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Kinematics of mountain-building in Taiwan: a basis for exploring the coupling between tectonics and surface processes.

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Because of its high rates of convergence and erosion, the Taiwanese range is an ideal place to investigate the interactions between tectonics, erosion and climate. It has been viewed as a case example of a critical wedge growing by frontal accretion of material. Such model of mountain-building is quite popular in numerical models that explore the interplay between tectonics and surface processes. However, in the case of Taiwan, we have recently shown that shortening across the wedge has been absorbed solely on the most frontal faults of the western foothills over the last $\sim$2 Myr, which indicates that the range has grown by underplating rather than by frontal accretion. We propose here a new thermo-kinematic model of Taiwan that combines these findings with a wealth of new thermometric and thermochronological data on the long-term vertical movements within the range. All these data can be reconciled in a model in which erosion at the surface is presently essentially sustained by underplating. More importantly, they suggest that the contribution of underplating to orogenic growth has in fact been increasing with time, in particular by 1.5 and 4 Myr ago. Whether these readjustments and this evolution are related to a tectonic response to climatic changes, or else to deeper processes is still an open question. Our study therefore provides key geological quantitative constraints on the long-term evolution of the Taiwanese range that need to be taken into account in future models exploring mountain-building processes and interactions between tectonics, erosion and climate.