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DSM generation from stereo aerial images for the reconstruction of the sea-cliff retreat pattern controlled by gullying process, Costa da Galé and Melides sectors (Southwest of Portugal)

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The seacliffs evolution is an important aspect to be taken in account in the evolution of the world coastline. The seacliffs can suffer erosion induced by the storm wave incidence or subaerial erosion leading to the retreat of the coastline. However the amount of sediments that come from the cliff retreat represent an important sediment source to the coastal system. In some cases it is essential to include this volume in the sediment budget balance of the studied coastal area. Many methods have been developed to monitor the evolution of seacliffs, most of them are supported by field measurements. In these work you propose the application of a new stereo photogrammetric method to reconstruct the cliff topography producing digital surface model (DSM) revealing the spatial distribution of the elevation errors. The model results are complemented by the acquisition of field data (GCP-ground control points) obtained using the DGPS (Differential Global Positioning System). This method also allows the generation of a coarse Digital elevation model (DEM) of the bottom of the seacliffs. The field study was conducted considering two small stretches of the sandy embayed coastline between Tróia and Sines (Southwest of Portugal). In these sectors the backshore of the subaerial beach is limited landward by the presence of seacliffs that suffer subaerial erosion (gullying process). The seacliffs presents poorly consolidated sediments (sand, clay, granule and fine pebbles) that suffer subaerial erosion showing complex gully morphology between the top and the bottom of the cliff. The sediments eroded by this process are stored at the base of cliffs in the form of debris fans. During storm periods the subaerial beach significantly decreases its width and the sediments contained in debris fans suffers cut-off. The sediments are transported by the waves thereby entering in the coastal system. Two data series of digital aerial images at 20 cm resolution, acquired in 2008 and 2009, were used to reconstruct cliffs digital surface models (DSM) and monitor the evolution of the complex gully system. A data set of 50 GCP was used to constrain the sensor location and orientation. The method was able to detect the presence of main areas of cliff displacement although the sensitivity of camera calibration prevented the absolute estimation of the displacement rate. New field surveys should help improve the results.
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