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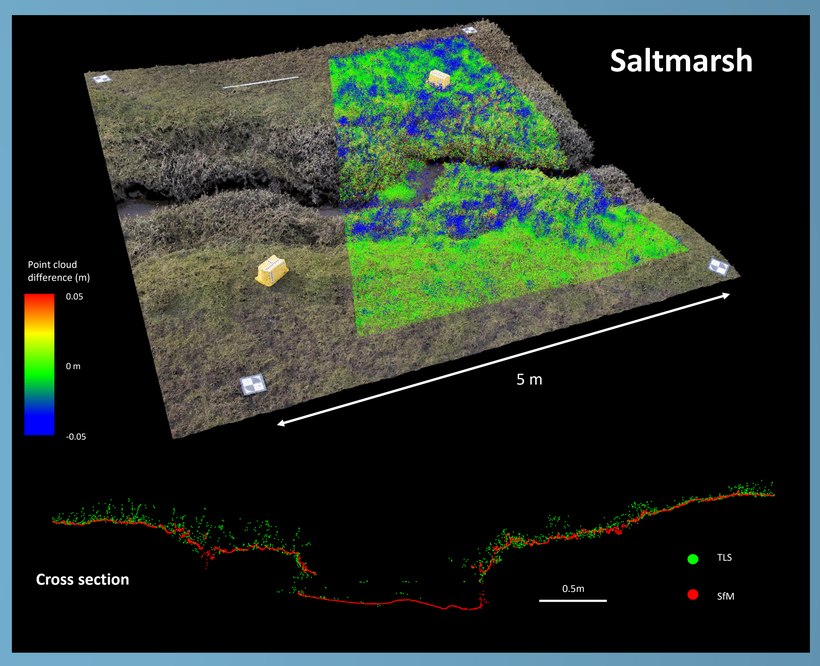
SEACAMS2:
Three-dimensional mapping for intertidal ecology

AIMS: To assess emerging, high-resolution remote sensing techniques for their application in intertidal ecological studies.

RATIONALE:

Quantifying fine scale 3D habitat structure is important for understanding ecological processes as well providing robust evidence for environmental impact assessment. Modern high resolution remote sensing techniques have the potential to be powerful tools in intertidal ecology, but have not been fully tested for their suitability in this application.



Above left to right: The three survey techniques compared - terrestrial laser scanner, camera pole and UAV. Right: example results from comparison of fine scale data showing the difference between TLS and SfM derived point clouds.

METHODS:

- High-resolution 3D digital ecosystem models were generated by terrestrial laser scanning and structure-from-motion photogrammetry in three habitats (rocky shore, honeycomb worm reef, saltmarsh) and at three scales (fine-scale: 25 m^2 with < 1 cm resolution, medium-scale: 2500 m^2 with < 2 cm resolution, and broad-scale: 2500 m^2 with 5 cm resolution).
- The accuracy of structure-from-motion models was assessed by comparing them to calibrated terrestrial laser scanner models.
- The practicality of the different methods was assessed semi-quantitatively.

OUTCOME:

- Structure-from-motion models were accurate at mm to cm scale. Accuracy was highest (mean ± sd absolute difference 4 mm ± 14 mm) at the fine scale in rocky shores and lowest (56 mm ± 111) at the medium scale in saltmarsh.
- Structure-from-motion was faster for field data collection than terrestrial laser scanning and has lower outlay costs, but more careful quality control is required to minimise error in the final models.
- High resolution 3D mapping technologies are now available and accessible for ecological data collection, with a wealth of applications in research and environmental management.

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