Geophysical Research Abstracts, Vol. 7, 06171, 2005
SRef-ID: 1607-7962/gra/EGU05-A-06171


# Long term sediment budget modelling of fluvial systems on large spatial scales (Rhine catchment)

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A major obstacle to our ability to asses future impacts of climate and human change on fluvial systems is the lack of understanding of sediment erosion, transport and deposition over long periods (i.e.7.000 years) and large spatial scales (i.e. 100-10.000 $km^2$). The applicability of process based-models over long periods and on large spatial scales is limited due to the limited process understanding and the lack of long term times series of sediment transport measurements. It is therefore stated that the calculation of empirical sediment budgets on large spatial and long temporal scales is of major importance. The aim of our research is to model the Holocene sediment budget covering the Rhine catchment (185.000 $km^2$) over the periode of agriculture, which dates back to the Early Neolithic (˜7000 yr BP). Our research objectives are (i) identification of Holocene storage components, (ii) estimation of Holocene erosion rates and sediment yields, and (iii) calculation of Holocene sediment delivery ratios at different spatial scales. We present a hierarchical modelling approach which focuses on the estimation of the distribution and volume of Holocene floodplain deposits. Major parts of floodplain material is stored along 2. and 3. order reaches, which is only resolved in geoscientific maps or DTMs of high resolution. These data are only available for small parts of the Rhine catchment. To calculate the volume of floodplain deposits of the entire catchment, (i) floodplains are extracted from geologic maps and DTMs using logistic regression, (ii) floodplain width and depth is correlated with stream power along certain transects, (iii) results of the transects are transferred to larger areas using a geomorphometric dissagregation of the Rhine catchment. Preliminary results of the River Rhine tributary catchment Sieg (2860 $km^2$), shows a Holocene floodplain volume of 0.1-0.3 $km^3$, which represents a erosion rate of 10-100 cm a-1 over the last 7000 years.