Supplementary Materials

Table S1: Summary of station name, location and elevation of gauge stations.

No.	Station Name	Latitude	Longitude	Elevation (m)
1	Moyale	3.533	39.033	1112.5
2	Thika	−0.960	37.05	1463
3	Dagoretti	−1.280	36.68	1850
4	Msabaha	−3.310	40.01	28.5
5	Kabete	−1.250	36.76	1780
6	JKIA	1.330	36.91	1624.0
7	Mwea	−0.680	37.35	1280
8	Kakamega	0.278	34.764	483.1
9	Narok	−1.153	35.768	1927
10	Nakuru	−0.271	36.104	1914.6
11	Lodwar	3.118611	35.590	502
12	Kitale	1.003	34.986	1855.2
13	Kericho	−0.419	35.251	1982.1
14	EldoretAp	0.531	35.268	2148.9
15	Eldoret	0.404	35.237	2116.9
16	Suba	−0.400	34.148	1143
17	Kisumu	−0.085	34.735	1170.9
18	Kisii	−0.669	34.701	1596
19	Wajir	1.748	40.059	257
20	Mandera	3.930	41.851	245.4
21	Meru	0.052	37.651	1626.5
22	Marsabit	2.347	37.984	1339.6
23	Makindu	−2.286	37.834	999.1
24	Embu	−0.501	37.496	1508.5
25	Voi	−3.382	38.576	574
26	Mombassa	−4.046	39.563	5
27	Malindi	−3.223	40.101	26.8
28	Lamu	−2.227	40.848	9
29	Garissa	−0.476	39.648	143
30	Nyeri	−0.443	36.981	1798

The RMSE measures the average error magnitude, giving greater weight to the larger errors than is done by the mean absolute error.

$$RMSE = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(y_i - x_i)^2} \quad \text{(S1)}$$

where x_i and y_i represent WRF outputs and PERSIANN-CCS-CDR datasets.

Table S2. K-index values for the probability of heavy PRE.

K-index (°C)	Probability of PRE (%)
<15	0
15-20	<20
21–25	20–40
26–30	40–60
31–35	60–80
36–40	80–90
>40	>90

Table S3. TTs values for the potential of heavy PRE.

TTs	Potential of PRE
44–45	Isolated to few moderate
46–47	Scattered moderate, a few heavy and isolated severe
50–51	Scattered heavy, a few severe
52–55	Scattered to numerous heavy
>55	Numerous heavy, scattered severe

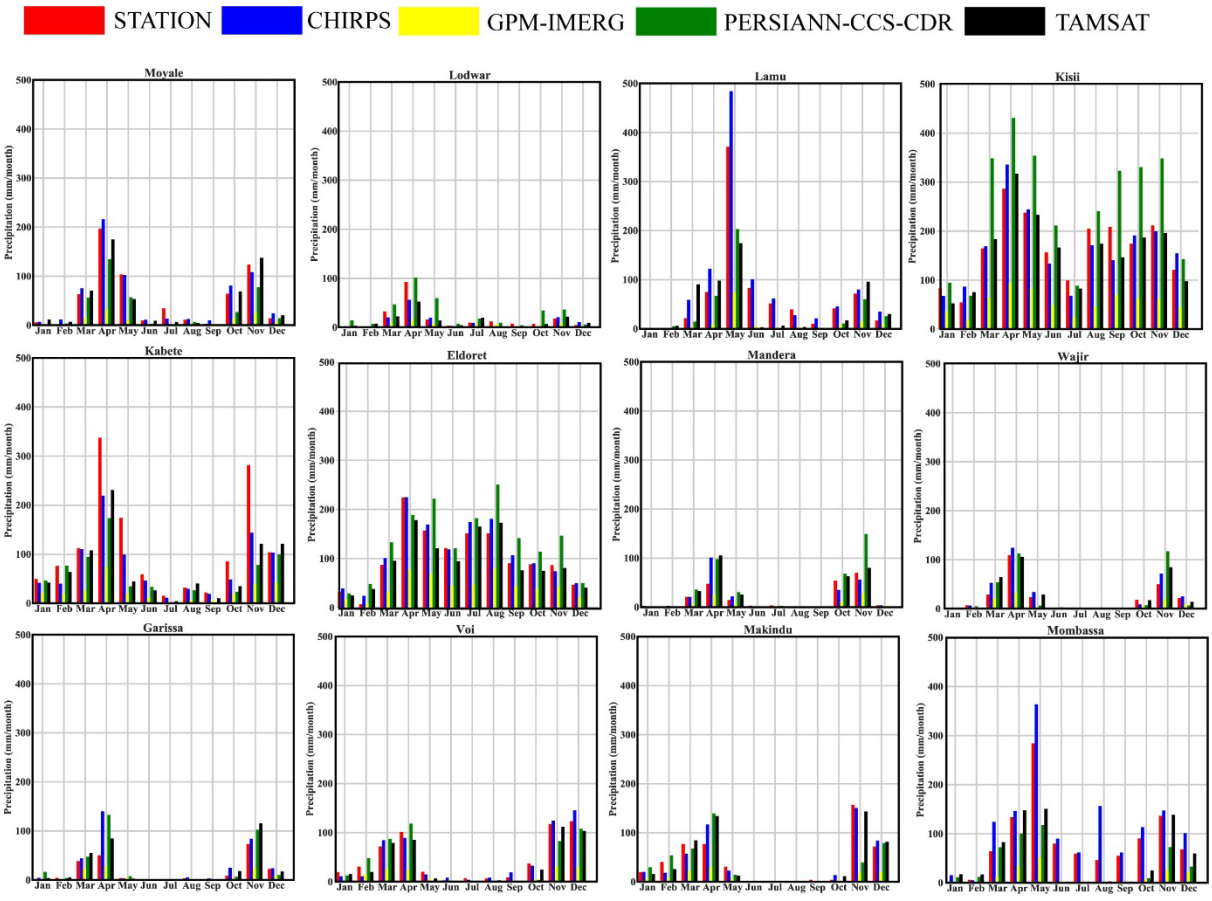

Figure S1: Observed and satellite estimated monthly PRE annual cycle over Kenya at sampled stations.

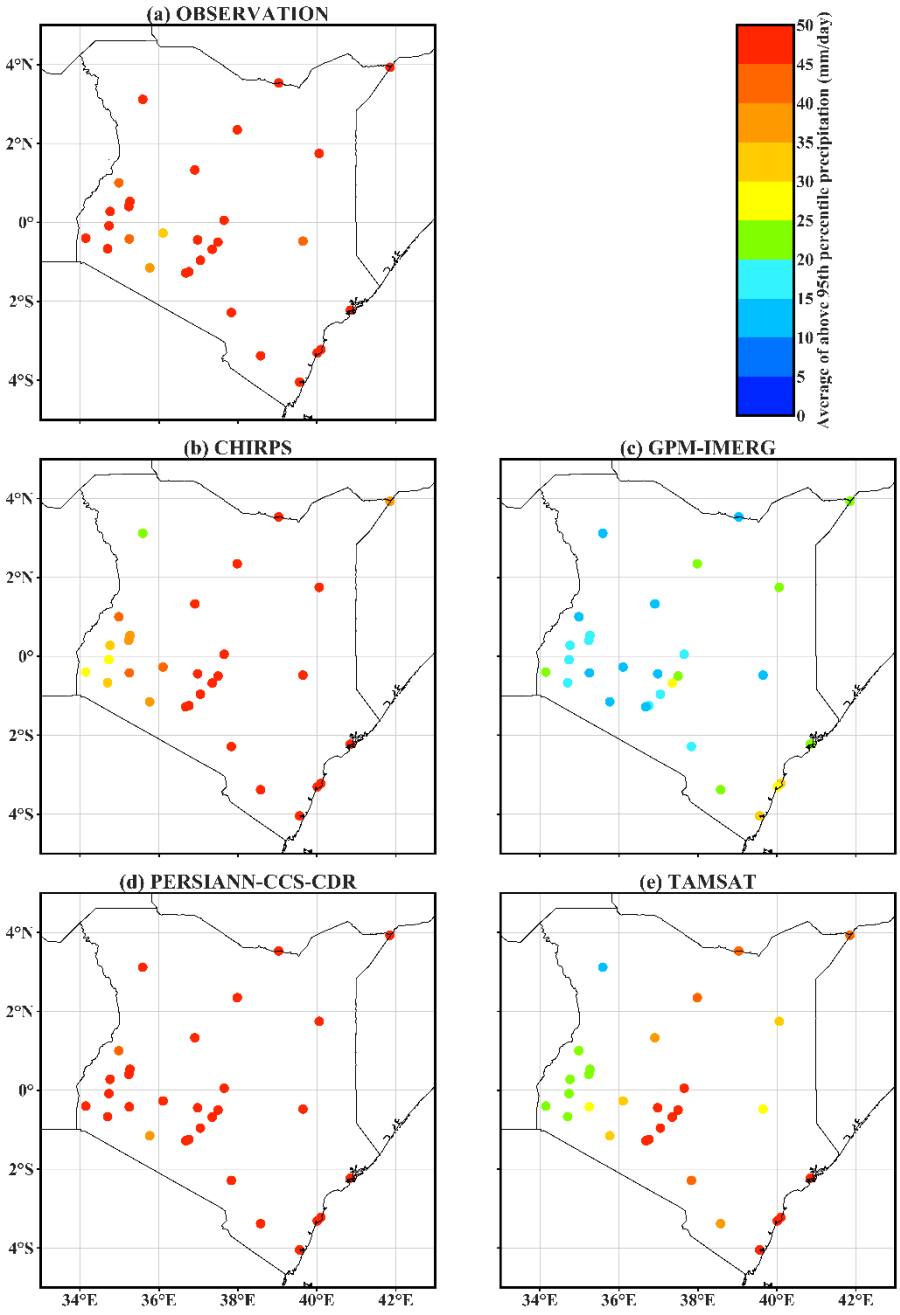

Figure S2. Observation and satellite estimate of the average rainfall quantities above top 95th percentile over Kenya (**a**) OBSERVATION, (**b**) CHIRPS, (**c**) GPM-IMERG, (**d**) PERSIANN-CCS-CDR, (**e**) TAMSAT.

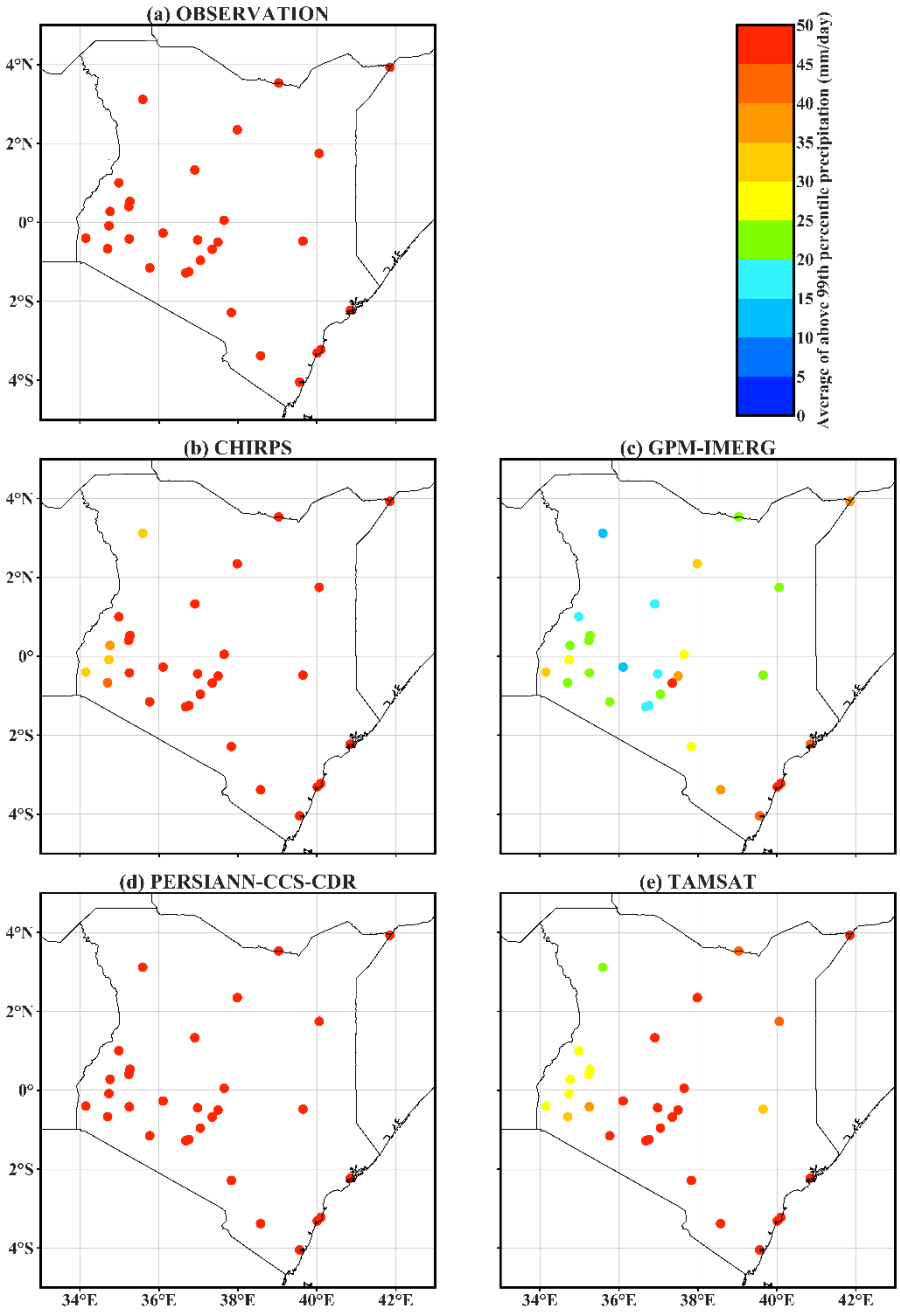

Figure S3. Same as Figure S2 but at top 99th percentile.

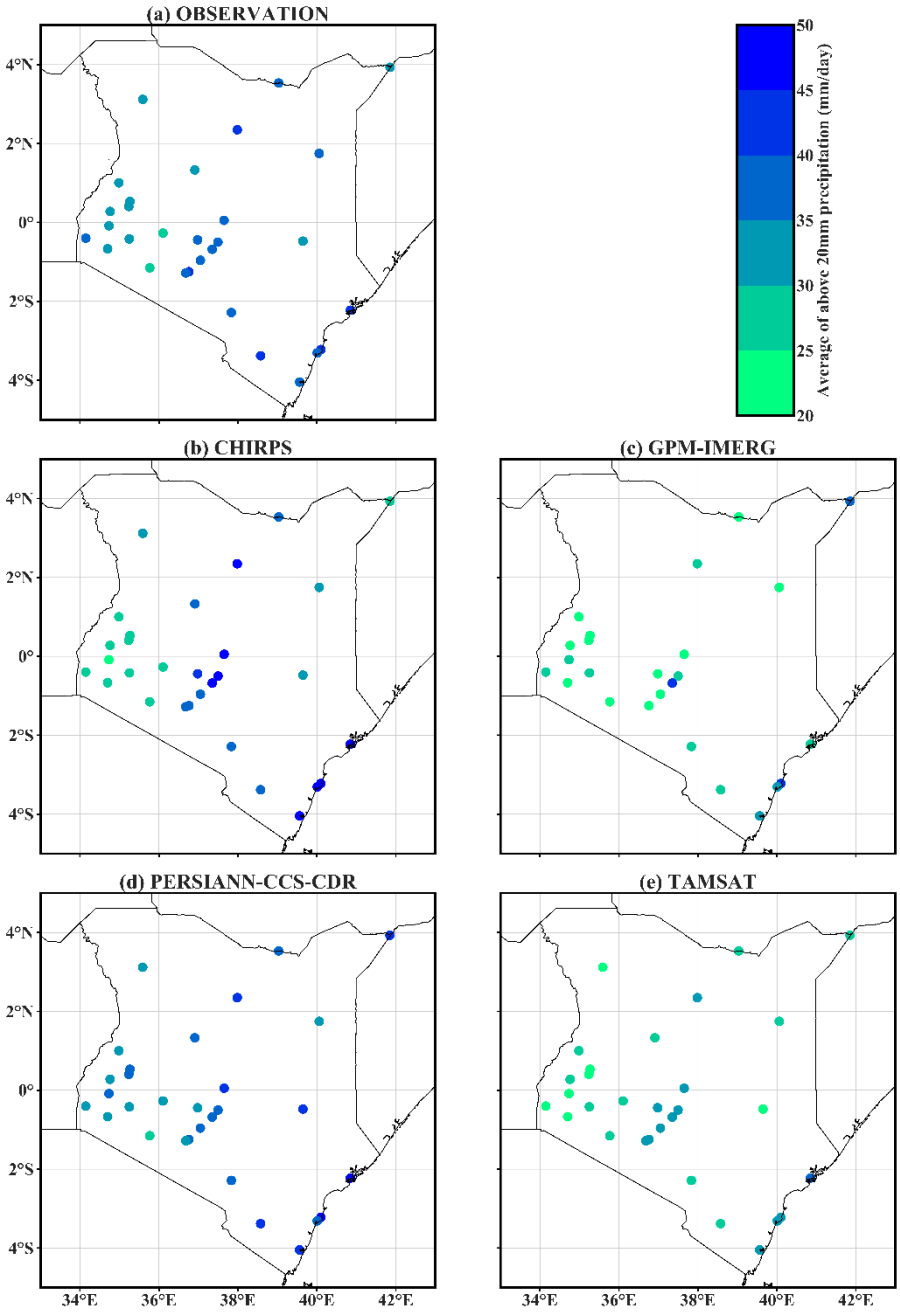

Figure S4. Same as Figure S2 but above R20 mm.

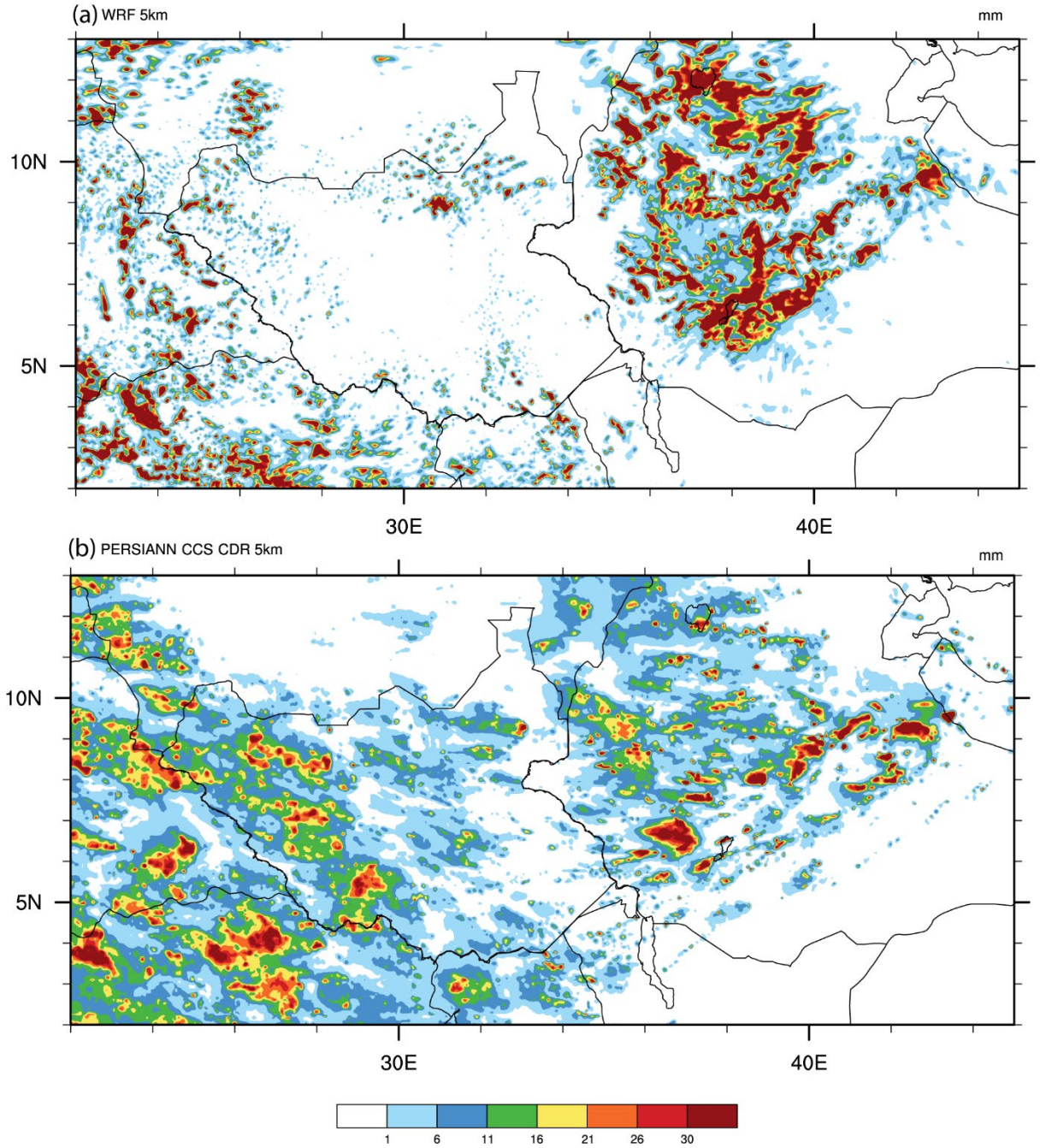

Figure S5. Distribution of simulated and observed precipitation (mm/d) on September 01, 2020 over East Africa: (**a**) WRF (top left), PERSIANN-CDR (top right), (**b**) CMORPH (bottom left) and TAMSAT (bottom right).

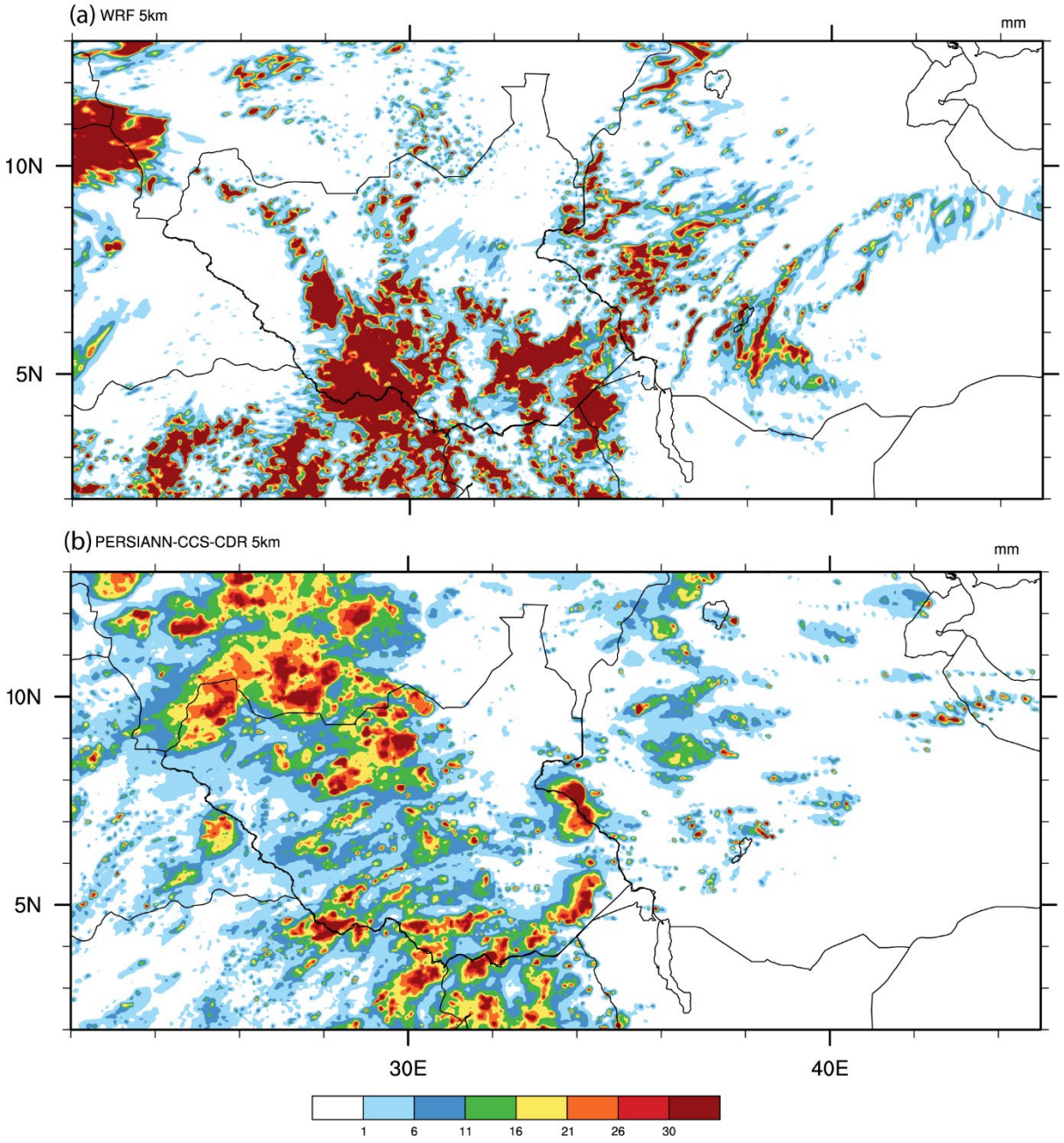

Figure S6. Same as Figure S5, but for September 06, 2020.