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Reconstruction of extreme palaeo-floods based on geochemical-mineralogical criteria in floodplain sediments

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The increasing frequency of extreme flood events has been discussed since many years and it is speculated that they are a possible consequence of climatic change and/or river regulation. The climatic history of Central Europe shows that extreme floods, comparable to the flood event of the River Elbe in 2002 must have occurred in the past millennium several times. However, a fact supported discussion on the cause(s) of extreme floods can only be led by knowing about their frequency and magnitude in the past.

During a flood event, prevailing hydrological conditions are significantly different in comparison to those during normal water level. The discharge is then characterised by a larger amount of water and higher flow velocity. Thus the suspended load will vary in terms of both concentration and composition. The particles being transported during a flood are quantitatively more, they are larger in size and they show other geochemical-mineralogical features than particles which are transported during normal water level. Preliminary investigations on both suspended load during floods and during normal water level lead to the assumption that the deposition of the suspended load results in a geochemical-mineralogical signal which can be detected using appropriate analytical methods.

Analyses on samples of suspended load from the River Rhine, taken at different water levels indicate that during floods the carbonate fraction is higher than the fraction of clay minerals. This is supported by a positive correlation trend between the discharge and the content of Ca and Sr in the suspended material, both being typical elements for the carbonate fraction. In contrast, elements like K, Ti, and As show a negative cor-

relation trend with the discharge, suggesting simultaneously a relative depletion in the clayey fraction (e.g., clay minerals, Fe-oxyhydroxides, etc.). This finding represents a promising starting point for further research, aiming to establish a concrete relationship between sediment chemistry and flooding events. The outcome of this could be a data record which would enable the reconstruction of the occurrence of extreme flood events far beyond historical records.