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# EarthShape: A Strategy for Investigating the Role of Biota on Surface Processes

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EarthShape – "Earth surface shaping by biota" is a 6-year priority research program funded by the German science foundation (DFG-SPP 1803) that performs soil- and landscape-scale critical zone research at 4 locations along a climate gradient in Chile, South America. The program is in its first year and involves an interdisciplinary collaboration between geologists, geomorphologists, ecologists, soil scientists, microbiologists, geophysicists, geochemists, hydrogeologists and climatologists including 18 German and 8 Chilean institutions.

EarthShape is composed of 4 research clusters representing the process chain from weathering of substrate to deposition of eroded material. Cluster 1 explores micro-biota as the "weathering engine". Investigations in this cluster quantify different mechanisms of biogenic weathering whereby plants, fungi, and bacteria interact with rock in the production of soil. Cluster 2 explores bio-mediated redistribution of material within the weathering zone. Studies in this cluster focus on soil catenas along hill slope profiles to investigate the modification of matter along its transport path. Cluster 3 explores biotic modulation of erosion and sediment routing at the catchment scale. Investigations in this cluster explore the effects of vegetation cover on solute and sediment transport from hill slopes to the channel network. Cluster 4 explores the depositional legacy of coupled biogenic and Earth surface systems. This cluster investigates records of vegetation-land surface interactions in different depositional settings. A final component of EarthShape lies in the integration of results from these 4 clusters using numerical models to bridging between the diverse times scales used by different disciplines.

The Chilean Coastal Cordillera between 25° and 40°S was selected to carry out this research because its north-south orientation captures a large ecological and climate gradient. This gradient ranges from hyper-arid (Atacama desert) to temperate to humid conditions without a dry season and pristine temperate Araucaria forest. All study sites comprise granitic, previously unglaciated mountain ranges. It is one of the very few regions on Earth with uniquely rich conditions for quantifying biotic interactions with topography. Here, we benefit from (1) similar rock type, (2) tectonic uplift providing a topographic gradient for erosion on geological time-scales, (3) glaciation free catchments, and (4) well-documented records of climate change (marine, and lacustrine sediment records available). The presentation provides an introduction to the EarthShape project and an overview of activities over the first year.