The Blue Marble Next Generation - A true color earth dataset including seasonal dynamics from MODIS

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1 Dataset User's manual

1.1 Map projection

The BMNG dataset is gridded at the following spatial resolutions: 15, 60 and 240 arc-seconds (500m, 2km, and 8km approximate spacing at the equator). It uses a geographic (Plate Carrée) projection, which is based on an equal latitude-longitude grid spacing (not an equal area projection!). The projection datum is WGS84.

1.2 Data format

All data are available as monthly global composite images. The highest resolution at 500m is furthermore split into 8 global tiles according to Figure 1 to facilitate their handling on less powerful computer systems.

In Table 1 the file and directory structure of the BMNG dataset is outlined. The geographical extent of each global composite or tile is specified in the columns showing the upper left and the lower right edges. File suffix [Y] shows the file format: *png* (lossless compression) or *jpg* (lossy compression with quality setting of 75%) [1]. The NDVI data is processed but not yet stitched on global scale. Files with monthly NDVI will be added to the BMNG dataset at a later stage.

1.3 Relief shading

The file prefix [X] is either *world* for non-shaded data, *world.topo* for a relief shading based on land topography or *world.topo.bathy* when a relief shading of

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[1]the global 500m composites stored in the *world_big* directory are raw binary files with the dimensions 3 x 86400 x 43200 (channels x columns x rows); data type is unsigned byte, with no header. They can be used for direct file access by data processing software (e.g. for subsetting, web-streaming etc.)

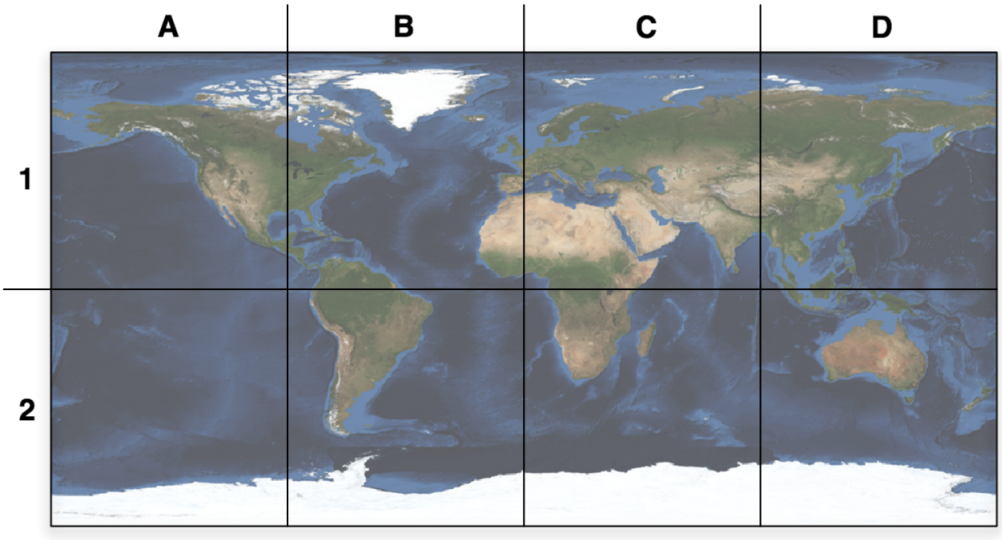

Figure 1: Sub-domains of the 500m BMNG files

Table 1: Geographic extents of the BMNG files

Directory	Filename	Upper left	Lower right	Resol. [pixels/°]
world_500m	[X].3x21600x21600.A1.[Y]	90N 180W	0N 90W	240
	[X].3x21600x21600.B1.[Y]	90N 90W	0N 0W	240
	[X].3x21600x21600.C1.[Y]	90N 0W	0N 90E	240
	[X].3x21600x21600.D1.[Y]	90N 90E	0N 180E	240
	[X].3x21600x21600.A2.[Y]	0N 180W	90S 90W	240
	[X].3x21600x21600.B2.[Y]	0N 90W	90S 0W	240
	[X].3x21600x21600.C2.[Y]	0N 0W	90S 90E	240
	[X].3x21600x21600.D2.[Y]	0N 90E	90S 180E	240
world_big	[X].3x86400x43200.bin.gz	180W 90N	180E 90S	240
world_2km	[X].3x21600x10800.[Y]	180W 90N	180E 90S	60
world_8km	[X].3x5400x2700.[Y]	180W 90N	180E 90S	15

land topography and ocean bathymetry was applied. The following topographic datasets were used for relief shading:

1. 3 arc-second SRTM dataset (Shuttle Radar Topography Mission, (**?**)) from 60S-60N

2. 30 arc-second GTOPO30 dataset (**?**), from 60N-90N, and to fill small voids in the SRTM dataset, using bi-cubic interpolation (David Gil, personal communication)

3. RAMP II dataset (Radarsat Antarctic Mapping Project Digital Elevation Model Version 2, (**?**)) from 90S-60S

4. 1 arc-minute GEBCO (General Bathymetric Chart of the Oceans (**?**)) dataset

1.4 Caveats

As with digital satellite remote sensing datasets, users of the BMNG must be aware that certain characteristics of the data and artifacts of the used processing methodology may render it unsuitable for certain applications. A number of problems may be encountered by using the data:

- **Spatial accuracy:** The used MOD09A1 product is derived by reprojecting satellite swath L1b granules into the sinusoidal projection. The BMNG is then reprojected into the geographic projection. The two involved reprojection steps may introduce small inaccuracies, and the chosen geographic projection of the final images results in distorted (smeared) appearance of higher latitude areas, since it is not an equal-area projection.

- **Temporal accuracy:** Water areas don't currently show any seasonal variation. This may be changed in future versions of the BMNG. Seasonal variations may be suppressed where heavy cloud cover does not provide sufficient temporal information. Agricultural landscapes do not necessarily follow the the continuous seasonal variations, on which our methodology is based. Apart from the climate, humans are an important driver of the plant phenology in such areas.

- **Processing artifacts:** As described in the Methods section, incomplete cloud or snow masking and problems in the atmospheric corrections in the MOD09A1 data presents a significant challenge to the extraction of monthly cloud-free land surface reflectances. The use of discrete Fourier series can remove most of these effects, but it can fail in some areas. These are especially areas with short term changes in snow cover and water, where sunglint, aerosols and other effects do not allow a good atmospheric correction of satellite reflectances.

1.5 Citation of the BMNG

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