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Alpine topography - young uplift and the glacial buzz-saw

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The complex topography of the European Alps reflects the interplay of tectonics, lithology, and erosional processes. Topographic gradients increase with surface elevation whenever an orogen commenced steady state whereas the European Alps are characterized by an inflection from increasing to decreasing slopes. This feature has been interpreted by in terms of the critical slope stability angle or the prematurity of a fluvial mountain landscape but could also be the result of the glacial buzz-saw. To determine the contributions of each of these principles we analyze the slope-elevation distributions of contiguous domains of contrasting structural units of the Alps. We further emphasize differences and similarities of glaciated and non-glaciated realms. Within the LGM extent inflections from increasing to decreasing slopes are conspicuously located at the LGM ELA highlighting the impact of glacial erosion. Varying lithological properties of different structural units control the decay rates of glacial landforms toward steady state slopes leading to a landscape characterized by different transient states. Most spectacularly the slope-elevation distributions show also inflections beyond the LGM limits. Here they are located at varying altitudes which implies a tectonic rather than a climatic driver suggesting that at least parts of the European Alps experienced a pre-Pleistocene pulse of tectonic uplift. This uplift event may have also influenced the onset and extent of the Alpine glaciations during the Pleistocene.