Evaluating radar beam occultation and ground clutter in urban environment using laser scanner data

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High spatial resolution weather radar observations are of primary relevance for hydrological applications in urban areas. However, when the weather radar site is located within a metropolitan area, partial beam blockage and return clutter by buildings can seriously affect its observations. Standard simulations with simple beam propagation models and digital elevation model (DEM) are usually not able to evaluate buildings contribution to the partial beam blockage. In the recent years airborne laser scanners (ALS) evolved to the state-of-the-art technique for topographic data acquisition. ALS, providing small footprint diameters (10 – 30 cm), allow accurate height determination of buildings and forest canopy.

Analysing the three weather C-band radar located in the metropolitan area of Helsinki, Finland, the present study investigates benefits of using ALS data to quantitative estimations of partial beam blocking and return clutter. Standard propagation model results are compared with actual reflectivity data to evaluate the effect of partial beam blocking due to the buildings. Detailed analysis is realized using Open Source Geographic Information System (GIS) tools providing physical interpretation of the results.