Data in Brief 32 (2020) 106291

Contents lists available at ScienceDirect

Data in Brief

journal homepage: www.elsevier.com/locate/dib

Data Article

Cliff erosion monitoring dataset on selected sites of Polish coast

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ARTICLE INFO

Article history:
Received 3 August 2020
Revised 1 September 2020
Accepted 2 September 2020
Available online 7 September 2020

Keywords:
Cliff coastlines
Time-series datasets
Terrestrial laser scanner
Southern Baltic Sea

ABSTRACT

Coastal storms are highly unpredictable phenomena, frequently changing their characteristics and directly linked to global climate changes. They result in an intensive erosion processes and, are now a serious concern for the communities inhabiting the littoral zones. However, owing to the technical difficulties in registering morphological changes on cliff coasts, most short-term monitoring systems, analyses, and models have been implemented primarily along the dune coasts. Notwithstanding these difficulties, the changes on cliff coasts have been investigated quantitatively in order to properly identify the mechanisms controlling those phenomena. Here, we report on three soft-cliff systems in the southern Baltic Sea that were monitored with the use of terrestrial laser scanner (TLS) technology. A time series of thirteen topographic surveys were generated over a period of two years (12.2016–04.2018) and presented as coastal profiles with 50 meter spacing.

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https://doi.org/10.1016/j.dib.2020.106291

Specifications Table

Subject	Earth-Surface Processes
Specific subject area	Remote Sensing Applications in Coastal Environment
Type of data	Table
How data were acquired	Riegl VZ-400 – a 3D Laser Scanning System was used to obtain location and height of each point (x, y, z).
Data format	Filtered, Raw
Parameters for data collection	Topography profiles of coastal cliffs
Description of data collection	Three coastal soft cliff test sites have been measured with a 3D Laser Scanning System from 10 spots, acquiring 90 to 100 points per square meter, with an estimated vertical accuracy of more than 5 mm.
Data source location	Institution: Institute of Marine and Environmental Sciences, University of Szczecin City/Region: Szczecin / Zachodniopomorskie Country: Poland Latitude and longitude: Międzyzdroje: 53.942878, 14.466891; 53.946304, 14.471933 Bansin: 53.984058, 14.129931; 53.987170, 14.124293 Wicie: 54.498868, 16.450979; 54.502293, 16.455900
Data accessibility	*Filtered profile data:* Repository name: Mendelay Data Data identification number: 10.17632/g448xnxp2j.2 Direct URL to data: https://data.mendeley.com/datasets/g448xnxp2j/1 *Primary data sources (raw data):* Repository name: Institute of Marine and Environmental Sciences FTP repository host: szop.ztikm.szczecin.pl user: lidarusz password: juk417y526je ftp://lidarusz:juk417y526je@szop.ztikm.szczecin.pl
Related research article	Terefenko, P.; Paprotny, D.; Giza, A.; Morales-Nápoles, O.; Kubicki, A.; Walczakiewicz, S. Monitoring Cliff Erosion with LiDAR Surveys and Bayesian Network-based Data Analysis. Remote Sens. 2019, 11, 843. https://doi.org/10.3390/rs11070843

Value of the Data

- Coastal morphology profiles enable to describe erosion processes occurring during storm events.
- This dataset could be used to investigate dynamic nature of coastal cliff systems.
- The dataset represent a starting point for detailed monitoring of morphology changes in Polish cliff systems.
- These data can facilitate long term modelling of coastline changes in Poland.
- The investigation of cliff profiles can help to understand landslide processes.

1. Data Description

Coasts are extremely dynamic environments. To track cliff changes and identify the processes of its modifications, data must be collected frequently over consistent time intervals [1,2]. The data presented here cover a survey timeline from November 2016 to June 2018. Thirty-nine topographic surveys (thirteen for each measured site – namely Międzyzdroje, Bansin and Wicie) were conducted with Terrestrial Laser Scanner (TLS) technology resulting in a point cloud. The results were filtered for beach and cliff areas as a profile lines with 50-m-wide spacing and are presented in a separate Excel sheet for each investigated site. A list of all surveys with dates and individual data files for each field campaign is included in Table 1.

Table 1
Analytical periods used according to dates of surveys by test site.

Campaign no.	Międzyzdroje	Bansin	Wicie	Profile file name	Point cloud catalogue
1	03.11.2016	09.11.2016	14.11.2016	Camp1.xlsx	C1
2	14.12.2016	19.12.2016	12.12.2016	Camp2.xlsx	C2
3	30.12.2016	29.12.2016	-*	Camp3.xlsx	C3
4	14.02.2017	16.02.2017	15.02.2017	Camp4.xlsx	C4
5	03.04.2017	06.04.2017	10.04.2017	Camp5.xlsx	C5
6	06.06.2017	07.06.2017	09.06.2017	Camp6.xlsx	C6
7	11.09.2017	04.09.2017	01.09.2017	Camp7.xlsx	C7
8	16.10.2017	17.10.2017	18.10.2017**	Camp8.xlsx	C8
9	07.11.2017	06.11.2017	29.11.2017**	Camp9.xlsx	C9
10	09.01.2018	12.01.2018	15.01.2018	Camp10.xlsx	C10
11	19.02.2018	01.02.2018	02.02.2018	Camp11.xlsx	C11
12	04.04.2018	21.03.2018	23.03.2018	Camp12.xlsx	C12
13	14.06.2018	26.06.2018	20.06.2018	Camp13.xlsx	C13

* survey on 28.12.2016 was unsuccessful due to high water levels;.
** survey was unsuccessful at two profiles.

2. Experimental Design, Materials and Methods

The implemented laser-based survey technique allowed for rapid and accurate collection of large amounts of topographic data. During the last decade, TLS has been successfully applied to topographic surveys and to the monitoring of coastal processes [3–5]. Highly accurate measurements of coastal changes were performed on three sections of south Baltic coast, each 500 m long. With the use of Riegl VZ-400 scanner measurements campaigns have been performed as a post-storm surveys. Scans have been carried out at each survey from eight stations located about 50 m from the coastline acquiring 90 to 100 points per square meter of measured surface. Additional two scanning stations have been located at the lower part of the slope. This enabled to partially resolve the occlusion problem generated generally by existing vegetation. The estimated vertical accuracy of all measurements was not higher than 5 mm.

Acquired set of data consist of millions of points, i.e. the locations/positions measured both on the cliff. Every single point carries information about its geographic location (discrete x,y,z values), which is obtained by calculating the distance and angle from the scanner's location [6,7].

With the use of the „point cloud" data, not only a full spatial surface model of the cliff face was generated, but also information about the whole beach up to the line of water had been registered. Obtained data required multi-scan adjustment and georeferencing. It was realized by using the georeferencing targets distributed evenly over the investigated area used to fit each scan in the same spatial reference. Based on precisely measured GCPs (Ground Control Points) different scans have been integrated into a common reference system. For further analysis data has been transformed into a Polish national coordinate system (PL-2000). The scanning procedure included also the process of authorized classification which enabled to identify the vegetation in the cloud of scanned points. Furthermore with the process of the 3D point cleaning procedure the reflections, rest of the vegetation and false measurements has been removed manually.

For further processing the point cloud representing coastal surface have been filtered and presented as profile lines with 50-m-wide spacing. First the profile lines has been generated automatically with a 1 meter node spacing. Finally each node has been assigned the value of the closest point form the point cloud.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships which have, or could be perceived to have, influenced the work reported in this article.

Acknowledgments

This dataset was conducted and stored as part of two projects: “Coastal cliffs under retreat imposed by different forcing processes in multiple timescales - CLIFFREAT”, -grant number UMO-2015/17/D/ST10/02191 funded by the National Science Centre, Poland, and “The Oceanographic Data and Information System eCUDO.pl” - contract No. POPC.02.03.01-00-0062/18-00 funded by the European Union through the Operational Programme Digital Poland 2014–2020 Fund.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.dib.2020.106291.

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