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Altitudinal and temporal evapotranspiration dynamics via remote sensing and vegetation index-based modelling over a scarce-monitored, high-altitudinal Andean páramo ecosystem of Southern Ecuador (Article)

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#### **Abstract**

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In the tropical Andes, the paramo ecosystem is known as water towers and the main water supplier for the cities of the Andean region. Nevertheless, considering that evapotranspiration (ET) is the major water loss and the lack of in situ evapotranspiration measurements in high altitudinal páramo ecosystems, ET dynamics on the hydrological regulation remains largely unexplored. Therefore, to close this gap, we focused on a remote sensing approach. This study addressed the altitudinal and temporal dynamics of actual evapotranspiration using a crop coefficient based on a Vegetation Index (VI) model. Enhanced Vegetation Index (EVI), Normalized Difference Vegetation Index (NDVI) and Soil-Adjusted Vegetation Index (SAVI) retrieved from Landsat imagery were evaluated. Four remote sensing images and ground-level meteorological data for a 10-month period were used to create ET maps from each VI. A cubic spline interpolation was used to obtain daily ET time series between two satellite overpass dates. Aggregated monthly values were used to validate against ET calculated from water balance. Results revealed that EVI-based ET outperformed the other VI-based ET. The results showed 30% of subestimation (Pbias%) in relation to the water balance. For upgraded results, an extended satellite images time series and a fine calibration are needed. Regarding the altitudinal variability, ET exhibited a strong dependence on land cover characteristics. Our work provides a plausible method to estimate ET in páramo ecosystems in the absence of ET measurements and with a scarcity of clear sky images, further evaluation is necessary to improve ET estimations using remote sensing in the future. © 2019, Springer-Verlag GmbH Germany, part of Springer Nature.

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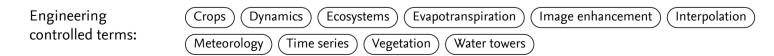
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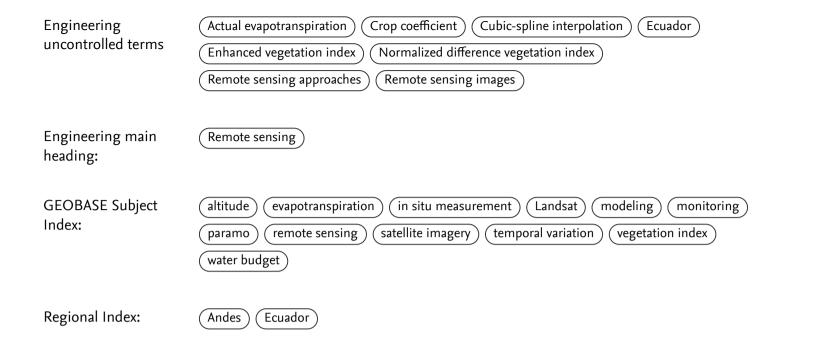
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