Hydrogeology Journal - Electronic Supplementary Material (ESM1)

Estimation of groundwater recharge rates using soil water isotope profiles: a case study of two contrasting dune types on Langeoog Island, Germany

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Within this document (ESM1)

- Summary results of the uncertainty analysis of the annual recharge rates
- Google Earth satellite images of the soil profile sampling sites in August 2015 and August 2019.

Additional file (ESM2)

- Animation showing the simulated δ^2H versus depth profile for the period 20 October 2018 to 26 June 2019
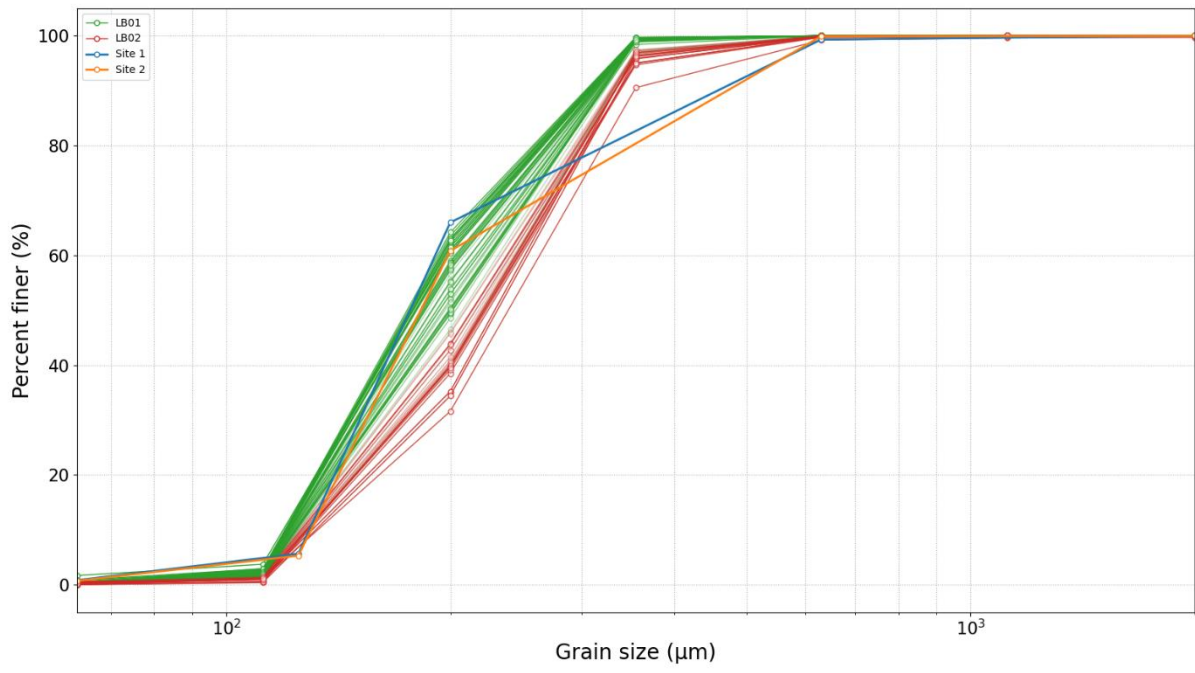
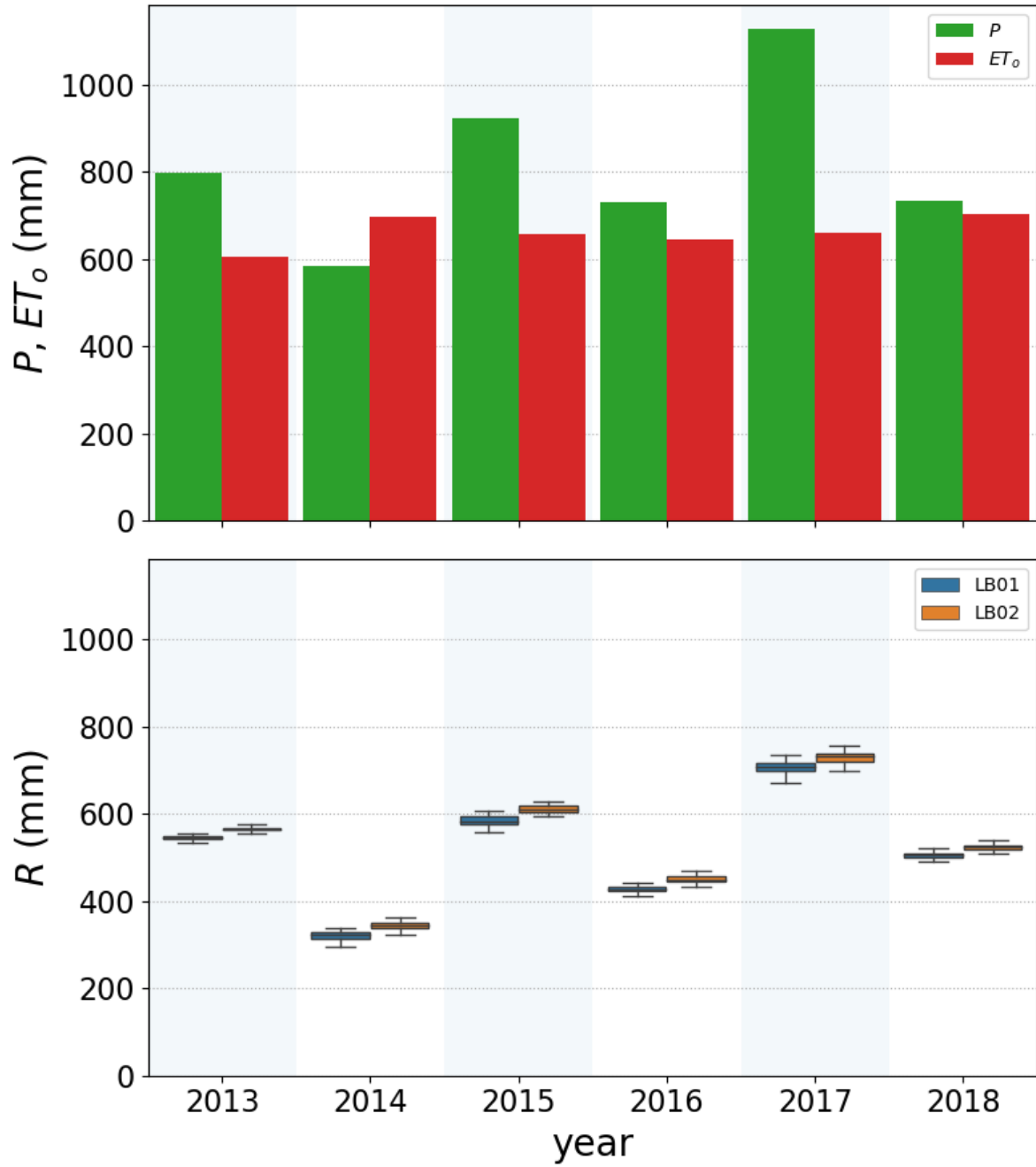*Figure S1: Particle size distribution curves of the soil samples.*

Figure S2 Top: Rainfall (green bars) and ETo (red bars) for the simulation years considered. Bottom: Box-whisker plot of the annual recharge rates for LB01 (blue) and LB02 (orange).
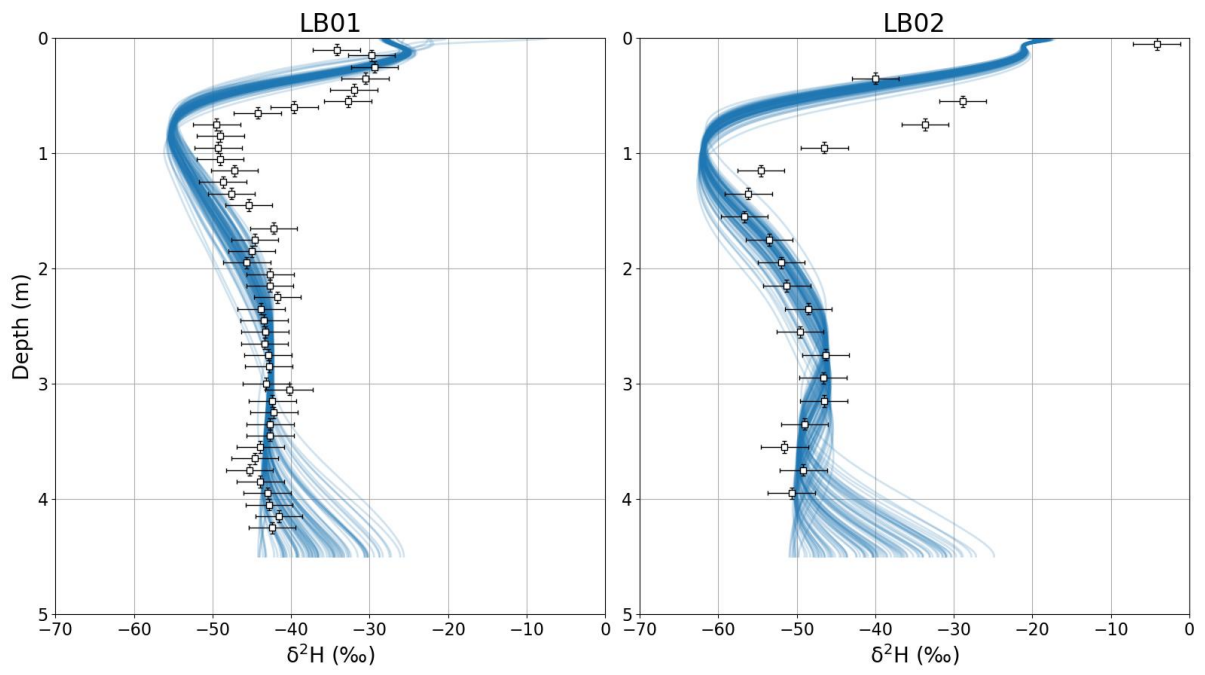
Figure S3: Measured and simulated δ²H values for profile LB01 (left) and profile LB02 (right). Each of the blue lines represent a model realization.

Table S1: Van Genuchten-Mualem model parameter ranges considered in the uncertainty analysis. Parameters were assumed to be normally distributed. Units of K_s are cm/day.

Parameter	Mean	Standard deviation
θ_r	0.045	0.005
θ_s	0.39	0.010
K_s	750	200
α	0.0233	0.002
n	4	0
l	0.5	0

Table S2: Summary statistics of the annual recharge rates based on the uncertainty analysis. All recharge values are in mm/yr.

	LB01					
year	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
count	92	92	92	92	92	92
mean	543	321	585	426	705	503
std	10	9	11	10	14	17
min	460	288	558	362	652	365
25%	541	314	577	423	697	499
50%	544	322	583	426	707	506
75%	548	329	594	432	715	510
max	561	336	607	443	734	520
	LB02					
year	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
count	96	96	96	96	96	96
mean	565	344	611	450	729	522
std	5	8	9	7	13	7
min	552	323	595	433	693	508
25%	562	338	603	444	720	517
50%	565	345	610	448	730	523
75%	568	349	619	456	736	527
max	576	362	629	469	756	539

Figure S4 Aerial images showing difference in vegetation between 2015 and 2019 (source: Google Earth).

July 2015

August 2019