# Paleosol-sediment-sequences along the Andean piedmont (Eastern Bolivia) and their implications for Late Quaternary landscape evolution

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The Eastern Bolivian lowlands are situated at the transition between the tropical-humid and the more arid subtropical climate regime. They should therefore be particularly suitable for the reconstruction of past climate changes. At least throughout the Quaternary, weathering products from the Andean Precordillera have been deposited in the Eastern Bolivian lowlands. Transport, accumulation, as well as subsequent erosion of these sediments, include fluvial, aeolian and denudative processes, which are primarily controlled by climate and tectonics. Accordingly, past climate changes can be expected to have influenced type and intensity of the prevailing geomorphic process, and they should be recorded in the stratigraphy and sedimentology of the foreland.
Here, we present preliminary results from using paleosol-sediment-sequences as archives for the reconstruction of landscape evolution and paleoclimatic conditions in Eastern Bolivia. Absolute chronologies are being established by $^{14}C$ and OSL dating, while analysis of remote sensing data enables the extension of local interpretations to a more regional scale.

The piedmont in Eastern Bolivia is bordered by the Andean Precordillera and the alluvial plain of the Río Grande. A series of small alluvial fans builds up the piedmont. Several sequences along the piedmont, which have been exposed due to the lateral erosion of the Río Grande, have been investigated (see Fig. 1 for an example outcrop at Cabezas). Alternating periods between geomorphological activity (gravels, sands, erosion channels) and stability (soil formation) have been identified .

Detailed sedimentological and stratigraphical studies along the outcrops enable us to define characteristic stratigraphical units. These form the basis for regional correlation and interpretation.
In general, coarse fluvial gravels and sands form the basis of the investigated profiles. They were probably deposited during the Last Glacial Maximum (LGM) or Late Glacial (LG) and grade into fluvial sand and silts. A well-developed paleosol has developed at the end of the Pleistocene/ Early Holocene at ~10 ka BP (all ages are uncalibrated $^{14}C$ years). A major erosional event then seems to have caused a pronounced hiatus before rapid (fluvio-aeolian) sedimentation and formation of a new, flat accumulation surface occurred between ~8 and 4 ka BP. Since ~4 ka BP, soil formation indicates surface stability. Base level changes resulting from large-scale river shifts of the Río Grande may have played a role in ending the depositional history of the piedmont at that time.

Based on the concept of landscape activity and stability, several conclusions regarding landscape evolution in Eastern Bolivia can be drawn: Forest cover may have been absent or significantly reduced during or before the LGM/ LG, thus allowing for the mobilization and sedimentation of the observed coarse fluvial deposits at the basis of the investigated sequences. This interpretation would be corroborated by findings from lake sediments in Bolivia, indicating dry conditions (Burbridge et al. 2004, Mayle et al. 2000). However, the limited number of age dates does not allow the precise temporal correlation of these sediments. The Pleistocene/ Holocene transition in Eastern Bolivia seems to be characterized by relatively stable, wet conditions, favouring soil formation and probably extensive forest cover. In contrast, the Early Holocene hiatus and the subsequent rapid accumulation point to extreme geomorphological in-

stability. This might be due to reduced forest cover under prevailing dry conditions. This interpretation may be corroborated by apparently reduced accumulation rates in Bolivian lakes (Burbridge et al. 2004, Mayle et al. 2000). Dry conditions have also been proposed by Servant et al. (1981) for the Mid-Holocene, based on widespread accumulation of fluvial sands and subsequent formation of dune fields. Even though modern aeolian activity can locally be observed in the study area, the Late Holocene transition to more humid conditions seems to be well documented: Recent soil formation at the top of our sequences are consistent with pollen findings from Bolivian lakes in the lowland (Burbridge et al. 2004, Mayle et al. 2000) and from lake sediments on the Altiplano (Baker et al., 2001b).

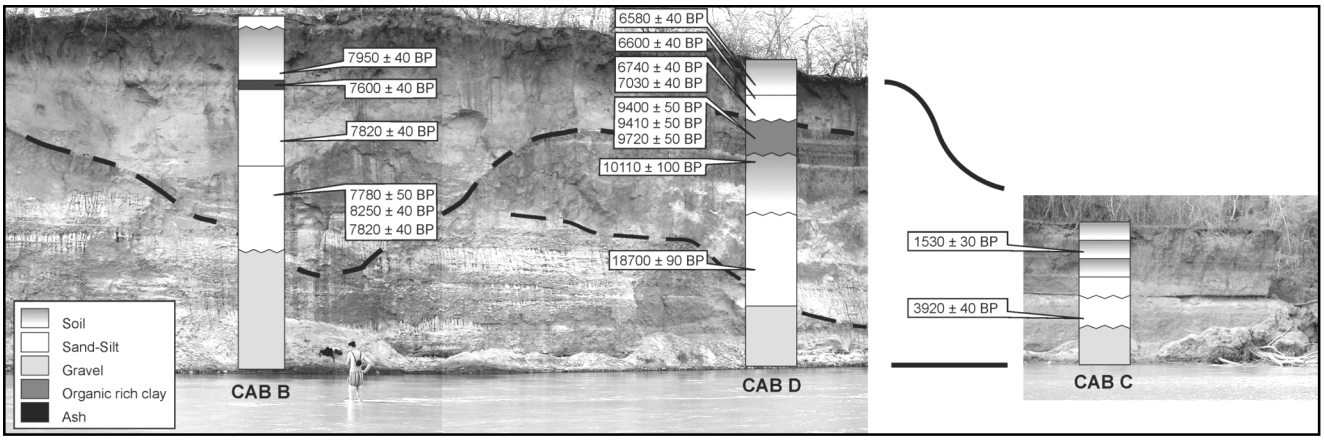


Figure 1: The picture shows the paleosol-sediment-sequence at Cabezas, E-Bolivia. Several stratigraphical units can be distinguished by sedimentological characteristics and have been $^{14}C$-dated (uncalibrated ages are shown here). Source of figure: Jan-Hendrik May

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