IAHS 2022 SCIENTIFIC ASSEMBLY
FROM 29TH MAY TO 3RD JUNE

IAHS2022-10
https://doi.org/10.5194/iahs2022-10
IAHS-AISH Scientific Assembly 2022

Evaporation dynamics and partitioning in Andean tussock grasslands

Ana Ochoa-Sánchez et al.

The paramo biome, located above 3300 m a.s.l. and covered mainly by tussock grasslands, provides ecosystem services for Andean cities, especially water resources used for drinking water, agriculture, hydropower generation and sustaining aquatic ecosystems. Even though research about the main components of the water cycle has increased substantially in the last decade, evaporation has remained unknown. In this study, we quantified for the first time daily, monthly and annual evaporation, its components (i.e. interception and transpiration) at event scale and its climatic drivers at a representative páramo catchment in Southern Ecuador (Figure 1). We used the eddy-covariance method to quantify evaporation. We additionally compared those measurements with lysimeters, water balance, energy balance, hydrological models (HBV-light and PDM) and the calibration of the Penman-Monteith equation in order to find easier and cheaper alternatives for estimating evaporation at the páramo (Figure 2).

Our results show that the paramo biome had a relatively low evaporation rate (annual ETa/P = 0.5, 1.7 mm/day) and is an energy-limited site, where net radiation is the primary control of evaporation (annual ETa/Rn = 0.47) (Figure 3). The secondary controls were wind speed, surface and aerodynamic conductance, especially important during dry periods. The maximum capacity of tussock grasslands to intercept water was 2 mm. During small events ($P < 2$ mm), between 100 and 80 % of precipitation was intercepted and released back to the atmosphere; while during large events ($P > 2$ mm), interception decreased from 80 to 10 %. During dry periods, transpiration rates ranged between 0.7 and 2.7 mm/day and on top, the fog and dew harvested by the vegetation contributed to the evaporation in around 30 %. When comparing eddy-covariance measurements with other methods, we found that the two hydrological models and the calibrated Penman-Monteith equation are robust alternatives for daily estimation of evaporation at the páramo. This study contributed to the understanding of the water cycle at the most important Andean ecosystem for its water resources.

Figure 1. Zhurucay ecohydrological observatory.

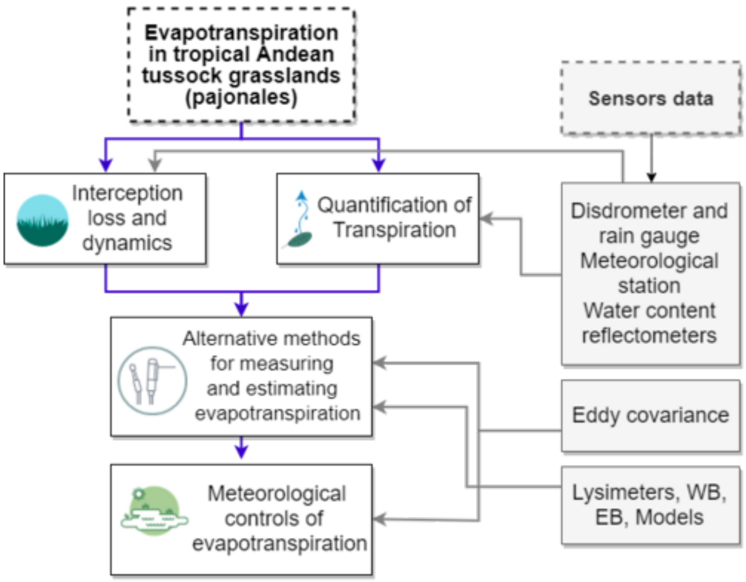

Figure 2. Methodology undertaken in the study.

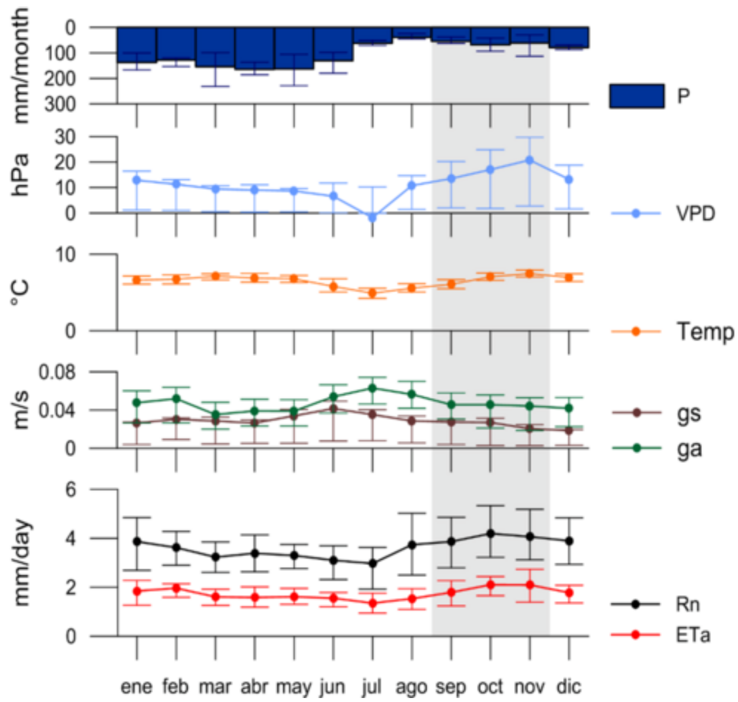

Figure 3. Evaporation (ETa) and climatic variables at the study site.

How to cite: Ochoa-Sánchez, A., Crespo, P., Carrillo-Rojas, G., Sucozhañay, A., Marín, F., and Célleri, R.: Evaporation dynamics and partitioning in Andean tussock grasslands, IAHS-AISH Scientific Assembly 2022, Montpellier, France, 29 May–3 Jun 2022, IAHS2022-10, https://doi.org/10.5194/iahs2022-10, 2022.