Table S1: Summary of the ground measurement observations (Longitude and Latitude in degrees)

S/N	Name of station	Longitude	Latitude	Altitude (m)	Average rainfall (mm/year)
1	Adi-Arkay	38.12	13.25	1600	1948
2	Ambagiorgis	37.74	12.6	3010	1157
3	Dabat	37.91	12.91	2600	838
4	Debark	38.04	13.07	2900	1273
5	Debre Tabor	38.16	12.08	2700	1628
6	Abi_Adi	39.02	13.37	1950	1114
7	Adigrat	39.2	14.25	2400	512
8	Adigudom	39.13	13.16	2100	453
9	Adishehu	39.52	12.94	2500	546
10	Adwa	38.9	14.17	1960	766
11	Dengolet	39	13.1	2150	692
12	Edaga Hamus	39.33	14.12	2700	546
13	Hagere Selam	39.27	13.35	2650	660
14	Maichew	39.53	12.79	2450	720
15	Maykental	39	13.54	1800	578
16	Mekele (AP)	39.26	13.15	2200	530
17	Senkata	39.36	13.57	2500	540
18	Shire	38.24	14.01	1920	1009
19	Wukuro	39.36	13.46	1970	600
20	Korem	39.44	12.47	2500	980
21	Kulmesk	38.98	11.76	2400	650
22	Lalibela	39.03	12.02	2500	790
23	Sekota	39.02	12.39	2150	635
24	Nefas Mewcha	38.45	11.7	3150	1112
25	Axum	38.74	14.12	2150	705
26	Gonder	37.64	12.66	2130	1100
27	Yechila	38.86	13.18	1575	558
28	Mytsebri	38.25	13.56	1430	1280
29	Hawzen	39.43	13.98	2250	519
30	Aguylae	39.59	13.69	1980	480
31	Atsbi	39.74	13.87	2670	600
32	Mugulat	39.42	14.25	2800	720
33	Endabaguna	38.2	13.95	1760	900
34	Samre	39.2	13.19	1960	570

Table S2: Summary of daily comparison between ground and Satellite rainfalls using RMSE (mm/day)

S/N	Station_N	ARC2	CHIRPS	CMAP	CMORPH	GPCP	PERSIAAN	RFEv2	TRMM
1	Adi_Arkay	74	9	25	15	38	20	15	25
2	Ambagiorgis	23	9	16	10	30	17	11	10
3	Debark	24	11	15	9	21	21	14	16
4	Debre Tabor	60	7	15	12	20	15	9	8
5	Abi_Adi	19	5	23	14	51	8	12	14
6	Adigrat	8	3	26	6	13	11	4	8
7	Adigudom	12	3	28	5	14	18	4	13
8	Adishehu	10	2	18	5	25	25	5	14
9	Adwa	8	2	12	3	25	23	5	15
10	Dengolet	12	5	6	4	8	9	6	3
11	Edaga Hamus	32	4	8	5	8	12	6	8
12	Hagere Selam	26	5	8	5	6	14	11	11
13	Maichew	29	5	15	3	4	16	12	12
14	Maykental	16	7	4	2	11	13	7	5
15	Mekele AP	10	6	16	10	5	7	14	14
16	Senkata	12	3	7	4	6	17	5	3
17	Shire	9	5	7	4	20	11	7	4
18	Wukuro	14	4	15	9	6	20	8	11
19	Korem	9	6	5	10	16	18	12	13
20	Gonder	31	5	8	10	17	6	15	13
21	Yechila	14	2	4	3	6	12	11	11
22	Mytsebri	11	5	31	18	32	16	12	9
23	Hawzen	16	2	8	5	6	11	5	7
24	Aguylae	22	6	19	12	26	26	8	11
25	Atsbi	29	8	12	80	8	14	6	14
26	Mugulat	27	8	15	9	18	25	7	8
27	Endabaguna	10	4	6	4	15	15	12	10
28	Samre	7	7	11	4	15	23	8	6
29	Kulmesk	27	4	6	11	8	23	15	8
30	Lalibela	9	5	6	4	6	6	8	10
31	Sekota	27	4	10	4	17	26	10	17
32	Nefas Mewcha	16	5	7	11	19	21	17	21
33	Dabat	29	9	17	10	11	18	14	13
34	Axum	10	7	7	4	7	5	6	14

Table S3: Summary daily comparison between ground and Satellite rainfalls using MAE (mm/day)

S/N	Station_N	ARC2	CHIRPS	CMAP	CMORPH	GPCP	PERSIANN	RFEv2	TRMM
1	Adi_Arkay	47	12	39	14	27	14	10	16
2	Ambagiorgis	19	11	23	8	11	12	7	7
3	Debark	34	0	23	10	13	14	12	7
4	Debre Tabor	25	13	21	9	12	19	8	5
5	Abi_Adi	6	5	26	6	3	6	11	6
6	Adigrat	17	7	39	14	10	8	2	6
7	Adigudom	8	3	15	3	10	16	3	12
8	Adishehu	5	9	11	3	23	17	3	10
9	Adwa	12	3	9	6	23	16	5	11
10	Dengolet	10	15	8	4	5	7	3	3
11	Edaga Hamus	8	9	13	10	6	7	5	5
12	Hagere Selam	28	5	15	6	5	14	8	9
13	Maichew	23	8	8	5	3	15	7	10
14	Maykental	16	4	6	7	9	11	5	3
15	Mekele AP	9	7	26	11	3	3	9	8
16	Senkata	13	23	12	7	5	12	5	2
17	Shire	14	11	11	5	17	12	4	1
18	Wukuro	5	6	23	3	6	17	6	10
19	Korem	18	16	7	8	6	16	7	12
20	Gonder	11	9	13	6	11	6	9	9
21	Yechila	9	3	7	3	6	9	7	10
22	Mytsebri	19	13	48	21	40	14	9	7
23	Hawzen	7	2	13	5	7	4	4	6
24	Aguylae	16	6	30	11	8	17	8	9
25	Atsbi	25	11	19	7	14	7	4	10
26	Mugulat	18	13	22	8	5	21	6	6
27	Endabaguna	8	2	9	3	9	11	11	8
28	Samre	13	7	15	6	8	9	5	4
29	Kulmesk	1	12	9	9	13	15	13	6
30	Lalibela	6	4	9	3	13	6	4	7
31	Sekota	5	1	16	5	9	17	6	13
32	Nefas Mewcha	19	13	10	9	14	18	11	18
33	Dabat	29	17	27	10	26	13	10	11
34	Axum	10	8	11	2	15	4	5	10

Table S4: Summary of we season comparison between ground and Satellite rainfalls using RMSE (mm/season)

S/N	Station_N	ARC2	CHIRPS	CMAP	CMORPH	GPCP	PERSIANN	RFEv2	TRMM
1	Adi_Arkay	418	79	342	634	514	122	114	321
2	Ambagiorgis	226	63	122	299	247	87	63	125
3	Debark	248	71	117	288	294	86	192	82
4	DebrTabor	271	73	112	276	270	135	103	103
5	Abi_Adi	250	16	173	474	263	67	130	175
6	Adigrat	2154	31	197	512	218	21	59	57
7	Adigudom	155	17	63	179	229	46	55	93
8	Adishehu	143	85	60	148	507	34	67	155
9	Adwa	196	26	88	246	5207	22	53	61
10	Dengolet	162	31	47	104	120	16	45	85
11	EdagHamus	166	25	58	168	136	39	57	49
12	Hag/Selam	139	29	63	163	103	51	89	63
13	Maichew	184	34	36	126	71	61	87	62
14	Maykental	151	13	31	80	204	25	57	66
15	Mekele AP	153	37	122	308	75	63	32	55
16	Senkata	103	18	56	150	107	30	56	76
17	Shire	84	8	49	135	383	30	63	87
18	Wukuro	71	37	110	300	87	46	52	59
19	Korem	141	35	38	95	300	87	87	67
20	Gonder	161	29	59	163	283	79	109	63
21	Yechila	61	7	34	89	62	45	26	77
22	Mytsebri	147	75	233	418	248	85	104	112
23	Hawzen	154	10	61	164	117	26	48	49
24	Aguylae	105	37	147	393	173	46	63	52
25	Atsbi	98	70	89	244	83	69	42	68
26	Mugulat	123	71	117	288	109	63	50	98
27	Endabaguna	143	11	47	121	197	76	90	64
28	Samre	95	31	80	201	184	23	53	73
29	Kulmesk	141	64	44	251	207	101	43	90
30	Lalibela	71	22	44	115	121	56	50	124
31	Sekota	118	6	75	204	198	65	68	87
32	Nefasmewch	92	62	51	126	307	113	125	177
33	Dabat	146	101	130	356	137	79	113	165
34	Axum	151	43	55	146	120	36	58	56

Table S5: Summary of we season comparison between ground and Satellite rainfalls using MAE (mm/season)

S/N	Station	ARC2	CHIRPS	CMAP	CMORPH	GPCP	PERSIANN	RFEv2	TRMM
1	Adi_Arkay	318	51	503	517	473	77	93	240
2	Ambagiorgis	130	41	152	149	104	65	32	96
3	Debark	134	46	250	144	109	76	88	40
4	Debre Tabor	238	48	256	138	107	104	60	93
5	Abi_Adi	105	10	374	383	218	40	29	110
6	Adigrat	45	20	435	456	198	15	24	33
7	Adigudom	67	11	127	150	222	16	25	67
8	Adishehu	55	55	78	104	432	31	27	57
9	Adwa	44	10	218	163	132	11	29	64
10	Dengolet	69	20	100	52	87	12	25	48
11	Edaghamus	78	16	125	84	98	30	29	27
12	H/Selam	145	19	127	81	81	26	67	52
13	Maichew	63	22	107	52	23	28	75	58
14	Maykental	32	8	43	40	157	20	34	68
15	Mekele AP	57	84	252	154	60	56	25	45
16	Senkata	66	22	124	75	99	23	35	50
17	Shire	53	15	121	67	309	12	45	53
18	Wukuro	60	24	247	250	72	39	47	56
19	Korem	53	23	56	47	287	33	75	55
20	Gonder	173	19	55	82	191	34	93	53
21	Yechila	50	5	43	44	32	30	22	55
22	Mytsebri	61	49	423	309	166	74	99	86
23	Hawzen	71	57	126	82	93	20	29	37
24	Aguylae	122	124	263	297	135	39	38	50
25	Atsbi	165	45	235	122	40	41	37	57
26	Mugulat	152	96	250	144	42	55	46	83
27	Endabaguna	56	77	120	60	178	60	79	47
28	Samre	37	60	124	101	177	16	51	72
29	Kulmesk	149	42	59	115	143	84	33	87
30	Lalibela	51	34	89	97	96	32	49	92
31	Sekota	52	67	187	182	191	40	65	74
32	Nefas Mewcha	88	41	106	113	101	98	108	105
33	Dabat	163	66	256	178	98	71	91	140
34	Axum	56	28	124	135	89	22	37	59
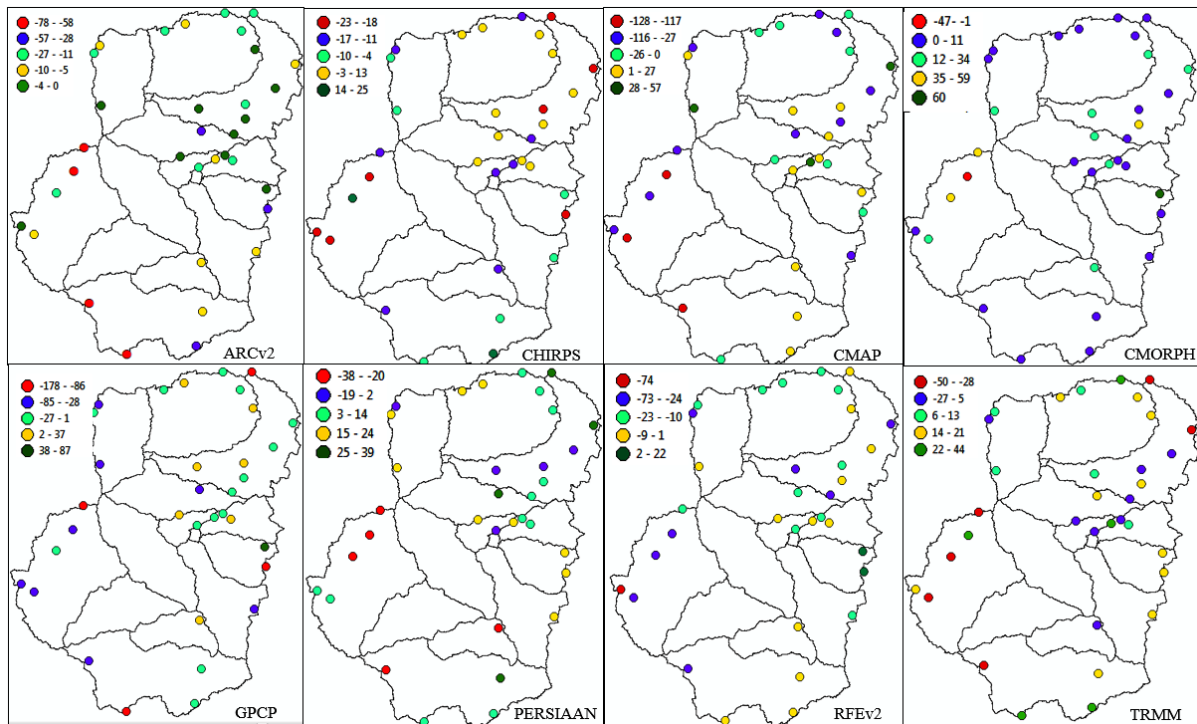
Fig.S1: Spatial distribution of PBIAS (%) over the basin during the wet season comparison