

# Geomorphometric analysis of glacial curvilineations (GCL) in Dobrzyń Lakeland, Central Poland

Aleksander Adamczyk, Marcin Sobiech, Agata Urbańska, Wojciech Wysota

Faculty of Earth Sciences  
Nicolaus Copernicus University  
Toruń, Poland  
adams@doktorant.umk.pl

**Abstract**— Morphometric analysis of forms of surface terrain is one of the main tasks facing the geomorphologists. This type of study is also using to describe landforms formed during the Pleistocene glaciations. So far, researchers analyzed morphometric characteristics of the tunnel valleys, drumlins, eskers and mega - scale glacial lineations.

Recent study ongoing by Lesemann et al. [1, 2] have led to describe new forms eroded by subglacial meltwater - glacial curvilineations. The main aim of the authors is describe morphometric characteristics of these features.

## I. INTRODUCTION

Dobrzyń Lakeland, located at the back of the maximum extent of the Scandinavian ice sheet (LGM) in central Poland (fig. 1), is characterizing by unique subglacial landscape [3]. Numerous tunnel valleys in Dobrzyń Lakeland (fig. 2) contain enigmatic bedforms that occur as fields of parallel, sinuous ridges separated by troughs [1]. For more than ninety years, these forms were determined as drumlins [4, 5, 6, 7, 8, 9, 10], although, their distribution and morphology are entirely different than typical. Recent studies suggest, that these features were formed due to subglacial meltwater erosion, so Lesemann et al. [1, 2] proposed quite new term to describe them as glacial curvilineations (GCL).

## II. METHODS AND AIMS

Previous studies have been focused mainly on the internal structure of the ridges, while much less attention have been paid to the analysis of their morphology. Researchers generally analyzed specific parameters for drumlins, such as length, width and height or length / width ratio [i.e. 7, 8, 9, 10]. So far, morphometric and spatial relationships between ridges and troughs and outstanding, spatial regularity of these features have

not been sufficiently analyzed. Availability of high resolution elevation data (LiDAR) and application of GIS tools to their analysis offer the possibility of a comprehensive morphostatistical study of these intriguing landforms. These researches could have big potential in new hypothesis about genesis of sinuous ridges in Dobrzyń Lakeland [1, 2] covered by the last continental ice sheet.



Figure 1. The study area on the background of maximum limit of the last Scandinavian ice sheet (LGM) in Poland

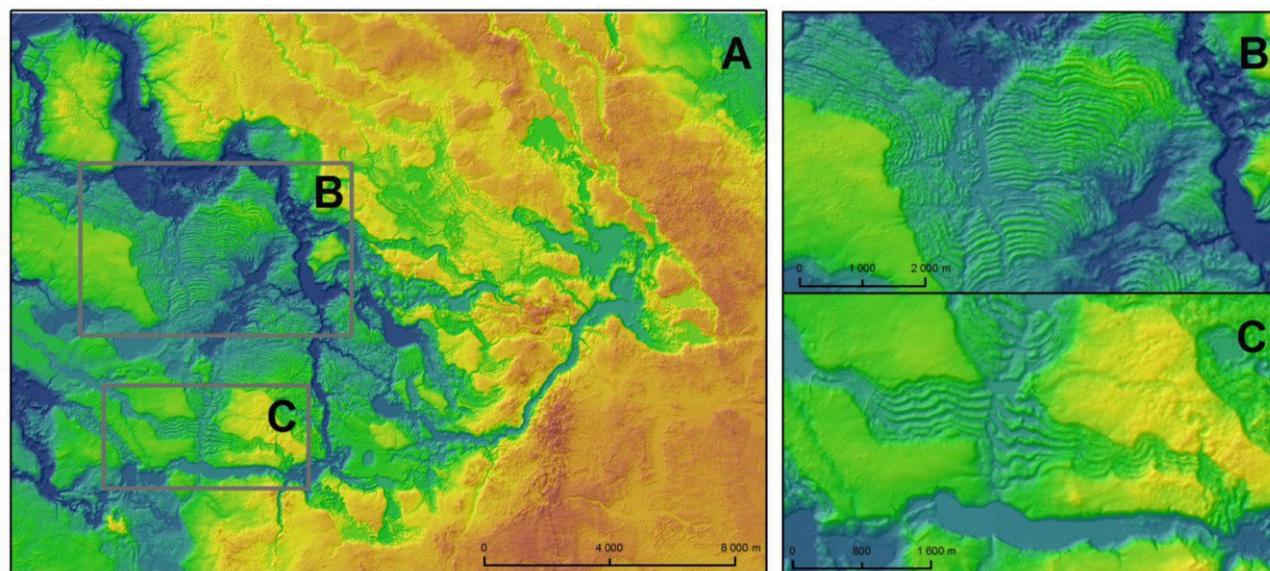


Figure 2. General view of study area (A), and two the most interesting locations of glacial curvilineations (B,C)

The main aim of the study is establishment in detail geomorphometric characteristics of ridges and depressions between them, especially: length, width, height / depth, sinuosity, orientation, development of the longitudinal profile and cross section spacing. High resolution digital elevation model will be used in the advanced ArcGIS analysis. Based on this data derivative shaded relief model, slope model and cross and longitudinal sections data will be created and statistically analyzed.

### III. RESULTS

First results show large diversity in few morphometric parameters, especially in length and width of these forms. The longest landforms exceed 8 km, however the shortest ones have only 0,5 km. Diversity of length of these features depend on cross-cutting its by lineations and channels perpendicular to their. The average width of the individual forms ranges from 57 to 120 m, although in some places even exceed 200 m. The average tortuosity of the shaft is 1.15 while the development of the longitudinal profile is minimal – 1,002.

Obtained first results show that analyzed landforms (GCL) have morphometric similarities to other subglacial features as eskers or tunnel channels, examined in a lot of areas of the last glaciation. It could be one of the strongest argument in discussion about genesis of glacial curvilineations.

Results of the study will be useful in verification of ideas on glacial curvilineations genesis and modeling of processes of

their formation within the Dobrzyń Lakeland subglacial landsystem.

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