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Classification of Urban Areas Using Full-waveform Airborne Laser Scanning Data

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Airborne laser scanning (ALS) data is increasingly used for classification purposes, and preferred over traditional aerial photogrammetric techniques in particular in vegetated areas. This work deals with the potential of full-waveform airborne laser scanning data for classification of urban areas. Information derived from full-waveform ALS data, such as amplitude and echowidth, can be used to calculate additional attributes such as backscattering coefficients. These physical attributes together with derived geometrical attributes like the normalized digital surface model, standard deviation of elevation and the number of echoes are used for the classification of urban areas. The study area is located in Vienna city where four classes are to be distinguished. They are buildings, trees, roads and grass area. Two classification methods are used, which are Maximum-Likelihood and Decision Tree. The results of these two methods prove the potential of features extracted from full-waveform airborne laser scanning data for classification purposes in urban environment. It turns out that the achieved accuracy of the Decision Tree classification is slightly better than that of Maximum-Likelihood. For Decision Tree classification, the bi-static backscatter coefficient γ is of less importance, although it may be responsible for a significant improvement for roads discrimination in Maximum-Likelihood classification.