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Forest Cover, Windspeed, and Precipitation: A South American Case Study of the Impact of Forest Ecosystems on Wind and Rainfall Patterns

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Gaps persist in our comprehension of forest-water interactions and how forest cover potentially alters and sustains precipitation at continental scales. We analyze high-resolution, remote sensing data on forest cover, annual average wind speed and total annual precipitation amounts in order to better understand how forest cover impacts windspeed, and how the forest impact on windspeed can influence the transport and potential re-deposition of atmospheric moisture as rainfall. In this first look at these interactions over the South American continent, our analysis indicates forests slow windspeed, providing more opportunity for the accumulation and aggregation of both incoming atmospheric moisture and local evapotranspiration, thereby contributing to its increased potential re-deposition as rainfall. Our findings indicate rainfall is greater where forest cover has the effect of slowing windspeed. Moreover, in slowing windspeed, greater forest cover intensifies the hydrologic cycle, providing more opportunities for atmospheric moisture and evapotranspiration to condense and precipitate, as well as re-evaporate and re-transpire back to the atmosphere, thereby potentially increasing the terrestrial rainfall recycling and thus water use and availability across continental surfaces. We are hopeful improved understanding of how forest cover, windspeed and rainfall interact can help motivate future study and promote the development of a more rigorous approach to preserving the hydrologic cycle through the pursuit of Nature-based Solutions to forest landscape restoration.