Geology, Geophysics & Environment • 2012 • Vol. 38 • No. 4 • 508–510

GRAIN SIZE DISTRIBUTION OF THE MIDDLE GAUJA LOWLAND AEOLIAN SEDIMENTS AND THEIR SUBSTRATUM – PRELIMINARY RESULTS

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The Middle Gauja Lowland is located in the northern part of Latvia next to the border with Estonia. It is enclosed by Alūksne Upland in the north-east, Vidzeme Upland in south-west and Karula Upland in the north. Gulbene Interlobate Ridge separates the lowland from the Eastern Latvian Lowland in the south-east and Aumeisteri Interlobate Ridge separates it from the North Latvian Lowland in the north-west. The Middle Gauja Lowland has been formed by the Middle Gauja ice lobe of the Peipsijarv ice stream of the last (Weichselian) glaciation (Zelčs & Markots 2004). Ice retreated from the territory between Gulbene and Linkuva deglaciation phases (15.5–14.5 ka) (Kalm et al. 2011, Zelčs et al. 2011) forming large ice-dammed lake (Zelčs & Markots 2004). Sandy sediments of Middle Gauja ice-dammed lake form the upper part of Quaternary sediment sequence in the largest part of the lowland (Juškevičs 2002).

A total of 76 sandy sediment samples were collected at eight sites. At each site, one or two vertical outcrops, up to 5 m high, were sampled. Samples were taken from visually identifiable beds or, in cases when individual beds were very thick or had visually identifiable grading, samples were taken in approx. 10 cm intervals. Collected samples were dried at room temperature for at least two weeks. 200 g of each sample were dry sieved (mesh sizes in milimeters: 1, 0.8, 0.5, 0.315, 0.25, 0.2, 0.125, 0.1, 0.063) with mechanical shaker for 20 minutes. Each fraction was weighted on electronic scale (d = 0.001g). The mean, sorting, skewness and kurtosis of each sample were calculated with Folk and Ward (1957) logarithmic graphic method provided by customized version of R package "rysgran" (Gilbert et al. 2012). Mean grain size verbal description was taken from GRADISTAT (Blott & Pye 2001). Frequency and cumulative frequency plots for each sample were prepared by custom R script. Obtained frequency and cumulative frequency curves were visually compared between each other and with distribution curves published by Mycielska--Dowgiałło & Ludwikowska-Kędzia (2011).

All of sampled sites consist of moderate to well sorted medium to fine grained sand. Grain size distributions of assumed aeolian and glacifluvial parts of the Zelini site are similar. Presumed glacifluvial part has a slight increase at medium sand fraction and small amount of fine gravel. Relation between substratum and dune suggests short duration of aeolian processes.

Mustjogi 3 parabolic dune samples show almost no presence of very fine sand/silt and retain large percentage of coarser (< 2 phi) sand grains. It suggests the formation exclusively from slightly reworked underlying glacifluvial delta sediments consisting of medium/coarse sand as observed in Mustjogi 1 site.

Bimodal distributions of glacilacustrine sediments, as observed at Garengrîda and Mielupîte sites and, in lesser extent, at Mustjogi 1 glaciofluvial delta, explain observed bimodal distributions at some of dunes (Garengrîda, Smilškalni, Mustjogi 3). Preservation of distribution maximas with only slight increase of fine sand maxima suggest only slight reworking of sandy sediment substratum in aeolian conditions before their final deposition in dunes. Similar preservation of substratum distribution characteristics has also been observed in dunes lying on fluvial and marine coastal sediments (Mycielska-Dowgiałło & Ludwikowska-Kędzia 2011).

Observed similarities between both, size distributions of aeolian sediments and potential source of sediment grain size distributions, confirm observations of other authors (i.e. McManus 1988) that granulometric analysis without assistance of other methodology is not sufficient to allow unambiguous separation of different sedimentary environments.

Work of Māris Nartišs and Ivars Celiņš has been supported by the European Social Fund within the project "Support for Doctoral Studies at University of Latvia". Work of Edyta Kalińska was funded by the Postdoctoral Research Grant ERMOS (FP7 Marie Curie Cofund the "People" programme) "Age and climatic signature of coversands deposits distributed on glaciolacustrine basins along the Scandinavian Ice Sheet margin southeast of the Baltic Sea".

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