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Tectonic, climate and topography of mountains ranges

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Topography of mountains results from the dynamic equilibrium between lithospheric (tectonics) and atmospheric (climate) processes. Landscape is at the interface, and evolves depending on the conditions of tectonics, climate, and their interaction through erosion. Here we quantify the relative importance of these factors to shape topography of mountain ranges using multi-parameter analyses of more than 70 mountain ranges worldwide.
Our goal is to explore, insofar as possible, the relative roles of tectonics and climate in shaping mountain topography.
To achieve this, we use GPS shortening rates, in combination with latitude (as a surrogate for potential of glaciers, independent of altitude), topographic (elevation, mean elevation) and relief variables. We show that decanal tectonics shortening does not account for the entire topography of ranges (weak correlation, large scatter), and that relief is not correlated to tectonics. However, relief and the scale length of the relief (ratio between large-scale relief over small-scale relief) depends strongly on latitude, and suggest that short wavelength ($\sim$1km) relief is ultimately controlled by glaciers, whereas longer wavelength ($\sim$15km) relief is more controlled by tectonics.
We show that the shape of mountain ranges depends equally on tectonic forcing and latitude. Topography and relief reflect equilibrium between tectonic processes that thicken crust and erosion that thins it. Both tectonic and erosive processes are crucial to shape a mountain belt, but the wide range of climatic conditions, together with isostatic compensation for eroded material, mask the tectonic signal.