EGU21-2123
https://doi.org/10.5194/egusphere-egu21-2123
EGU General Assembly 2021

Vegetation changes and sediment transfers in the catchment of Lake Alaotra, Madagascar

Nils Broothaerts[1], Vao Fenotiana Razanamahandry[1], Liesa Brosens[1,2], Benjamin Campforts[3], Liesbet Jacobs[1], Tantely Razafimbelo[4], Tovonarivo Rafolisy[4], Gert Verstraeten[1], Steven Bouillon[1], and Gerard Govers[1]

[1]KU Leuven, Department of Earth and Environmental Sciences, Leuven, Belgium
[2]Research Foundation Flanders (FWO), Egmontstraat 5, 1000 Brussels, Belgium
[3]University of Colorado at Boulder, Institute for Arctic and Alpine Research, Boulder, CO, USA
[4]University of Antananarivo, Laboratory for Radioisotopes, Antananarivo, Madagascar

To understand the driving processes for changes in African ecosystems and related problems such as soil degradation, it is crucial to gain insight in the relative importance of human disturbance and climate change. Madagascar is known for its particularly high erosion rates in the central highlands, yet the role of human disturbance versus natural processes are not well understood and is a topic of ongoing debate. Recent studies have challenged the traditional view that the currently observed intense erosion processes and sediment fluxes in Madagascar are mainly driven by recent large-scale deforestation. However, at present almost no quantitative data is available to couple vegetation dynamics and sediment fluxes over time in Madagascar. This study aims to provide more insight in landscape changes (vegetation changes, sediment mobilization and deposition) in central Madagascar, and in the specific role of man and climate. The study focuses on the 1800 km² catchment of Lake Alaotra, located ca 200 km northeast of Antananarivo. Lake Alaotra is formed in a graben system in the highlands of Madagascar, and is the largest freshwater lake of the country (400 km²). A pollen record from the lake was used to reconstruct regional vegetation changes. Radiocarbon dates of extracted pollen provide a detailed chronostratigraphic framework. Augerings and radiocarbon dates from floodplains and marshes in the catchment were used to reconstruct the sediment deposition history. The pollen record and charcoal data shows the vegetation changes over the last 3000 years. The main observed shift in vegetation is a transition from a woodland/grassland mosaic towards an open grassland, starting ca 1850 years ago, which coincides with the onset of human activities. Data on floodplain sedimentation show an increase in accumulation rates in the last 600 years, from ca 1 mm yr^{-1} to ca 30 mm yr^{-1}, which can be linked to increased hillslope erosion rates during that time period. The sedimentation wave, however, does not reach Lake Alaotra nor the surrounding marshes as floodplains act as a buffer. Overall, this study provides a spatial and temporal integrated reconstruction of vegetation changes in the Lake Alaotra catchment and the link with sediment mobilization and deposition, thereby providing a better understanding of environmental changes in central Madagascar and its driving forces.