

## Assessment of Holocene soil erosion rates on the loess plateau in East Poland using sedimentary archives from closed depressions

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Closed depressions (CDs) are typical geomorphological features of the European loess belt. They are closed sedimentation basins that enable the estimation of long-term soil erosion rates for different land use environments. This study was conducted in eastern Poland (Nałęczów Plateau). In this region CDs are rather small landforms and the area of 70% of all CDs does not exceed 1500 m<sup>2</sup>. The study objective was to assess Holocene soil erosion rates in the loess plateau based on a quantitative analysis of colluvial sediments deposited in CDs. Two representative CDs were selected for this study: one CD is located in an old (long-term) forest and the other is situated in a long-term agricultural land. The maximum depth of the CD in the forest, the mean slope gradient and area of the corresponding catchment are 4.9 m, 3.410 and 7568 m<sup>2</sup> respectively. For the CD in agricultural land these values are 3.2 m, 2.760 and 5156 m<sup>2</sup> respectively. In both CDs several dozen of drillings and two trenches (2 m long, 1m wide, 2 m deep) were made in the deepest point of the CDs. Mean long-term soil erosion rates were calculated based on the stratigraphy of the soil-sediment sequence infilling the CDs.

C-14 and OSL datings of soils and colluvial sediments within the CDs were obtained.

For the long-term agricultural used catchment of the CD it was calculated that since  $6.31 \pm 0.35$  ka BP the mean annual soil loss due to water and tillage erosion is 0.63-0.7 t/ha/year or 279.3 mm. In the prehistoric period since  $6.31 \pm 0.35$  ka BP until 1026-1162 AD the mean annual soil erosion rate amounted to 0.10-0.11 t/ha/year or 41.5 mm. During the last ca. 1000 years mean soil erosion rates increased to 3.99-4.63 t/ha/year or 249.2 mm. Results of long-term soil erosion rates (calculated using colluvial sediment sequences in CDs) from agricultural catchments in the loess regions of eastern Poland (this study) and Central Belgium (Gillijns et al. 2005) are quite similar.

For the forested catchment of the CD the mean annual soil erosion rate since at least ca. 1000 years is 0.073-0.086 t/ha/year or 41.9 mm. In this catchment soil erosion and correlative colluviation deposits occurred mainly in prehistoric times.

CDs play an important role for archiving sediments which allow to reconstruct both natural and anthropogenic processes in the past. The study of these sediment archives allows a better understanding of human-environment interactions and its impact on long-term soil erosion rates.

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References: Gillijns K., Poesen J., Deckers J., 2005: On the characteristics and origin of closed depression in loess-derived soils in Europe- a case study from central Belgium. *Catena* 60, 43-58.