

RAINFALL-RUNOFF-SEDIMENTATION DYNAMICS IN THE MOUNTAINEOUS AREAS OF NORTHERN CHAD

Context and objectives

Northern Chad lies in the Saharan climate zone. Despite the high aridity, the mountainous regions receive low frequency but high intensity rainfalls, which are rapidly concentrated in the watercourse network composed of wadis (non-perennial watercourses mainly following structural accidents/geological limits). The “flash floods” effect enables to transport fine materials which will be deposited where the gradient decreases. The deposition of the fine material lowers the hydraulic conductivity of the top soil layer, eventually playing a major role in the separation of the shallow aquifer from the surface. Being able to identify such areas of clay-silt accumulation is therefore of great interest as it indicates the strength of transport as a function of precipitation intensity, and has a direct impact on the capacity of water to infiltrate. The present project aims at identifying and understanding the relationship between rainfall intensity and sediment transport/deposition in the arid climate of Northern Chad by the use of a combined number of remote sensing products and land classification techniques. The effect of lowering hydraulic conductivity will also be investigated by the use of hydrogeological modelling.

Research approach and methodology

Because of the political/security situation in Chad and the neighboring countries, it is not possible to propose field work for this subject. The student will be analyzing sediment samples which were collected in 2014 from the northern regions, using a hyperspectral camera used in the PhD project of Laurent Fasnacht (PhD student at CHYN). Based on the spectra of the sediments, the student will have to develop a land classification workflow by using Geographic Information System (ArcMap, QGIS) and Remote Sensing (ENVI) programs. Hydrogeological modelling will be developed for specific areas.

Partners and collaboration

The project will be supervised by Prof. P. Brunner, Marie-Louise Vogt and Laurent Fasnacht. It represents a part of the ongoing research focusing on the Nubian Sandstone Aquifer System of Northern Chad. It will be carried out entirely at the CHYN.

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