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A comparison of the accuracy of pixel based and object based classifications of integrated optical and LiDAR data

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Land cover maps are generally produced on the basis of high resolution imagery. Recently, LiDAR (Light Detection and Ranging) data have been brought into use in diverse applications including land cover mapping. In this study we attempted to assess the accuracy of land cover classification using both high resolution aerial imagery and LiDAR data (airborne laser scanning, ALS), testing two classification approaches: a pixel-based classification and object-oriented image analysis (OBIA). The study was conducted on three test areas (3 km2 each) in the administrative area of Kraków, Poland, along the course of the Vistula River. They represent three different dominating land cover types of the Vistula River valley. Test site 1 had a semi-natural vegetation, with riparian forests and shrubs, test site 2 represented a densely built-up area, and test site 3 was an industrial site. Point clouds from ALS and ortophotomaps were both captured in November 2007. Point cloud density was on average 16 pt/m2 and it contained additional information about intensity and encoded RGB values. Ortophotomaps had a spatial resolution of 10 cm. From point clouds two raster maps were generated: intensity (1) and (2) normalised Digital Surface Model (nDSM), both with the spatial resolution of 50 cm. To classify the aerial data, a supervised classification approach was selected. Pixel based classification was carried out in ERDAS Imagine software. Ortophotomaps and intensity and nDSM rasters were used in classification. 15 homogenous training areas representing each cover class were chosen. Classified pixels were clumped to avoid salt and pepper effect. Object oriented image object classification was carried out in eCognition software, which implements both the optical and ALS data. Elevation layers (intensity, firs/last reflection, etc.) were used at segmentation stage due to proper wages usage. Thus a more precise and unambiguous boundaries of segments (objects) were received. As a results of the classification 5 classes of land cover (buildings, water, high and low vegetation and others) were extracted. Both pixel-based image analysis and OBIA were conducted with a minimum mapping unit of 10m2. Results were validated on the basis on manual classification and random points (80 per test area), reference data set was manually interpreted using ortophotomaps and expert knowledge of the test site areas.