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Examining the thermal characteristics of a highly diverse Andean mountain ecosystem in southern Ecuador and explore the process of regionalizing its thermal patterns.

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This study investigates the thermal characteristics of a highly biodiverse mountain ecosystem in southern Ecuador. The analysis involves temperature measurements conducted within the native mountain forest and at open sites across an altitudinal range from 1600 to 3200 meters. The primary methodological objective is to create a tool for regionalizing air temperature, enabling the generation of spatial datasets for average monthly mean, minimum, and maximum temperatures using observational data. These temperature maps, based on data spanning from 1999 to 2023, are essential for ecological projects operating in areas lacking climate station data.

To develop the temperature maps, a combination of a straightforward detrending technique, a Digital Elevation Model, and a satellite-based land cover classification is employed. This classification also provides information on the relative forest cover per pixel. The specific focus of the study is to examine the thermal structure of both components of the ecosystem (pastures and natural vegetation), with special attention given to how the conversion of natural forest into pasture affects the ecosystem's temperature regulation service.

The findings reveal a distinct thermal variation throughout the year, influenced in part by changes in synoptic weather patterns and the impact of land cover. Thermal amplitudes are notably low during the primary rainy season when cloudiness and air humidity are high. However, they become more pronounced in the relatively dry season, marked by differences in daily irradiance and outgoing nocturnal radiation between land cover units. Lower pasture areas, resulting from slash-and-burn practices on the natural forest, experience the most extreme thermal conditions, while the atmosphere within the mountain forest remains slightly cooler due to the regulating effects of dense vegetation.

In summary, the study underscores that clearing the forest diminishes the ecosystem's thermal regulation function (regulating ecosystem services). This reduction in thermal regulation could pose challenges, especially in the context of anticipated global warming trends in the future.