

## SUPPLEMENTAL MATERIALS

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# Development of Strategy for SWAT Hydrologic Modeling in Data-Scarce Regions of Peru

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**Table S1.** Soil profiles used to estimate properties of soil classes in El Frayle watershed.

Soil class name	Coverage (% of watershed)	Associated profile(s)	Alternate profile(s) [Soil class]
MM-P3sec	13.5	CA-14-Ancoyo	-
MM-P3s	12.4	S001	-
MM-P3swc	5.4	-	S001 [MM-P3s]
MM-P3se	2.9	CAL 23, CAL 42	-
SO-P2swc	17.0	-	CAL 14 [SO-P3se]
LL-Xsl	15.8	SC 12	-
CO-P2sec	7.2	M – 05, M – 06, M – 09	-
CO-P3sec	3.6	M – 02, M – 03, M – 10, M – 13, M – 14, M – 29	-
AC-P3sc	5.2	-	CAL 55, CAL 58 [AC-P3s]
AC-P3s	2.8	CAL 55, CAL 58	-
PA-P3sw	3.8	-	CAL 53 [PA-P3s]
PA-P3swc	3.3	-	CAL 53 [PA-P3s]

**Table S2.** Estimated SWAT soil properties for MM-P3s.

Name [unit]	Value(s)		
NLAYERS	3		
HYDGRP	B		
SOL_ZMX [mm]	250		
USLE K	0.10		
SOL_ALB	0.09		
TEXTURE	Loamy Sand	Sand	Loamy Sand
SOL_Z [mm]	250	800	1200
SAND [%]	86.0	92.0	84.0
SILT [%]	8.0	6.0	10.0
CLAY [%]	6.0	2.0	6.0
SOL_CBN [%]	0.46	0.23	0.29
ROCK [%]	27.5	27.5	27.5
SOL_BD [g/cm <sup>3</sup> ]	1.54	1.51	1.56
SOL_AWC [mm/mm]	0.04	0.03	0.04
SOL_K [mm/hr]	57.97	108.96	55.29

**Table S3.** Estimated SWAT soil properties for MM-P3sec.

<b>Name [unit]</b>	<b>Value(s)</b>	
NLAYERS	2	
HYDGRP	C	
SOL_ZMX [mm]	1100	
USLE_K	0.16	
SOL_ALB	0.13	
TEXTURE	Sandy Clay	Loam
SOL_Z [mm]	500	1100
SAND [%]	52.0	48.0
SILT [%]	24.0	28.0
CLAY [%]	24.0	24.0
SOL_CBN [%]	0.17	0.17
ROCK [%]	27.5	27.5
SOL_BD [g/cm <sup>3</sup> ]	1.59	1.58
SOL_AWC [mm/mm]	0.08	0.08
SOL_K [mm/hr]	5.18	4.78

**Table S4.** Estimated SWAT soil properties for SO-P2swc.

<b>Name [unit]</b>	<b>Value(s)</b>	
NLAYERS	2	
HYDGRP	C	
SOL_ZMX [mm]	850	
USLE_K	0.18	
SOL_ALB	0.09	
TEXTURE	Sandy Loam	Sandy Loam
SOL_Z [mm]	550	850
SAND [%]	60.2	69.2
SILT [%]	31.2	21.0
CLAY [%]	8.6	9.6
SOL_CBN [%]	0.38	0.42
ROCK [%]	50.0	25.0
SOL_BD [g/cm <sup>3</sup> ]	1.59	1.58
SOL_AWC [mm/mm]	0.06	0.07
SOL_K [mm/hr]	20.51	34.29

**Table S5.** Estimated SWAT soil properties for LL-Xsl.

<b>Name [unit]</b>	<b>Value(s)</b>		
NLAYERS	3		
HYDGRP	C		
SOL_ZMX [mm]	0		
USLE_K	0.16		
SOL_ALB	0.30		
TEXTURE	Sandy Loam	Loamy Sand	Loamy Sand
SOL_Z [mm]	100	600	800
SAND [%]	74.0	86.0	86.0
SILT [%]	18.0	10.0	10.0
CLAY [%]	8.0	4.0	4.0
SOL_CBN [%]	0.46	0.17	0.17
ROCK [%]	60.0	60.0	60.0
SOL_BD [g/cm <sup>3</sup> ]	1.57	1.55	1.55
SOL_AWC [mm/mm]	0.04	0.03	0.03
SOL_K [mm/hr]	25.51	47.92	47.92

**Table S6.** Estimated SWAT soil properties for CO-P2sec.

<b>Name [unit]</b>	<b>Value(s)</b>						
NLAYERS	7						
HYDGRP	C						
SOL_ZMX [mm]	450						
USLE_K	0.19						
SOL_ALB	0.18						
TEXTURE	Sandy Loam	Loam	Sandy Loam	Sandy Loam	Sandy Loam	Loam	Sandy Loam
SOL_Z [mm]	100	150	300	400	450	750	1000
SAND [%]	53.3	48.0	52.7	60.0	56.0	51.0	52.0
SILT [%]	40.0	37.3	33.3	32.0	29.0	32.0	30.0
CLAY [%]	6.7	14.7	14.0	8.0	15.0	17.0	18.0
SOL_CBN [%]	1.85	1.54	1.14	0.87	0.57	0.50	0.62
ROCK [%]	10.3	10.3	10.3	13.7	13.7	13.7	27.5
SOL_BD [g/cm <sup>3</sup> ]	1.37	1.44	1.49	1.53	1.57	1.57	1.55
SOL_AWC [mm/mm]	0.13	0.12	0.11	0.10	0.10	0.10	0.09
SOL_K [mm/hr]	54.05	24.05	25.19	41.84	19.64	14.69	12.15

**Table S7.** Estimated SWAT soil properties for CO-P3sec.

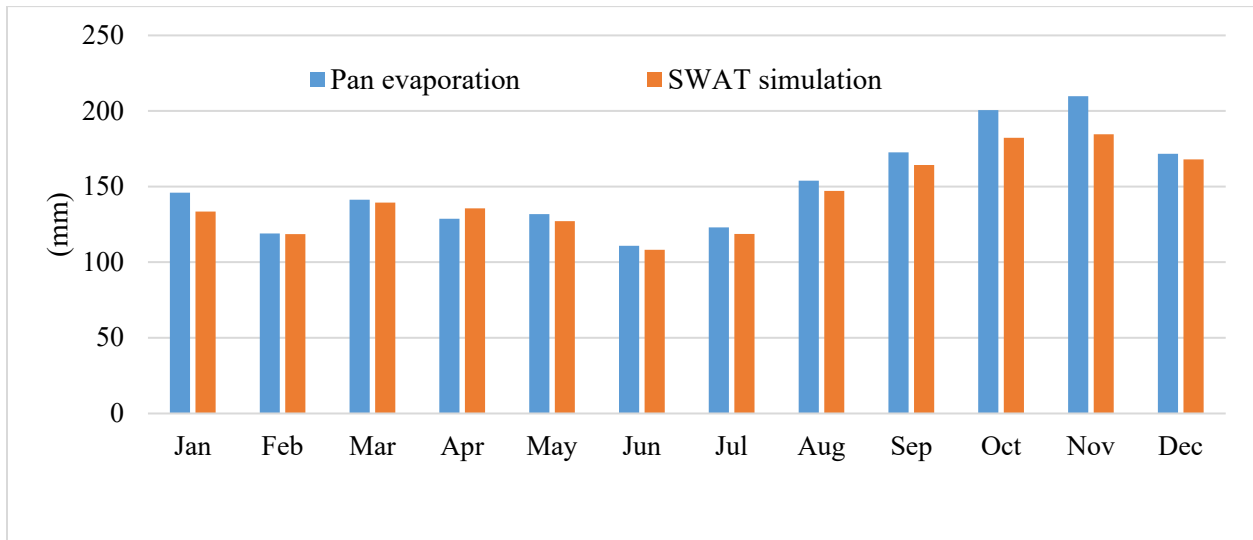
<b>Name [unit]</b>	<b>Value(s)</b>				
NLAYERS	5				
HYDGRP	C				
SOL_ZMX [mm]	350				
USLE_K	0.18				
SOL_ALB	0.15				
TEXTURE	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam
SOL_Z [mm]	50	100	150	350	1200
SAND [%]	67.3	67.3	66.4	64.8	56.0
SILT [%]	28.3	28.3	29.2	28.8	30.0
CLAY [%]	4.3	4.3	4.4	6.4	14.0
SOL_CBN [%]	3.34	2.06	1.60	0.75	0.61
ROCK [%]	23.1	23.1	25.7	25.7	31.2
SOL_BD [g/cm <sup>3</sup> ]	1.37	1.46	1.50	1.57	1.59
SOL_AWC [mm/mm]	0.09	0.08	0.08	0.08	0.08
SOL_K [mm/hr]	75.21	66.85	60.49	44.61	16.38

**Table S8.** Estimated SWAT soil properties for AC-P3s.

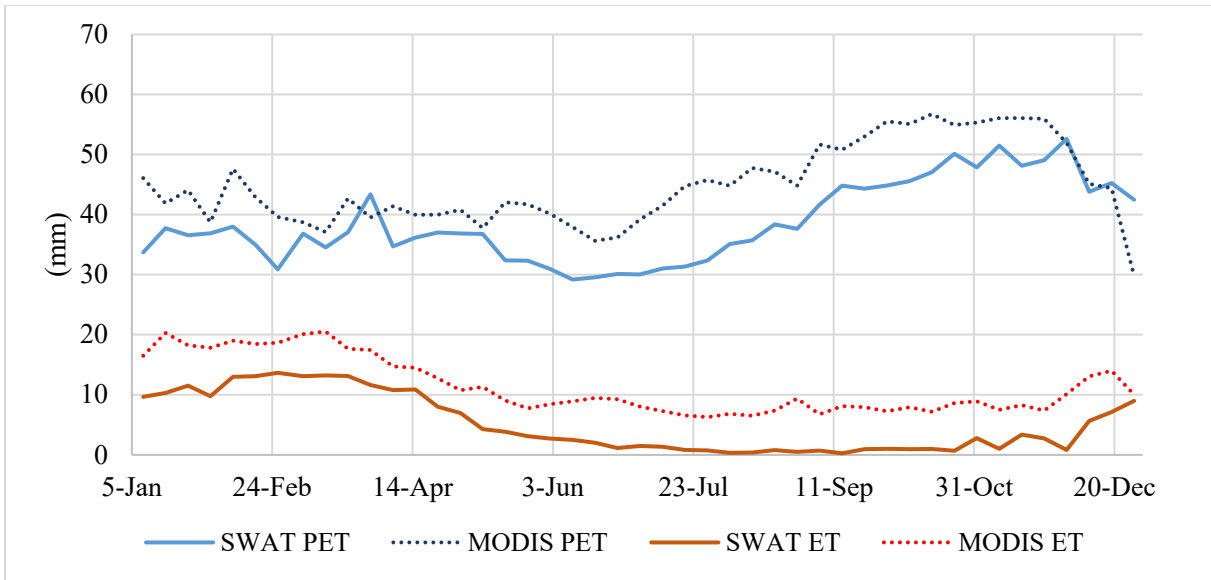
<b>Name [unit]</b>	<b>Value(s)</b>	
NLAYERS	2	
HYDGRP	C	
SOL_ZMX [mm]	220	
USLE_K	0.18	
SOL_ALB	0.20	
TEXTURE	Sandy Loam	Sandy Loam
SOL_Z [mm]	220	320
SAND [%]	52.8	52.8
SILT [%]	36.6	28.6
CLAY [%]	10.6	18.6
SOL_CBN [%]	1.37	0.12
ROCK [%]	45.0	50.0
SOL_BD [g/cm <sup>3</sup> ]	1.46	1.61
SOL_AWC [mm/mm]	0.09	0.07
SOL_K [mm/hr]	22.34	6.70

**Table S9.** Estimated SWAT soil properties for PA-P3sw.

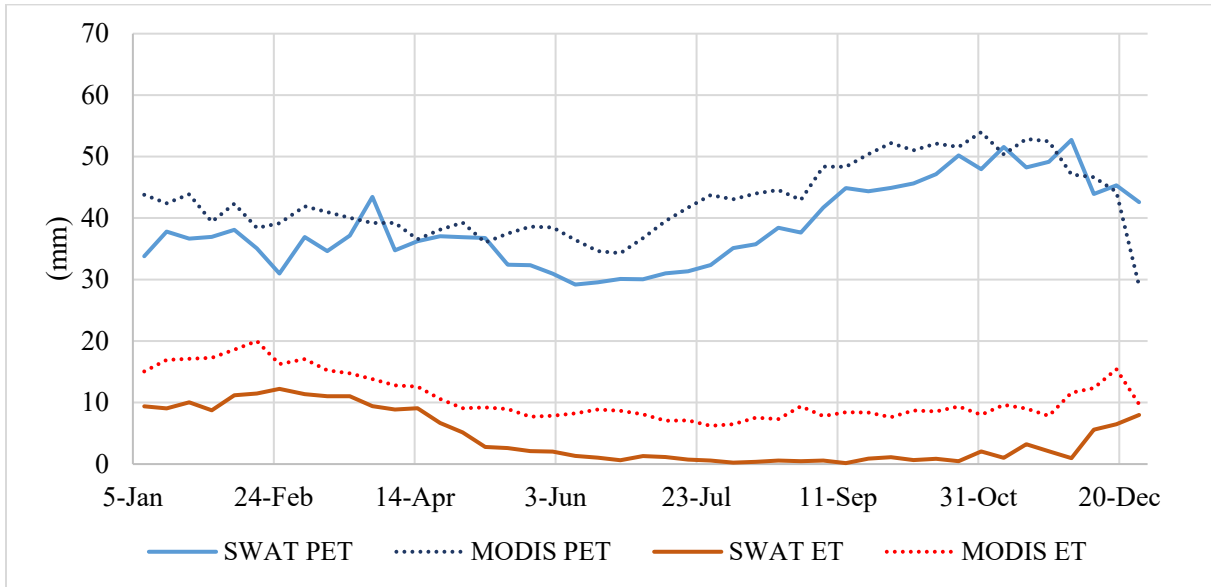
<b>Name [unit]</b>	<b>Value(s)</b>
NLAYERS	1
HYDGRP	C
SOL_ZMX [mm]	250
USLE_K	0.18
SOL_ALB	0.09
TEXTURE	Loam
SOL_Z [mm]	250
SAND [%]	48.4
SILT [%]	38.0
CLAY [%]	13.6
SOL_CBN [%]	0.12
ROCK [%]	30.0
SOL_BD [g/cm <sup>3</sup> ]	1.62
SOL_AWC [mm/mm]	0.10
SOL_K [mm/hr]	12.47



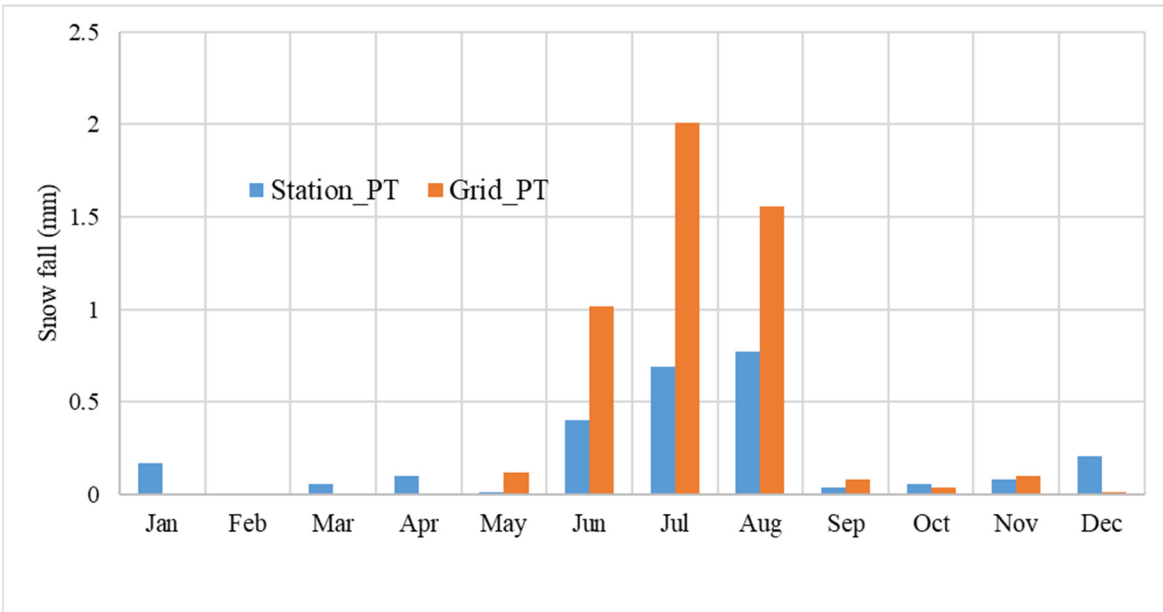
**Fig. S1.** Comparison of monthly averaged reservoir evaporation from 2010-2017.



**Fig. S2.** Simulated and observed (by MODIS) eight-day average PET and ET for a subbasin covered by pajonal (bushes of tall grasses and hard leaves) at 4200 m elevation (2010-2017).



**Fig. S3.** Simulated and observed (by MODIS) eight-day average PET and ET for a subbasin covered by tolares (open herbaceous with a mixture of woody plants) at 4200 m elevation (2010-2017).



**Fig. S4.** Comparison of simulated monthly snow fall for the El Frayle watershed based on two weather datasets.