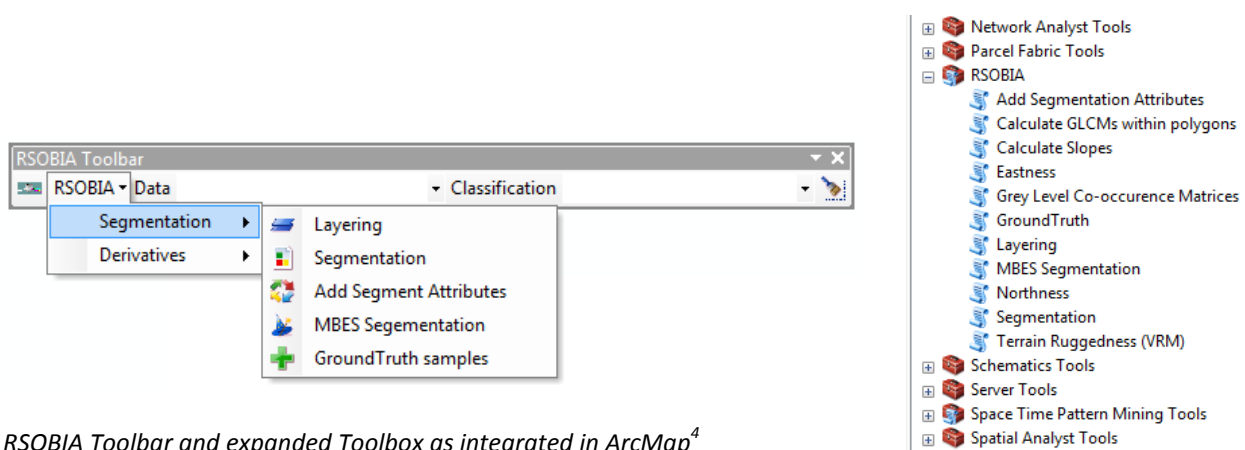# RSOBIA: a new OBIA toolbox and toolbar for ArcGIS

CODEMAP Protocol Factsheet 2

Aim Straightforward segmentation of remote sensing data (seafloor mapping data, satellite imagery, LiDAR data, …), creating image objects for further classification. Ideal for multibeam bathymetry and backscatter data, especially for focussed research areas.

Input One or more layers of spatial information, typically multibeam bathymetry and backscatter, but a range of remote sensing layers covering the same area with the same pixel resolution can also be used.

Approach A new toolbar has been developed[4] for integration in the widely-used GIS software ArcMap version 10.x, based on a combination of the existing open-source software library RSGISLib[2], existing ArcGIS tools and newly programmed functionalities. In addition, a toolbox is available so that the RSOBIA functions can be incorporated into other programming models and new, complex functions can be created.
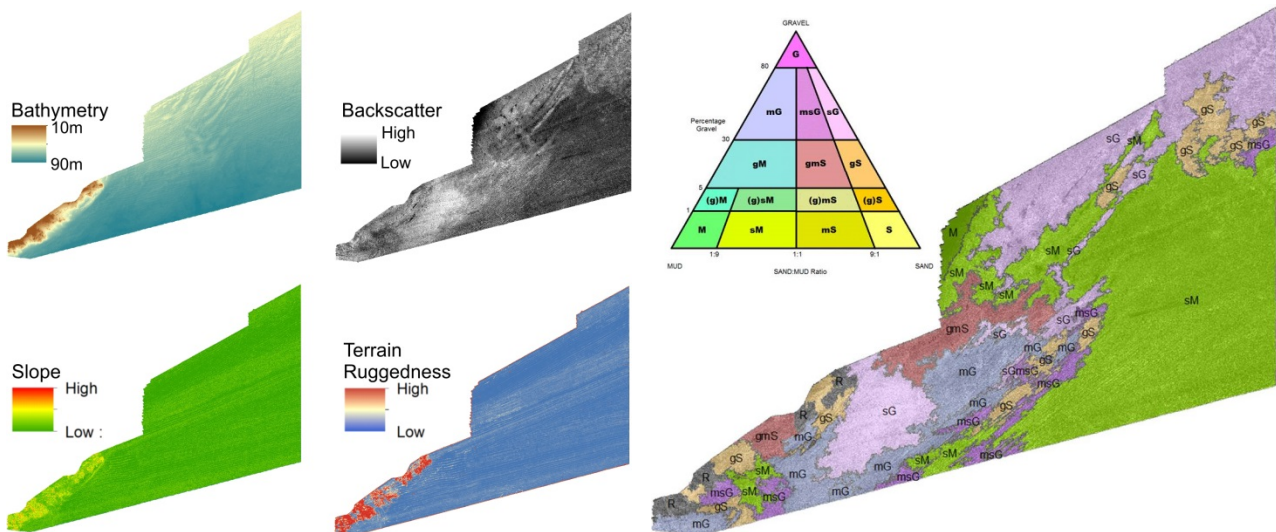

RSOBIA Toolbar and expanded Toolbox as integrated in ArcMap[4]

The toolbar offers following functions:

- Creation of derived layers (Slope, Terrain Ruggedness, Northness, Eastness, Curvature)
- Combination of individual layers into a multi-band raster
- Segmentation of a single-band or multi-band raster into image objects
- Extraction of segment attributes (for each input layer: mean and standard deviation of the pixel values within the segment)
- Manual classification of segments
- Wizard for quick segmentation of seafloor multibeam bathymetry and backscatter data

For more advanced applications, RSOBIA adds a toolbox to the ArcMap capabilities. This allows users to create their own models and tools, in combination with standard ESRI tools, using the ArcMap model builder.

The software can be downloaded from http://www.codemap.eu/Outputs. It requires Python and specialised Windows libraries to be installed together in the same place. The ArcGIS Spatial Analyst extension is also required.

Input layers and RSOBIA-segmented, manually classified map of a shallow-water section offshore the UK. The segment classification was based on ground-truth information and the modified Folk classification for marine sediments. Data courtesy: Maritime & coastal agency, UK.

Background Object-Based Image Analysis, or OBIA, is an image analysis technique that combines two main processing steps: image segmentation, and segment classification[3]. The segmentation step partitions the entire image in a series of non-overlapping regions (or "objects"), aiming for maximum homogeneity within the segments[1]. RSOBIA uses a region-growing algorithm for this[4]. The objects can then be classified, either manually, based on a set of rules, or fully automatically, using their numerical characteristics. An extensive range of attributes can be used for this, capturing pixel values, object shapes, object topology etc.

OBIA offers advantages over traditional pixel-based methods[3]: through object merging, segmentation can be carried out at multiple scales, providing objects that represent real-world objects on the ground. The segmentation provides clear boundaries, and is closer to how a human interpreter would digitise and identify spatial patterns in the image. The technique is also less prone to speckle noise.

Further reading

[1]Blatschke T (2010) Object based image analysis for remote sensing. ISPRS Journal of Photogrammetry and Remote Sensing 65:2-16, doi:10.1016/j.isprsjprs.2009.06.004

[2]Bunting P, Clewley D, Lucas RM, Gillingham S (2014) The Remote Sensing and GIS Software Library (RSGISLIB). Computers & Geosciences 62:216-226, doi:10.1016/j.cageo.2013.08.007

[3]Diesing M, Mitchell P, Stephens D (2016) Image-based seabed classification: what can we learn from terrestrial remote sensing? ICES J Mar Sci 73(10):2425-2441, doi:10.1093/icesjms/fsw118

[4]Le Bas T (2016) RSOBIA - A new OBIA Toolbar and Toolbox in ArcMap 10.x for Segmentation and Classification. In: Kerle N, Gerke M, Lefevre S (eds) GEOBIA 2016: Solutions and Synergies, vol. University of Twente Faculty of Geo-Information and Earth Observation, Twente, p 4pp, doi:10.3990/2.448