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Plant diversification is associated with habitat disruption in the transient Hengduan Mountains

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Mountain regions harbor disproportionately high biodiversity levels on Earth, which can hardly be explained solely by contemporary climate and heterogeneity. The complex interactions between the geological and climate dynamics in the mountain system could provide a unique substrate for species to diversify, leading both to higher diversity and higher endemism in the mountains. The Hengduan Mountains region is a unique biodiversity hotspot outside of the tropics. It is characterized by complex geological and climate histories associated with the Indian-Eurasia plate collision and monsoon intensification shaping intense geomorphic processes. These unique and complex histories are expected to have shaped landscapes across millions of years, fostering the emergence of lineages. Using the clade level of phylogenies and species range maps, we generated the spatial pattern of diversification rate for 33 highly diversified clades in the Hengduan Mountains. These spatial clade diversification rate patterns are spatially associated with active deformation history in the past 15 Ma. In this talk, I will present hotspots of diversification rate and potential linkage to geological and climate processes. I will demonstrate that the diversification rate hotspots are concentrated in the Three Rivers Region, Dadu River, and Shangri-La Plateau in the Hengduan Mountains. Then I will show the elevational gradient of the diversification rate within these hotspots and link them to specific geological processes. Specifically, long-term erosion from low-temperature thermochronology indicates the deformation process in the recent 15 Ma associated with new habitat and high diversification speciation process in the Three Rivers region and Dadu River in the Hengduan Mountains. Moreover, the landscape transience characterized by divides migration and low relief surface formation may create habitat disruption and range fragmentation to increase allopatric speciation. Taken together, the high plant diversity of Hengduan Mountain may be caused by intense focalized geological processes generating new species from habitat disruption.