

# **An Object Based Image Analysis Approach to Semi-Automated Karst Morphology Extraction**

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Object based image analysis (OBIA) approaches on landform study are considered relatively fewer as compared to landuse/landcover studies. By using OBIA approach, subjectivity on conventional manual interpretation can be further minimized. The OBIA, until recently, have not been carried out to extract karst morphology. This study aimed to evaluate how OBIA can be used to extract karst morphology on land facet level.

This study used digital topographic map at 1:25.000 scale to generate digital elevation model (DEM) and ALOS AVNIR-2 satellite imagery. Slope, topographic position index, and elevation percentile were then derived from the DEM, while false colour composite, medium filtered NIR, Sobel edge detected NIR, band ratio, and NDVI were derived from ALOS AVNIR-2 to be used as input to segmentation and classification processes. Parameterization on segmentation and classification was applied by trial and error method. The resulted rule sets for each data were then applied to five pairs of 3 x 3 km wide area of interest. Each of these five areas has different karst type and landuse characteristics. All the results were then evaluated based on efficiency and consistency of segmentation and classification. Karst features obtained by the proposed method were also visually compared to those which were identified using manual digitization on 1:30.000 panchromatic aerial photographs.

It was found that the overall segmentation and classification results on proposed method worked better on DEM than on ALOS AVNIR-2 imagery. The resulted karst features on DEM data were generally more consistent than those on the ALOS AVNIR-2 imagery. In terms of efficiency, the proposed method worked better on karst with conical hill type, while for other types, the rule sets need to be further adjusted. On land facet level, conical hills boundary found to be more comparable and easier to evaluate than any other features such valley, doline, polje, and uvala. Though extracted features on ALOS AVNIR-2 were considered not as good as those on DEM, it was found that the proposed method on ALOS AVNIR-2 was able to extract smaller and less steep hills. The proposed method on ALOS AVNIR-2 was also time-sensitive, due to the difference in landuse characteristics at different times. A better result was found when the DEM and ALOS AVNIR-2 were combined together on proposed method, though it still lacked of efficiency on different areas

with different types of karst and land-use/land-cover characteristics. However, the results also proved that OBIA provides a better, quicker, more objective, and repeatable alternative to fieldwork and manual digitization.

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