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Appraisal of peat thickness using combined GPR and terrestrial lidar survey

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Estimating the depth of peat cover has traditionally been carried out manually using hand-held probe rods, and more recently using methods of near surface geophysics, principally ground-penetrating radar (GPR). These studies provide an important basis for evaluating carbon storage in organic mire ecosystems. However, peatlands often represent a challenge when acquiring GPR over large areas (on the order of 100s ha) of rough terrain; processing of GPR data is also often difficult due to local variations in topography.
Little Woolden Moss is > 100 ha peatland site west of Manchester, UK. The site is crossed with numerous shallow ditches and some deeper drainage ditches, and a number of linear raised areas of peat. Peat extraction has taken place on the site over many years, and still being actively worked. A detailed study of peat thickness and base-peat topography was carried out in late 2012. The site was surveyed using a MALÅ RAMAC GPR and 200 MHz unshielded antenna linked to differential GPS. The antennae were housed within a bespoke rough terrain sledge. The data, collected along over 40 profiles with length between 200 and 600 m, were post-processed using MALÅ RadExplorer and Seismic Unix software, including digitising of peat depth layers. Static terrain corrections were derived from terrestrial lidar data acquired at the site using a Riegl LMS-Z40i scanner, integrated with GPS readings provided at the time of GPR survey. The survey enabled detailed maps of base peat elevation and terrain corrected peat thickness to be produced in ArcGIS.