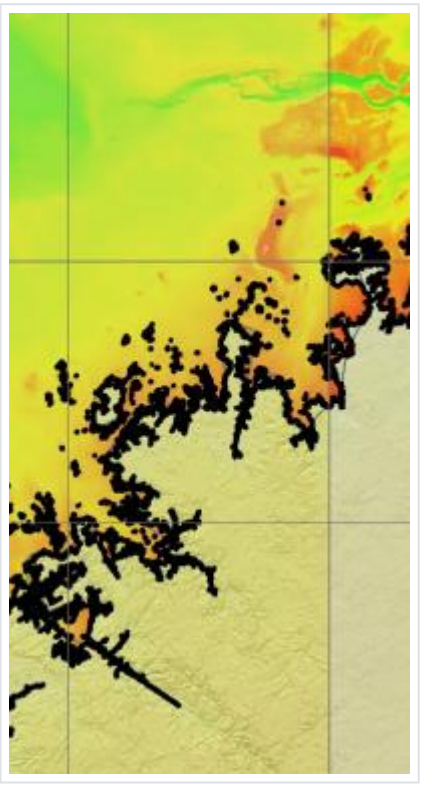
High-Resolution Depth Model (Northern Australia)



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Version
1.0.0

Program
Marine

Resource type
Derivative

Published Date
12/03/2018

View the original metadata page for the most up-to-date information on this product.

Basics

Background

Bathymetry mapping of the seafloor is vital for the protection of Northern Australia, allowing for the safe navigation of shipping and improved environmental management.

Shallow- and deep-water multibeam surveys have revealed the highly complex seafloor of the continental shelf and adjacent slope canyons draining into the Indian Ocean and Timor Sea.

What this product offers

This dataset contains bathymetry (depth) products from the compilation of all available source bathymetry data within Northern Australia into a 30 m-resolution Digital Elevation Model (DEM).

The Northern Australia region includes a broad continental shelf over 400 km wide extending out from Western Australia and the Northern Territory, and stretching over a distance of ~1500 km.

This region encompasses numerous shallow coral reefs including the offshore Sahul Banks, sand cays, drowned ancient river valleys, broad inner-shelf banks and a rugged coastline.

Access

Data access

Link to data	Download the data via eCat
eCat record	121620
CMI RESTful node ID	299
Access constraints	General public
Security classification	Unclassified
Update frequency	asNeeded

Details

Technical information

Airborne LiDAR bathymetry acquired by the Australian Hydrographic Office cover most of the Sahul Banks reefs, with some coverage gaps supplemented by satellite derived bathymetry.

The Geoscience Australia-developed Intertidal Elevation Model DEM improves the source data gap along Northern Australia's vast intertidal zone.

All source bathymetry data were extensively edited as point clouds to remove noise, given a consistent WGS84 horizontal datum, and where possible, an approximate MSL vertical datum.

GRID RESOLUTION: 0.0003° (~30 m).

TOTAL SURFACE COVERAGE: 1,200,000 km2.

HORIZONTAL DATUM: WGS84.

VERTICAL DATUM: Approximates mean sea level.

Accuracy and limitations

Not to be used for navigational purposes.

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References

Wessel, P., Smith, W.H.F. (1991). Free software helps map and display data. EOS, Transactions, American Geophysical Union 72, 441.

Whiteway, T.G. (2009). Australian Bathymetry and Topography Grid, June 2009. Geoscience Australia Record 2009/21, Canberra, Australia, pp. 46.

Processing

Lineage

This dataset is a collaboration between James Cook University and Government agencies, to process and compile all available digital bathymetry data and develop regional-scale 100 m- and 30 m-resolution DEMs for the Northern Australia region. The 30 m-resolution depth model, called nthaus30, is a fundamental dataset to underpin marine habitat mapping and improve environmental management.

MBES SOURCE DATA: The Australian Hydrographic Office (AHO) supplied the majority of the multibeam echo sounder (MBES) data on the Northern Australia shelf. Geoscience Australia (GA) provided other MBES data for the shelf and offshore areas by Australia's Marine National Facility vessels and also foreign research vessels transiting through the area. The Western Australian Marine Science Institution (WAMSI) also supplied MBES data near the coast. Extensive editing on the source data were conducted using QPS Fledermaus and Caris HIPS&SIPS software, and by applying sound velocity and MSL tide corrections where necessary.

SBES SOURCE DATA: The AHO have conducted extensive singlebeam echo sounder (SBES) surveys across the shelf for safety of navigation purposes. Other SBES data were from the WA Dept. of Transport (WADOT). Data editing were conducted on 3D point clouds generated with Fledermaus software, and LAT-MSL tide corrections applied using the Australian Vertical Datum Transformation Tool (AusCoastVDT).

ENC SOURCE DATA: Electronic Navigational Chart (ENC) spot depths were generated from S-57 files provided by the AHO and broadly cover the entire shelf and offshore Timor and Arafura seas. These spot depths were extracted from S-57 files using an ESRI file geodatabase and the xyz data imported to Fledermaus software for examining as 3D point clouds. The accepted bathymetry data were then exported from Fledermaus and LAT-MSL adjustment conducted with AusCoastVDT prior to interpolation of the depth model.

ALB SOURCE DATA: Airborne lidar bathymetry (ALB) data were from AHO-supplied Laser Airborne Depth Sounder (LADS) surveys conducted over the shelf since 1994. ALB depths are typically limited to ~40 m. Bathymetry data were imported to Fledermaus software for editing and then LAT-MSL adjustment conducted with AusCoastVDT.

ITEM SOURCE DATA: The ITEM DEM data were derived from the Intertidal Extents Model (ITEM v1.0), a national-scale gridded dataset characterising the spatial extents of the exposed intertidal zone, based upon a full 28 year time series of Landsat observations. These data have 25 m horizontal point spacing and a MSL vertical datum.

SDB SOURCE DATA: Satellite derived bathymetry (SDB) data utilise optical imagery and rely on physics- or empirical-based techniques to extract depth data. The SDB data used in the nthaus30 grid used empirical-based Landsat8 data to supplement coverage over several large reefs on the shelf lacking ALB data, such as Scott Reef. SDB data are limited to ~20 m depth.

COASTLINE SOURCE DATA: Coastline data were used to 'pin' the bathymetry grid at the coast in order to prevent 'bleeding' of land into the water during the grid development phase. Coastline data were only used for the Indonesia and Timor-Leste coast as the Australia coastline used the ITEM DEM data instead. The coastline data were rasterised and converted to 25 m point spacing files, then a value of +2 m was applied to approximate a mean high water springs elevation value to

the data.

SRTM SOURCE DATA: The 1 arcsec (~27 m) Shuttle Radar Topographic Mission (SRTM)-Digital Surface Model (DSM) data were used as land elevation data for the nthaus30 grid. The DSM data best represents the topography of the mainland and islands, but also includes vegetation features. The 27 m data were resampled to 30 m to match the interpolated bathymetry grid pixel size. During the grid development phase, the SRTM-DSM data were merged onto the interpolated bathymetry grid to complete the nthaus30 grid.

GRID DEVELOPMENT: The final grid development phase was conducted using Generic Mapping Tools (GMT) software (Wessel and Smith, 1991), following the methodology used in Becker et al. (2009). GMT is a Unix-based gridding and plotting software package that can deal with large datasets. This grid development phase is a 'repair and replace' method that is widely used for aggregating source bathymetry data for regional-scale and global-scale DEMs, e.g. SRTM30_PLUS.

GRID DEVELOPMENT: The xyz source data were first decimated using GMT blockmedian into individual xyz data files representing single node points at 15 m-resolution. The decimated data files were then concatenated into one large xyz file. Next, GMT blockmedian was conducted on the single large file to decimate the combined data to 30 m-resolution in order to produce one valid depth point for each pixel location to be used in the interpolated bathymetry grid at that same 30 m-resolution.

GRID DEVELOPMENT: The 30 m xyz data were then compared with co-located depths from an underlying base grid, in this case the 250 m-resolution AusBathyTopo grid (Whiteway, 2009). The purpose of using a base grid was to flag any new data that may be greatly in error and thus be rejected, and also to provide underlying bathymetry data for pixels that lack coverage by the new source data. The 'repair and replace' method repairs the AusBathyTopo grid, replacing pixels with newer, higher-resolution data.

GRID DEVELOPMENT: A grid was made with GMT surface using the difference values between the co-located new data and the underlying base data. GMT surface was used to resample the AusBathyTopo grid to 30 m-resolution. The difference grid and the resampled base grid were then added together with GMT grdmath. This netCDF file was converted into an ESRI raster grid. Finally, the SRTM-DSM data were merged with the interpolated bathymetry grid and clipped to produce the nthaus30 depth model.

PROCESSING SCHEME: Please refer to the "Processing_scheme_nthaus30.jpg" image in the Metadata downloadable folder that explains the steps used to develop the nthaus30 grid. REFERENCE: Becker, J.J., Sandwell, D.T., Smith, W.H.F., Braud, J., Binder, B., Depner, J., Fabre, D., Factor, J., Ingalls, S., Kim, S.-H., Ladner, R., Marks, K., Nelson, S., Pharaoh, A., Trimmer, R., Von Rosenberg, J., Wallace, G., Weatherall, P., 2009. Global bathymetry and elevation data at 30 arc seconds resolution: SRTM30 PLUS. Marine Geodesy 32(4), 355-371.

DATA SOURCES: Please refer to the "Data_sources_nthaus30_V3_GAmetadata.xlsx" metadata spreadsheet of source data used in compiling the nthaus30 grid.

Schema / spatial extent

WGS84 Northern Australia Depth Model

Update frequency	asNeeded

Temporal extent	2018-06-21 11:02:59
Min. longitude	121.00
Max. longitude	133.00
Min. latitude	-18.00
Max. latitude	-8.00
Coordinate reference system	WGS 84 (EPSG: 4326)
Cell size X	30.00
Cell size Y	30.00

Media

Credits

Owner

Commonwealth of Australia (Geoscience Australia)

License

Rights statement

Acknowledgments

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