Chemical & Physical Sciences
UNIVERSITY OF TORONTO
MISSISSAUGA

COLLOQUIUM
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Interplay of Forest and Topography during the Growth of a Tropical Mountain

Insights from the Luquillo CZO observatory, Puerto Rico

The Luquillo Critical Zone observatory was set in the Luquillo Mountains, an isolated massif at the northeastern tip of Puerto Rico Island. These mountains receive more than five meters of rainfall annually. Such harsh conditions have helped keep the forest essentially unscathed, offering an opportunity to study the original structure of a rainforest over the topography.

In the Luquillo Mountains, forests exert a powerful control on erosion. As a result of quickflow through the soil macropores, physical erosion is kept very low over sheer slopes and in spite of abundant rainfall. Thick saprolite soils have become nutrient-poor, forcing the rainforest to retrieve its nutrients from. A wave of erosion initiated during a phase of uplift that started 4 Ma ago and converted a former low-lying xeric island into the wet peaks we see today. The wave of erosion allows for nutrient-rich minerals to make their way through the saprolite up into the soil. As a result the knickpoints split the forest into an upland landscape feeding on the Saharan dust and marine aerosols and a downstream landscape feeding on the bedrock. Vegetation in the upland region is dominated by Palm forest in the covers and Palo Colorado, which generates greater soil coverage and rain interception, making its soils less vulnerable to erosion forest on the ridges. This provides a positive feedback which favors incision of the coves and protection of the ridges, resulting in net increase in local relief.