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Assessment of fog gauges and their effectiveness in quantifying fog in the Andean páramo

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Abstract

In tropical highlands of the northern Andes, known as páramos, fog incidence is very frequent. Its quantification is not yet clear, mostly because of the complexity of distinguishing between fog and low-intensity rainfall. Moreover, there is uncertainty about the performance of the various types of gauges used to capture fog in this ecosystem. This study was carried out at the Zhurucay Ecohydrological Observatory (3,800 m a.s.l.), in southern Ecuador, assessing two cylindrical (Juvik and

Wire Harp types) and two flat-screen fog collection gauges. A high-resolution laser disdrometer was installed next to the fog gauges, to measure precipitation of very low intensities and isolate fog from rainfall. We collected data over a 12-month period for four types of events—fog only, fog dominant, fog non-dominant and fog negligible. We evaluated the performance of the gauges during each type of event as well as to estimate the amount, rate and duration of fog. Fog was present during 68% of the days of the study, predominantly in the early morning and at night, and the average daily contribution was 1.37 mm. Most of the events occurred at rates below 0.3 mm h^{-1}. Measured rainfall was 1,200.1 mm, and fog estimations amounted to 340.1 mm. This fog contribution could bring total annual precipitation to about 1,540.2 mm, suggesting an extra 22% of water potentially available to the ecosystem—a very important asset for hydrological and ecological processes. This is the first study that has compared different types of fog gauges in the Andean páramo. © 2021 John Wiley & Sons, Ltd.

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