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Modelling the performance of a LIDAR system for the measurement of atmospheric carbon dioxide concentrations

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With atmospheric carbon dioxide concentrations rising steadily, investigations into perturbations of sources, sinks and net surface fluxes are of increasing importance. Active space-borne measurement systems such as LIDAR offer one potential technique to derive near-surface concentrations over broad spatial scales. However significant instrumental challenges need to be overcome for such measurements to achieve a useful degree of accuracy. This poster presents results from modelling work undertaken at the University of Leicester as part of the UK's Centre for Earth Observation Instrumentation which refine performance requirements for space-borne systems.

Instrument parameters such as signal strength, receiver size, detector performance and optical performance are analysed in a number of scenarios with varying atmospheric, aerosol loading and surface conditions. Analysis is performed in the 1.57 and 2.05 ìm windows, with heterodyne and direct detection systems modelled. In order to retrieve near-surface CO2 concentrations in the order of a few ppm the resulting instrument requirements are unquestionably demanding, but provide a benchmark for new technology development initiatives.