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Humps and hollows: basalt weathering in low-latitude mountains

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Physical, chemical and biological weathering processes are significant contributors to landscape development in mountain blocks worldwide, and over long time scales, but the interplay between different weathering processes is uncertain. Jurassic-age basalt lava flows underlie the Drakensberg mountain range of eastern Lesotho, southern Africa (summits 3200-3400 m asl), and weathered bedrock is commonly exposed on flat plateau surfaces. Subaerial weathering throughout the Quaternary and Holocene has resulted in a range of weathering forms, some of which exploit pre-existing cooling fractures within the basalts, and some of which are independent of geological control. These forms include pseudokarst-style potholes, karren and other microforms. The geometry, chemistry of water contained within the potholes, seasonal presence of ice, sediment and organic residues all suggest that physical, chemical and biological weathering processes are significant at different times and in different ways in subaerial weathering. Moreover, it is also likely that these process-types show pronounced seasonal variability that means that the interplay between different processes is subtle. Aggregated rates of land surface denudation or geomorphic development of single landforms therefore hide this subtle interplay between different processes. Changes in mountain summit soil depth (through soil erosion), ecosystems and climate will change this balance between different processes, and will operate over different spatial and temporal scales.