although general guidance does not exist about which is preferred for any given location or application. It has been noted that the GDEM2 tends to be more noisy than SRTM and [Hengl and Reuter [18]](#_ENREF_18) recommend aggregating GDEM2 to 90 m. Note that GDEM2 is available for a wider geographic area and is actually used in SRTM3 to fill voids in rugged terrain. GLOBE [[19](#_ENREF_19),[20](#_ENREF_20)] is the Global Land One-km Base Elevation (GLOBE) project to create a database at 30 arc seconds / 1km by compositing elevation datasets from different sources. Finally, for any given study area the researcher may be able to access a finer resolution DEM, compiled from either airborne or satellite data via a government agency or private company. GTOPO30 [[21](#_ENREF_21),[22](#_ENREF_22)], SRTM [[23](#_ENREF_23),[24](#_ENREF_24)], the ASTER GDEM [[25](#_ENREF_25)] and GLOBE [[26](#_ENREF_26)] have all be used in NTD studies.

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