

Historical differences in precipitation shape microbial composition and functional potential in Namib desert soils.

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Supplementary figures:

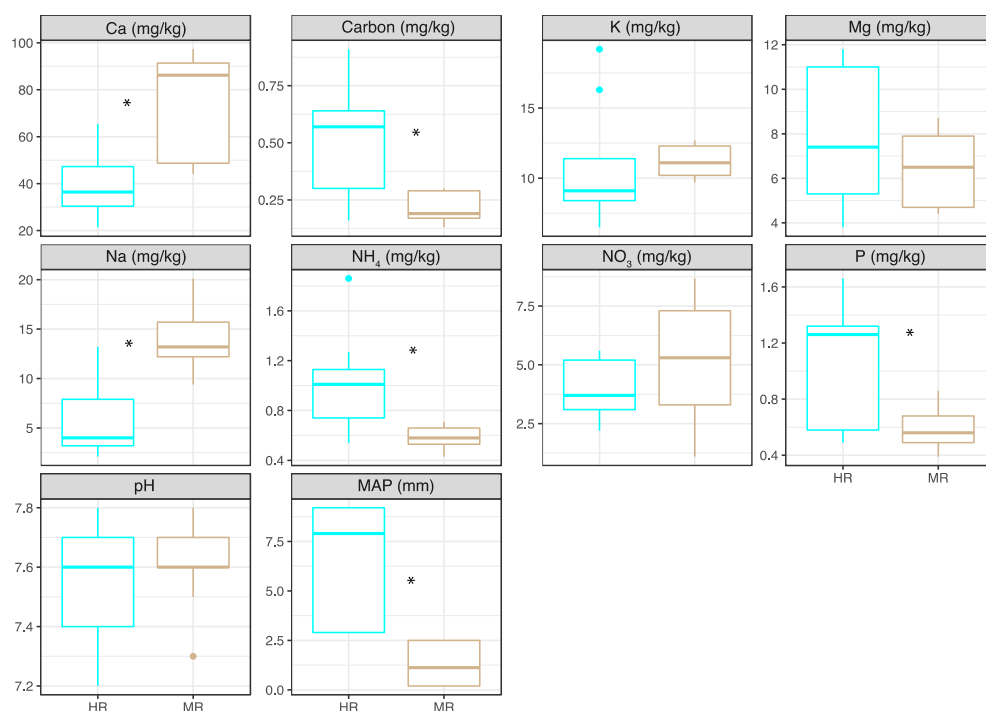


Fig. S1 Environmental characterization of high-rainfall (HR) and mid-rainfall (MR) zones. Asterisks indicate statistically significant differences between means using Kruskal-Wallis tests ($P < 0.05$)

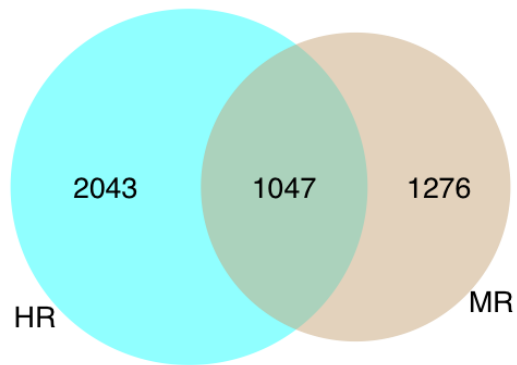


Fig.S2 Venn diagram showing the number of shared and the number of unique ASVs in the high-rainfall zone (HR) and the mid-rainfall (MR) zone respectively.

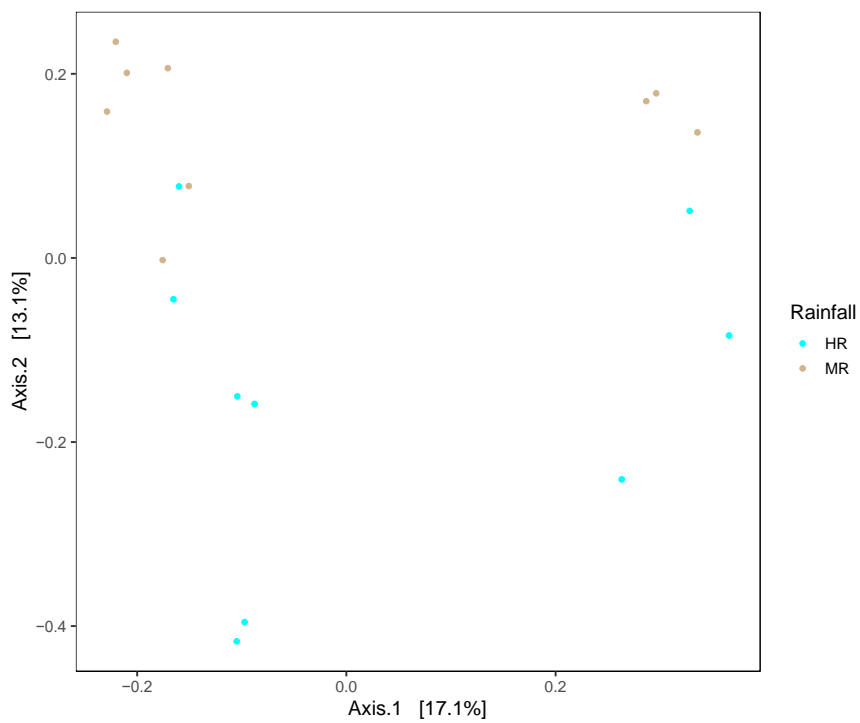


Fig. S3 PCoA ordination of normalized weighted UniFrac distances between microbial communities in the mid-rainfall (MR) and high-rainfall (HR) zones (PERMANOVA: F ratio = 1.83, $P < 0.01$)

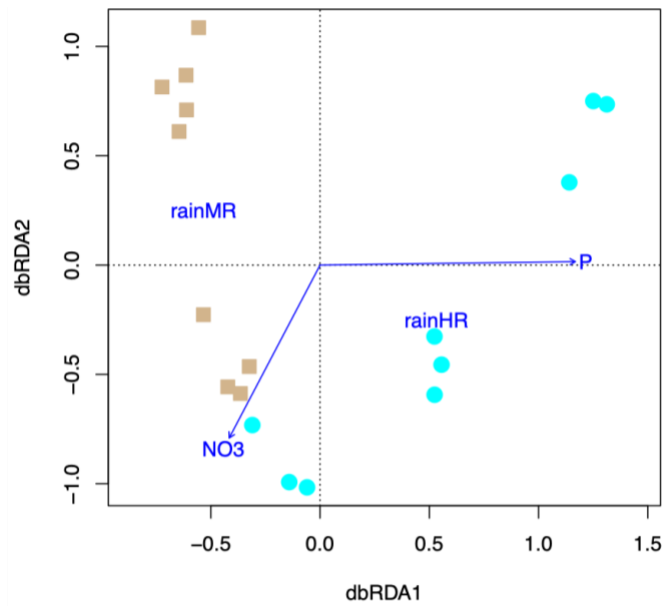


Fig. S4 Distance-based redundancy analysis (db-RDA) plot of the prokaryotic communities in the high (HR) and mid-rainfall (MR) zones. The two significant environmental variables explaining the variability in microbial community structure are represented by the arrows

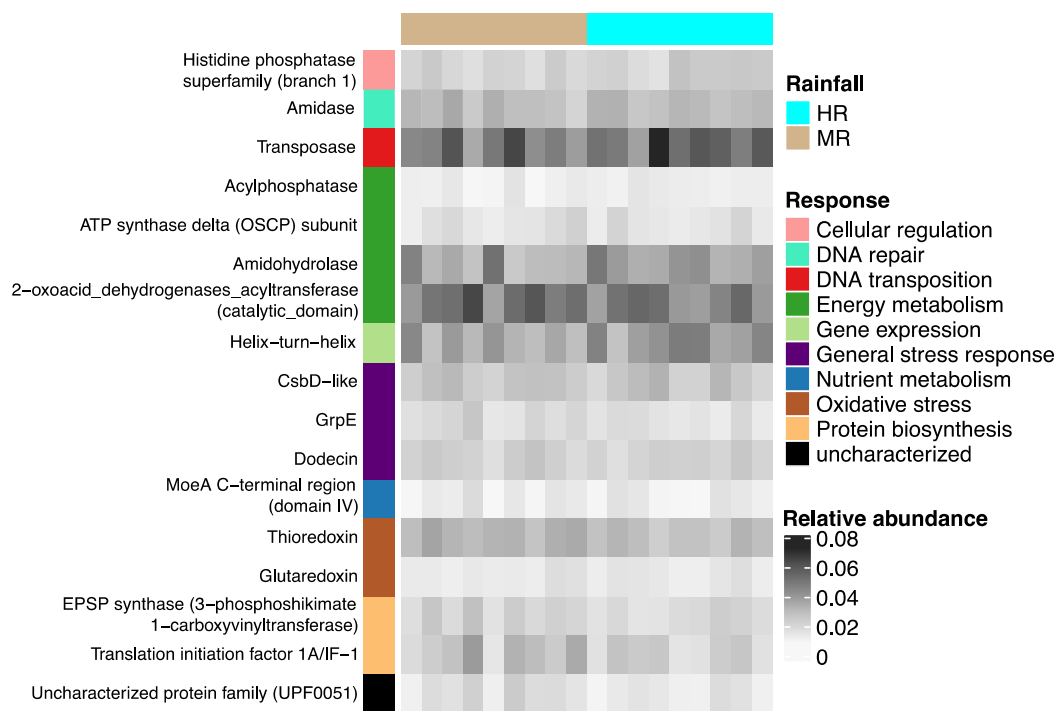


Fig. S4 Heatmap showing the core functional profile generated by pFam (Protein domain families) data in the mid-rainfall (MR) and high-rainfall (HR) zones

Supplementary tables:**Table S1.** Physicochemical analyses for sample sites including rainfall and soil temperature measurements.

Sample site	Zone	Co-ordinates	Rainfall (mm)	Soil Temp (°C)	pH	P	Na	K	Ca	Mg	NH4	NO3	% C
C142017sample10	MR	23°11'76.1"S 15°16'69.2"E	1.12	25.6	7.8	0.49	19.2	10.2	91.4	4.5	0.58	4.2	0.19
C142017sample12	MR	23°17'47.2"S 15°26'56.2"E	1.12	25.6	7.6	0.52	9.4	10.1	88.4	5.1	0.54	3.3	0.29
C142017sample14	MR	23°19'22.1"S 15°37'39.7"E	1.12	25.6	7.6	0.86	12.8	11.1	44.1	7.9	0.66	8.67	0.17
C142017sample16	HR	23°18'12.6"S 15°47'42.9"E	7.9	26.8	7.7	0.49	13.2	8.9	47.3	11.8	1.27	3.6	0.91
C142017sample18	HR	23°20'63.2"S 15°55'16.5"E	7.9	26.8	7.6	1.26	3.6	16.3	21.4	7.4	1.86	2.2	0.16
C142017sample20	HR	23°14'71.8"S 16°08'59.9"E	7.9	26.8	7.3	1.32	3.2	11.1	33.7	6.14	0.74	5.2	0.57
C142018sample10	MR	23°11'34.2"S 15°16'56.1"E	2.5	24.7	7.8	0.56	13.2	9.7	97.3	4.7	0.71	5.3	0.18
C142018sample12	MR	23°18'42.2"S 15°26'73.2"E	2.5	24.7	7.3	0.46	13.3	12.7	86.2	8.3	0.43	1.1	0.29
C142018sample14	MR	23°19'33.4"S 15°36'29.4"E	2.5	24.7	7.6	0.56	15.7	12.3	47.2	8.7	0.53	7.1	0.16
C142018sample16	HR	23°18'52.8"S 15°47'55.2"E	9.2	26.3	7.6	0.56	8.4	7.9	65.4	11.2	1.13	5.6	0.64
C142018sample18	HR	23°19'47.2"S 15°56'17.5"E	9.2	26.3	7.8	1.66	4.5	11.4	28.0	5.3	1.01	3.1	0.30
C142018sample20	HR	23°11'67.8"S 16°07'53.1"E	9.2	26.3	7.4	1.08	2.1	6.5	44.8	3.8	0.54	3.7	0.62
C142019sample10	MR	23°11'57.2"S 15°16'35.3"E	0.2	25.7	7.7	0.39	20.12	12.3	95.4	4.4	0.63	2.7	0.22
C142019sample12	MR	23°17'65.3"S 15°26'78.5"E	0.2	25.7	7.5	0.68	12.2	10.8	77.2	6.5	0.45	7.3	0.30
C142019sample14	MR	23°19'22.1"S 15°36'42.7"E	0.2	25.7	7.6	0.78	11.6	11.4	48.7	7.2	0.71	8.4	0.13
C142019sample16	HR	23°18'63.3"S 15°47'57.2"E	2.9	26.1	7.7	0.58	7.9	8.4	59.8	11.0	1.11	4.5	0.38
C142019sample18	HR	23°19'53.2"S 15°56'27.5"E	2.9	26.1	7.2	1.31	4.0	19.2	30.4	8.2	1.0	2.4	0.26
C142019sample20	HR	23°15'67.8"S 16°08'35.7"E	2.9	26.1	7.5	1.32	2.5	9.1	36.46	4.7	0.64	5.2	0.67

Table S2. Clustering of ASVs into OTUs showing the different ecotypes at the Genus level.

ASVs	log2FoldChange	pvalue	padj	Phylum	Genus	OTU (97%)
ASV1351	-5.557.700.148	0.00188863	0.022496537	Abditibacteriota	Abditibacterium	OTU47
ASV170	-8.624.350.128	7.75E-06	0.000533968	Bacteroidota	Adhaeribacter	OTU02
ASV307	8.435.301.273	0.00010348	0.003989733	Bacteroidota	Adhaeribacter	OTU02
ASV57	-1.002.387.741	7.07E-20	4.91E-17	Bacteroidota	Adhaeribacter	OTU02
ASV447	-7.443.811.792	0.00234992	0.025481965	Bacteroidota	Adhaeribacter	OTU08
ASV52	-3.037.371.741	0.00356632	0.033000919	Bacteroidota	Adhaeribacter	OTU08
ASV467	7.878.556.731	0.00036789	0.008802526	Actinobacteriota	Angustibacter	OTU34
ASV998	-5.958.935.784	0.00381971	0.034426994	Proteobacteria	Azospirillum	OTU51
ASV386	8.100.113.991	0.00109604	0.016903372	Firmicutes	Bhargavaea	OTU20
ASV510	7.793.483.203	0.00162064	0.020994777	Actinobacteriota	Blastococcus	OTU32
ASV723	-667.327.968	0.00478944	0.041035222	Actinobacteriota	Blastococcus	OTU37
ASV1026	6.469.105.239	0.00601348	0.048527125	Acidobacteriota	Bryobacter	OTU11

ASV439	7.924.458.799	0.00124586	0.018396402	Acidobacteriota	Bryobacter	OTU12
ASV675	7.194.339.537	0.00289598	0.029127665	Acidobacteriota	Bryobacter	OTU13
ASV287	8.723.238.877	5.82E-05	0.00252357	Acidobacteriota	Bryobacter	OTU14
ASV880	6.642.245.509	0.00513202	0.043434473	Acidobacteriota	Bryobacter	OTU15
ASV513	7.563.370.868	0.00188785	0.022496537	Acidobacteriota	Bryobacter	OTU16
ASV872	6.903.442.751	0.00409788	0.035998813	Acidobacteriota	Bryobacter	OTU17
ASV1029	-6.172.149.347	0.00319827	0.03082778	Acidobacteriota	Bryobacter	OTU61
ASV161	9.027.863.954	8.94E-06	0.000533968	Crenarchaeota	CandidatusNitrososphaer	OTU10
ASV86	9.764.208.628	1.63E-08	3.78E-06	Crenarchaeota	CandidatusNitrososphaer	OTU10
ASV144	-8.951.007.554	9.37E-06	0.000533968	Verrucomicrobiota	CandidatusUdaeobacter	OTU46
ASV468	7.593.605.443	0.00218553	0.024864917	Cyanobacteria	ChlorogloeopsisPCC-	OTU43
ASV402	8.055.803.783	0.00101077	0.016310257	Proteobacteria	Ellin6055	OTU52
ASV280	8.713.467.109	0.00025952	0.006927396	Bacteroidota	Flavisolibacter	OTU03
ASV504	-745.626.453	0.00061453	0.012185318	Bacteroidota	Flavisolibacter	OTU03

ASV518	7.554.872.067	0.00048728	0.010567932	Bacteroidota	Flavisolibacter	OTU03
ASV114	9.702.695.164	6.10E-07	0.000105751	Bacteroidota	Flavisolibacter	OTU05
ASV196	9.021.944.496	6.80E-09	2.36E-06	Bacteroidota	Flavisolibacter	OTU05
ASV644	-6.895.353.724	0.00389242	0.034632625	Bacteroidota	Flavisolibacter	OTU05
ASV113	970.713.387	0.00016530	0.004987895	Bacteroidota	Flavisolibacter	OTU26
ASV463	-7.328.995.525	0.00254983	0.026811935	Actinobacteriota	Klenkia	OTU06
ASV806	6.810.089.968	0.00138488	0.019827162	Actinobacteriota	Klenkia	OTU06
ASV12	-1.202.178.341	0.00025332	0.006927396	Actinobacteriota	Leifsonia	OTU35
ASV502	-7.207.834.559	0.00075478	0.012776035	Actinobacteriota	Marmoricola	OTU30
ASV601	7.552.738.577	0.00266575	0.027612474	Proteobacteria	Methylobacterium	OTU66
ASV742	7.076.849.883	0.00025664	0.006927396	Proteobacteria	Methylobacterium	OTU69
ASV177	9.056.765.351	1.00E-05	0.000533968	Proteobacteria	Microvirga	OTU01
ASV182	8.918.555.994	0.00013070	0.004471246	Proteobacteria	Microvirga	OTU01
ASV2	1.527.695.855	2.94E-06	0.000340176	Proteobacteria	Microvirga	OTU01

ASV937	-6.180.520.627	0.00015237	0.00480665	Proteobacteria	Microvirga	OTU09
ASV775	-6.559.330.281	0.00546198	0.045126356	Proteobacteria	Microvirga	OTU58
ASV765	6.915.299.199	0.00381535	0.034426994	Proteobacteria	Microvirga	OTU59
ASV691	7.154.190.819	0.00308195	0.03024589	Proteobacteria	Microvirga	OTU60
ASV577	7.475.465.138	0.00223038	0.024914392	Proteobacteria	Microvirga	OTU71
ASV372	8.295.817.404	0.00068680	0.012543214	Actinobacteriota	Modestobacter	OTU36
ASV268	-8.229.465.201	1.32E-05	0.000654396	Actinobacteriota	NA	OTU04
ASV340	8.403.517.665	0.00011636	0.004250329	Actinobacteriota	NA	OTU04
ASV612	7.496.848.776	0.00064923	0.01241893	Actinobacteriota	NA	OTU04
ASV559	7.478.541.671	0.00212096	0.02453249	Actinobacteriota	NA	OTU07
ASV642	-7.018.275.827	0.00348468	0.032680732	Actinobacteriota	NA	OTU07
ASV10	0.968837379	0.00241243	0.025757345	Proteobacteria	NA	OTU09
ASV575	7.386.712.367	0.00226168	0.024914392	Planctomycetota	NA	OTU18
ASV129	9.456.386.788	2.26E-06	0.000313502	Crenarchaeota	NA	OTU21

ASV832	6.770.665.791	0.00147459	0.02006611	Bacteroidota	NA	OTU23
ASV646	-6.830.087.267	0.00422138	0.03662055	Bacteroidota	NA	OTU24
ASV648	7.297.200.522	0.00075072	0.012776035	Bacteroidota	NA	OTU25
ASV792	-6.623.306.592	0.00058606	0.011962696	Bacteroidota	NA	OTU27
ASV600	-7.010.006.089	0.00103408	0.016310257	Chloroflexi	NA	OTU29
ASV411	-7.672.213.113	0.00041526	0.009296485	Actinobacteriota	NA	OTU41
ASV481	-7.338.886.645	0.00066210	0.01241893	Bacteroidota	NA	OTU45
ASV804	6.735.572.177	0.0013999	0.019827162	Acidobacteriota	NA	OTU48
ASV406	8.084.518.901	0.00100741	0.016310257	Proteobacteria	NA	OTU50
ASV359	8.207.643.783	0.00073949	0.012776035	Proteobacteria	NA	OTU62
ASV281	8.476.349.542	5.48E-06	0.000475323	Proteobacteria	NA	OTU65
ASV15	-1.065.445.622	0.00587510	0.047968488	Proteobacteria	NA	OTU70
ASV709	7.030.952.937	0.00332679	0.031627307	Proteobacteria	Psychroglaciecola	OTU57
ASV451	779.444.607	0.00145202	0.02006611	Proteobacteria	Psychroglaciecola	OTU63

ASV655	7.408.746.585	0.00275515	0.028118742	Proteobacteria	Psychroglaciecola	OTU64
ASV524	7.569.383.544	0.00052942	0.011134027	Proteobacteria	Psychroglaciecola	OTU67
ASV516	7.825.403.349	0.00155321	0.020729421	Proteobacteria	Psychroglaciecola	OTU68
ASV176	9.123.431.455	6.68E-06	0.000514944	Actinobacteriota	Quadrisphaera	OTU33
ASV71	3.497.859.615	0.0012116	0.01827935	Acidobacteriota	RB41	OTU49
ASV452	7.859.349.339	0.00033163	0.008524141	Gemmatimonadota	Roseisolibacter	OTU19
ASV389	-7.716.973.231	0.00039760	0.009197917	Actinobacteriota	Rubrobacter	OTU38
ASV568	-7.166.044.301	0.00309432	0.03024589	Actinobacteriota	Rubrobacter	OTU39
ASV751	-6.571.252.705	0.00538196	0.045000991	Actinobacteriota	Rubrobacter	OTU40
ASV662	-6.765.090.733	0.00183513	0.022496537	Bacteroidota	Rufibacter	OTU22
ASV275	-8.170.626.328	0.00013529	0.004471246	Bacteroidota	Segetibacter	OTU28
ASV369	-7.858.933.945	0.00035644	0.008802526	Bacteroidota	Segetibacter	OTU44
ASV213	-8.494.581.118	4.28E-06	0.000424301	Actinobacteriota	Solirubrobacter	OTU42
ASV433	-7.572.910.795	0.00191253	0.022496537	Proteobacteria	Sphingomonas	OTU53

ASV219	9.035.643.333	1.86E-05	0.000860438	Proteobacteria	Sphingomonas	OTU54
ASV545	7.779.084.243	0.00166385	0.020994777	Proteobacteria	Sphingomonas	OTU55
ASV443	-7.503.883.142	8.83E-05	0.003605056	Proteobacteria	Sphingomonas	OTU56
ASV906	6.683.697.747	0.00165798	0.020994777	Actinobacteriota	Streptomyces	OTU31