APPLICATIONS OF PERMANENT TERRESTRIAL LASER SCANNING

A YEAR OF INTER- AND SUBTIDAL BEACH TOPOGRAPHY

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INTRODUCTION

Recently, a lot of research has been devoted to the monitoring of spatiotemporal beach dynamics using multitemporal LiDAR. However, geomorphic processes that change at rapid timescales may require hypertemporal resolution. Previous work demonstrated the use of permanent laser scanning (PLS) for continuous – repeated at one place with a high temporal resolution – geomorphic observation of coastal change. This research describes a one-year PLS data set of beach topography near Mariakerke-Bad. As a case-study, a one-week period of low environmental forcing is used to assess the scanner's precision. In addition, a prototype of a web-based GIS user-interface (UI) for Digital Terrain Modelling of Differences (DoD) is presented.

STUDY SITE & SYSTEM CONFIG

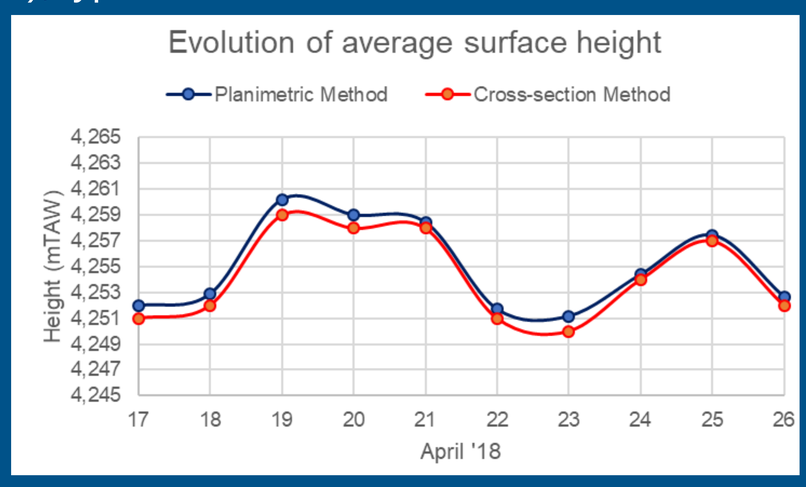
- **Study Area**
  Mariakerke-Bad (Ostend)
  Artificial beach (concrete seawall + stone groin field)
  Frequent beach nourishments
  Gently sloping (1 – 2 %) with a steep supratidal artificial berm
  Semi-diurnal tide w/ a macrotidal regime
  Presence of a few embryo dunes, sparsely covered in Marram grass
- **Scanner Configuration**
  TOF pulse-based Riegl® VZ-2000 terrestrial LiDAR
  Mounted on a 42 m high building overlooking the beach
  Hourly scan of the inter- and subtidal beach from Nov. '17 – Dec. '18

METHODOLOGY

- Scanner's 10-day period precision
  → No significant hydrodynamic / aeolian forcing
  → Avg. surface H within (cross- × along-shore) area of (220 × 180) m
  (1) Planimetric surface calculation via TIN-interpolation
  (2) Cross-section method of TIN-interpolated DTM
- Prototype of online GIS-based UI for DoD
  → DTM w/ TIN-interpolation: (1 × 1) meter grid of weekly surveys
  → Raster calculations between two user-selected dates
  → Difference of DTMs within the (220 × 180) m area
  → Additional visualisation of cross-profiles and DTMs

RESULTS

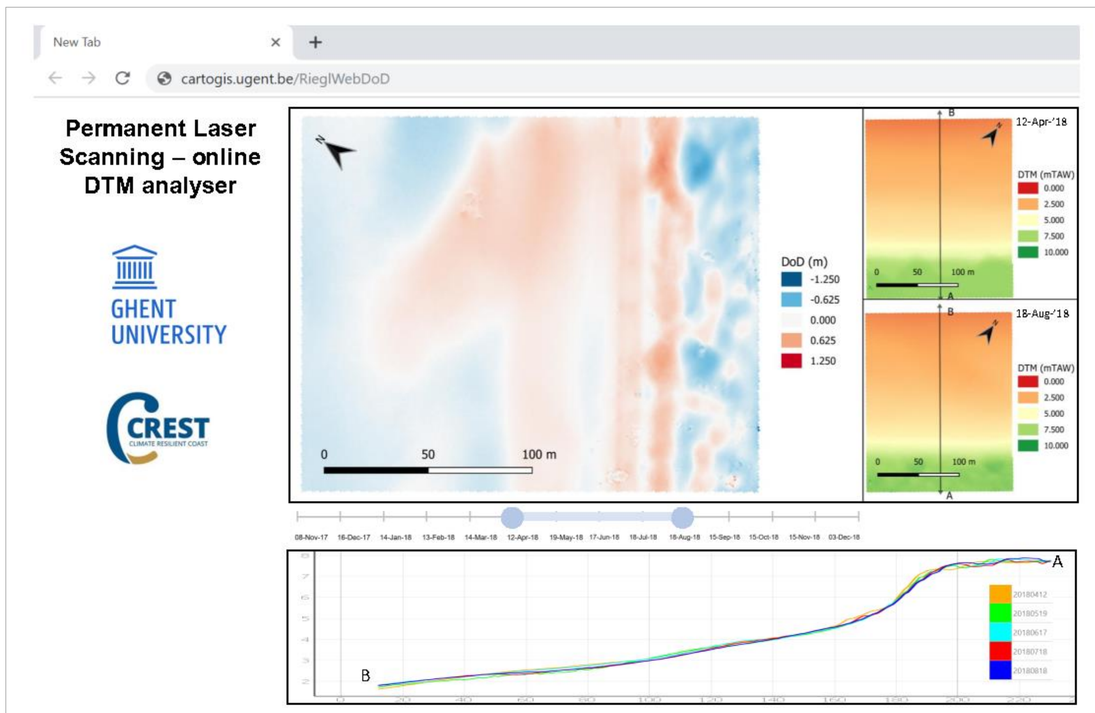
- Between successive days the max. abs. difference of the avg. surface height is only 7 mm with σ = 3 mm
- Total arithmetic change over 10 days = + 1 mm
- A σ of 3 mm on the avg. surface height between consecutive days is mainly due to the random errors (noise), typical for LiDAR measurements



- A 1-year series of weekly (1×1) m DTMs was calculated
- A prototype for the online DoD viewer was developed
- Handy range slider for time window selection
- Visualisation of DoD; start- & end DTM; in-between cross-shore profiles

CONCLUSION

PLS of the dry and intertidal beach yields good vertical precision and permits very time intensive scanning over longer periods. A one-year series of hypertemporal scans was acquired at Mariakerke Beach. A prototype GIS-based web viewer for ad hoc DTM analysis asks for further development.



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