Giant slope failures as breeding grounds for earthflows in the Patagonian Andean foreland

Elisabeth Schönfeldt, Tomáš Pánek, Diego Winocur, Karel Šilhán & Oliver Korup

Giant landslides (≥108 km³) dot the Argentinian Patagonian Andean foreland along margins of basaltic plateaus. One cluster of these giant landslides surrounds the Meseta del Lago Buenos Aires (MLBA) that is formed mainly by Neogene-Quaternary basalts. Two types of slope failures prevail along the plateau. 1) Pre-Last Glacial Maximum compound landslides, here defined as a combination between rotational slides and lateral spreads, and 2) younger, >2-km long earthflows, nesting within the compound landslides. Some 95% of all earthflows are located in areas of compound sliding, and indicate a striking coincidence between compound landslides and earthflows. The abundance of these earthflows is at odds with the currently dry climate in the Patagonian foreland, raising the question about the causing mechanism. We reconstruct the history of these slope failures using geomorphic mapping, hydrological analysis, radiocarbon dating, and interpretation of exposed earthflows interiors at the El Mirador landslide, one of the most representative slope failures along the western margin. Our results show that local infiltration and channelling of precipitation on top of the plateau sustain springs along the margin of the plateau. Those springs nourish peat meadows that are especially abundant in areas of former earthflow activity. Radiocarbon ages suggest that earthflows displaced meter-thick peat deposits in the Late Holocene (< 2. 5 ka). The majority of ages coincide with the onset of a wetter Holocene climate in Easter Central Patagonia. We hypothesize that the distribution of large earthflows depends on the precursory occurrence of compound landslides by providing necessary depressions for the storage of water as well as weak and crushed material. Our results contribute to refining models of large landslides along volcanic plateau margins in dry climates, and yield new insights into the widespread backwearing of scarps in dry climates.

Kontakt:

Elisabeth Schönfeldt: Universität Potsdam, E-Mail: elschoen@uni-potsdam.de