A new database sub-system for grain-size analysis

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Detailed grain-size analyses of large depth profiles for palaeoclimate studies create large amounts of data. For instance (Novothny et al., 2011) presented a depth profile of grain-size analyses with 2 cm resolution and a total depth of more than 15 m, where each sample was measured with 5 repetitions on a Beckman Coulter LS13320 with 116 channels. This adds up to a total of more than four million numbers. Such amounts of data are not easily post-processed by spreadsheets or standard software; also MS Access databases would face serious performance problems.

The poster describes a database sub-system dedicated to grain-size analyses. It expands the LabData database and laboratory management system published by Suckow and Dumke (2001). This compatibility with a very flexible database system provides ease to import the grain-size data, as well as the overall infrastructure of also storing geographic context and the ability to organize content like comprising several samples into one set or project. It also allows easy export and direct plot generation of final data in MS Excel.

The sub-system allows automated import of raw data from the Beckman Coulter LS13320 Laser Diffraction Particle Size Analyzer. During post processing MS Excel is used as a data display, but no number crunching is implemented in Excel. Raw grain size spectra can be exported and controlled as Number- Surface- and Volume-fractions, while single spectra can be locked for further post-processing. From the spectra the usual statistical values (i.e. mean, median. . .) can be computed as well as fractions larger than a grain size, smaller than a grain size, fractions between any two grain sizes or any ratio of such values.

These deduced values can be easily exported into Excel for one or more depth profiles. However, such a reprocessing for large amounts of data also allows new display possibilities: normally depth profiles of grain-size data are displayed only with summarized parameters like the clay content, sand content, etc., which always only displays part of the available information at each depth. Alternatively, full spectra were displayed at one depth. The new software now allows to display the whole grain-size spectrum at each depth in a three dimensional display.

LabData and the grain-size subsystem are based on MS Access as front-end and MS SQL Server as back-end database systems. The SQL code for the data model, SQL server procedures and triggers and the MS Access basic code for the front end are public domain code, published under the GNU GPL license agreement and are available free of charge.

References:

Novothny, Á., Frechen, M., Horváth, E., Wacha, L., Rolf, C., 2011. Investigating the penultimate and last glacial cycles of the Süttő loess section (Hungary) using luminescence dating, high-resolution grain size, and magnetic susceptibility data. Quaternary International 234, 75-85.

Suckow, A., Dumke, I., 2001. A database system for geochemical, isotope hydrological and geochronological laboratories. Radiocarbon 43, 325-337.