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Using botanical evidence to reconstructing extreme flood in the Sierra de las Minas, Guatemala

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The Sierra de las Minas (SLM) is a Biosphere Reserve located in eastern Guatemala; the reserve is considered one of the most important ecosystems in Guatemala, and the origin of most of the rivers draining the country. The SLM has been spotted as highly susceptible to hydro-geomorphic processes due to its abrupt orography and the impact of hurricanes and tropical depressions. However, rivers in this mountain region is poorly recorded or are only constrained to the bottom of valleys over the last few years. Here we present a multi-centennial flash-flood reconstruction combining (i) field recognition, (ii) tree-ring records, and (iii) aerial picture interpretation of two contrasting torrential streams called río Hondo and río Pasabien in the municipality of Santa Rosalía. Río Hondo is characterized by an upper catchment with abrupt slopes that are well connected to the stream and sparse vegetation; whereas the upper catchment of río Pasabien present gentle slopes covered by a pristine, well-developed tropical forest. Major fluvial geomorphic changes were detected based on the interpretation of time series of aerial pictures. We also sampled pine tree showing scars induced by past flood activity , tilted trees and trees with exposed roots due to fluvial erosion. More than 60 trees were sampled in the floodplain of the streams. Besides, 20 unaffected trees were also sampled for cross-dating and to separate climate noise from flood signals. Although preliminarily, results suggest a contrasting flood behavior between the streams with dissimilar geomorphic imprints in the valleys, despite the fact that both catchments have been similarly impacted by recent hurricanes (including Mitch in 1998). This contrasting flash flood activity is explained by the dissimilar runoff and landslide activity observed in the upper catchments as a results of differing geomorphic and vegetation characteristics.