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Modelling heights of sparse aquatic reed (*Phragmites australis*) using Structure from Motion point clouds derived from Rotary- and Fixed-Wing Unmanned Aerial Vehicle (UAV) data

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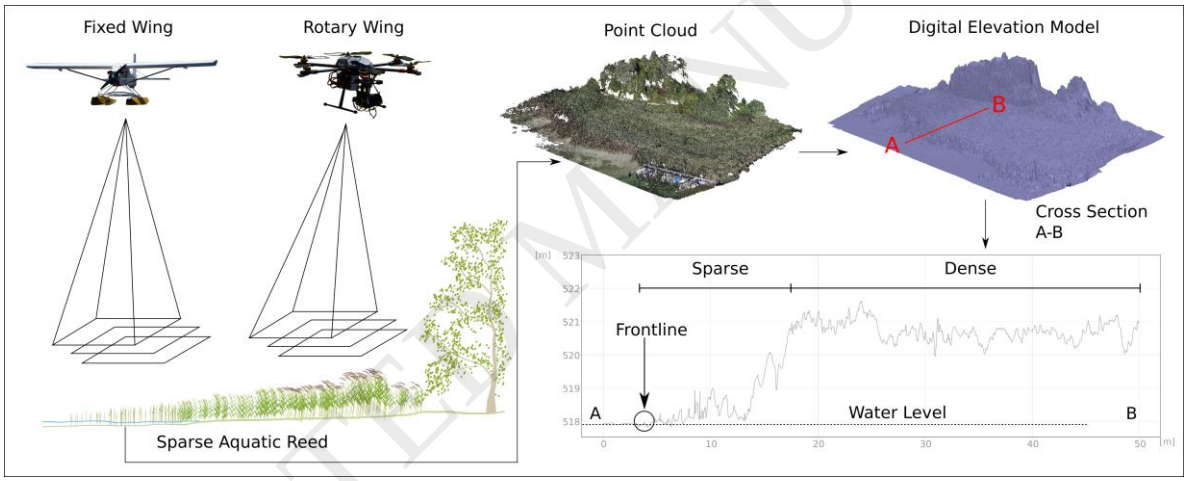
Graphical abstract



Highlights

- Heights of sparse aquatic reed beds consisting of Phragmites australis were modelled.
- Photogrammetric reconstruction of heights was obtained by image alignments with low reprojection error.
- Accurate Digital Elevation Models (DEM) are important data for coverage quantification of aquatic reed beds.

Abstract: Aquatic reed beds consisting of *Phragmites australis* play an important role in lake ecosystems. Digital Elevation Models (DEM) provide essential information in identifying and quantifying these stocks. This study modelled sparse aquatic reed beds with aerial images collected from Rotary (RW) and Fixed Wing (FW) Unmanned Aerial Vehicles (UAV) by the same imaging system. Image processing was executed in a Structure from Motion (SfM) environment and based on bundle adjustment. The DEMs were referenced with Ground Control Points (GCPs) and validated with independent Reference Points (RPs) of heights from reed and flat surfaces. Root Mean Squared (RMS) reprojection error showed that imagery taken with FW could be