Article—*Supplementary Material*

Control of Tropical Landcover and Soil Properties on Landslides' Aquifer Recharge, Piezometry and Dynamics

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2.3.2 Estimating the Runoff Coefficient and Aquifer Response to Recharge

To evaluate the runoff coefficient (Rc), the flood hydrographs were broken down according to the approach proposed by Hewlett and Hibber [78]. This approach assumes that groundwater flow in an aquifer increases linearly between the start and the end of a flood (**Figure S1**). The part of the flow associated with surface runoff (S) is then dissociated from groundwater flow (B). The component (S) is defined between the start of the flood episode and the start of the recession curve [81]. In our case, the latter corresponds to the start of the linear portion of the hydrograph on a semi-logarithmic plot. The runoff coefficient (Rc = S/R) allows the quantity of water precipitated during a rainfall event (R) to be linked to that evacuated by surface runoff (S). Breakdown of the hydrograph here is based on daily rainfall measurements and over the total duration of an event spanning several days. Clain (S6) station data were used for calculating the runoff coefficient of soils developed over the landslide's breccia material. Ravine Blanche (S1) station data were used for determining the runoff coefficient of the ramparts. This approach provides a runoff history per surface unit and per type of watershed, for the period January 2011 to December 2012. The aquifer response to recharge (**Figure S1**) was evaluated by the amplitude of the piezometric variations dP of the breccia aquifer when such a variation was measured [82]. Variation dP corresponds to the difference between Pmin, the water level before the rainfall episode and Pmax, the highest water level during or after the episode.

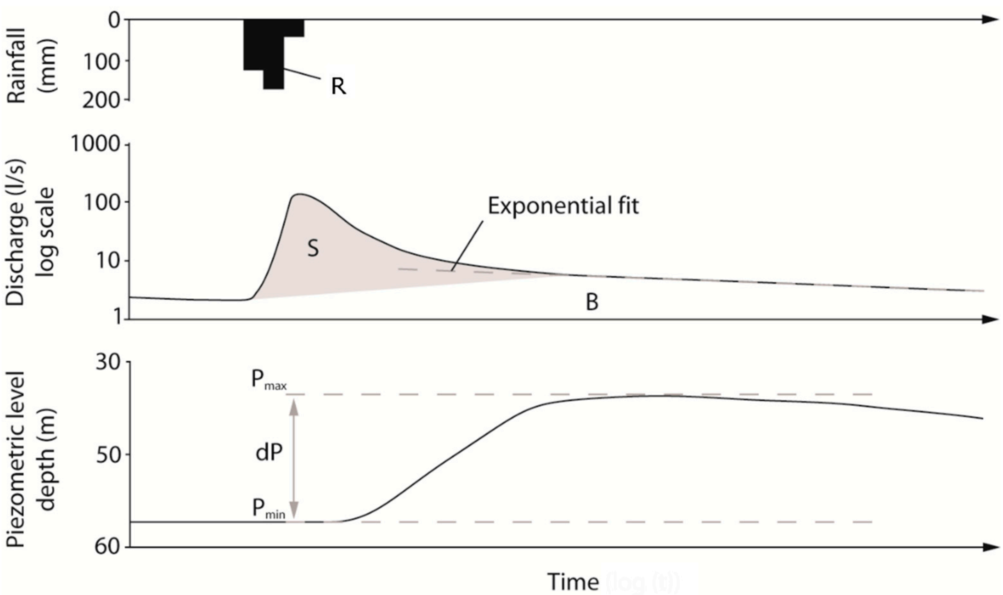

Figure S1. Top: method for breaking down hydrographs, for separating runoff (S) from ground water flow (B). Bottom: at the same time, the amplitude of piezometric variation dP is measured for each recharge episode (Dp = P_{max}–P_{min}). In this study, the time step is one day for rainfall, and 15 minutes for discharge and piezometric level.

3.5. Validation of the Water Budget from Piezometric Variations

On the scale of the landslide, the recharge volumes calculated from the mean amplitude of the piezometric variations were compared, event by event, to the recharge volume calculated with the water budget model (**Figure S2**). Only six rainfall events generated significant recharge between January 2011 and December 2012. The influence of the value of H_{Br} was tested. This again showed that the H_{Br} value of 250 mm systematically calculates volumes that are coherent with those estimated from the piezometric variations. Moreover, it confirms, as shown in section 3.4., that the discharge regime of both the streams and the piezometers is not sustained by slow water motion in the unsaturated zone of the landslide's aquifer during the dry season. Using H_{Br} values of <250 mm leads to a systematic overestimation of recharge volumes, especially for low rainfall episodes (12 February 2011, 10 January 2012, 12 February 2012). The model using a H_{Br} of 250 mm is the only one reproducing the observed recharge process, confirming the earlier observations. Moreover, from these data, effective porosity (= specific yield in unconfined aquifer) of the breccia aquifer is estimated at about 8% in the zone of piezometric variation (**Figure S2**). This estimation of effective porosity is very realistic for this type of aquifer. Moreover, it is in good accordance with the modeling of spring recession curves [61]. For two rainfall events only, the two lowest (below 200 mm), it appears that the estimated effective porosity is slightly higher than 8% (about 13–14%). During these 'low rainfall' events, the computed recharge is slightly more than expected, and thus high efficient porosity is required in the model. This is indubitably linked to the fact that the H_{Br} 250 mm value is probably slightly underestimated, as this parameter is more sensitive for "low" rainfall events than for higher.

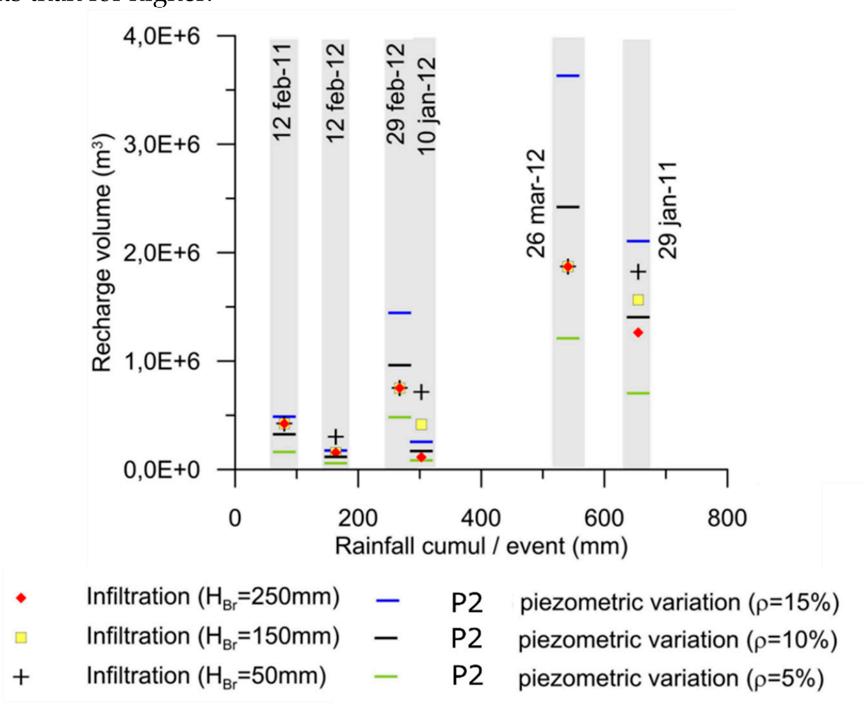

Figure S2. Estimated recharge volumes per recharge event, based on the amplitude of piezometric variations (for different effective porosity ρ values) and on budget calculations, in terms of cumulative rainfall per event.

2.1.4. Geological and Hydrogeological Setting

Table S1: Correspondence between spring names and codes using in the study.

Type	Name	Code
Springs	RB	S1
	NR	S2
	NR 3-4	S3
	NR2	S4
	TR-C	S5
	CL	S6
	SPRL-NE	S7
	EG2	S8
	EG1	S9
	TI3	S10
	TI	S11
	PDC	S12
	SPRL-E	S13
	JA	S14
	BIE2	S15
	BIE2	S16
	BE	S17
Piezometers	PZE2	P1
	PZA3	P2
	PZB3	P3