



Causes and effects of soil erosion in small catchments of Central Europe

Markus Dotterweich

Heisenberg Fellow of the German Research Council (DFG), Institute of Geography, University of Mainz,
Johann-Joachim-Becherweg 21, 55099 Mainz, Phone: +49-6131-39-24880, mail@markus-dotterweich.de

The onset of agricultural practices around 5000 years BC changed the European environment significantly. Woodland clearance and subsequent farming facilitated soil erosion. Run off, caused by heavy rainfalls eroded bare arable land. The accumulation sequences of these soil erosion events can be found as colluvial fans and terraces of gullies or as fluvial deposits in sedimentary basins. In Central Europe peaks of soil erosion and fluvial depositing due to human impact have been reconstructed for Bronze Age, Iron Age, Late Medieval Times and Modern Times.

The presented investigation areas in central Europe are characterised by well preserved geoarchives: deposition areas on concave hill slopes, in gullies, small valleys and river banks. Stratigraphic, sedimentologic, and pedologic parameters were determined from large pits dug in the geoarchives. The sediments and soil formations were dated by physical and archaeological methods. Analysis of contemporary written documents provided information about the regional land use, settlement, and climate history to complete the reconstruction of the environment history. Archaeological investigations were carried out in some catchments by the Offices for Heritage Protection.

From the beginning of the Neolithic Revolution (~ 5000 BC) until the Early Medieval Times (~ 800 AD), the landscape development was determined by several phases of vacillating land use intensity and duration. Woodland clearings for agriculture consisted of only small plots over a limited time span. In large areas, soil formation under wood was still the dominant process. During the Roman Times (~30 BC until ~450 AD) more land was used agriculturally. Extreme rainfall events caused soil loss of more than one meter. In the Dark age period (~450 AD until ~650 AD) land use intensity decreased, soil formation was the dominant process. Until the end of the High Medieval Times (~1200 AD), nearly all investigated catchments were almost completely deforested and used for agriculture or as settlement sites. However, soil erosion was low during this time. During the Late Medieval Times (~1200 until ~1400 AD), a period of extreme rainfall events and the extended land use, led to high soil erosion intensities. Gullies, up to several hundred meters in length and six meter deep developed. Single erosion events led to sheet erosion that lowered the slopes up to 12 centimetres. The fertile soil was eroded and the underlying stones were exposed. Land use was abandoned over a wide area. From the 16th until the 18th centuries land use increased again. The gullies that developed during the late medieval soil erosion period lengthened. The lower parts of the gullies filled with sediments. From the 19th century until today the land use intensity and subsequently the soil erosion intensity decreased continuously. Gully erosion occurred only along pathways. Since the middle of the 20th century almost all investigation areas were reforested or used as pasture.