Comparisons of Rainfall Data for the Bouregreg Basin

NASA GSFC Office of Applied Science

November 4, 2014

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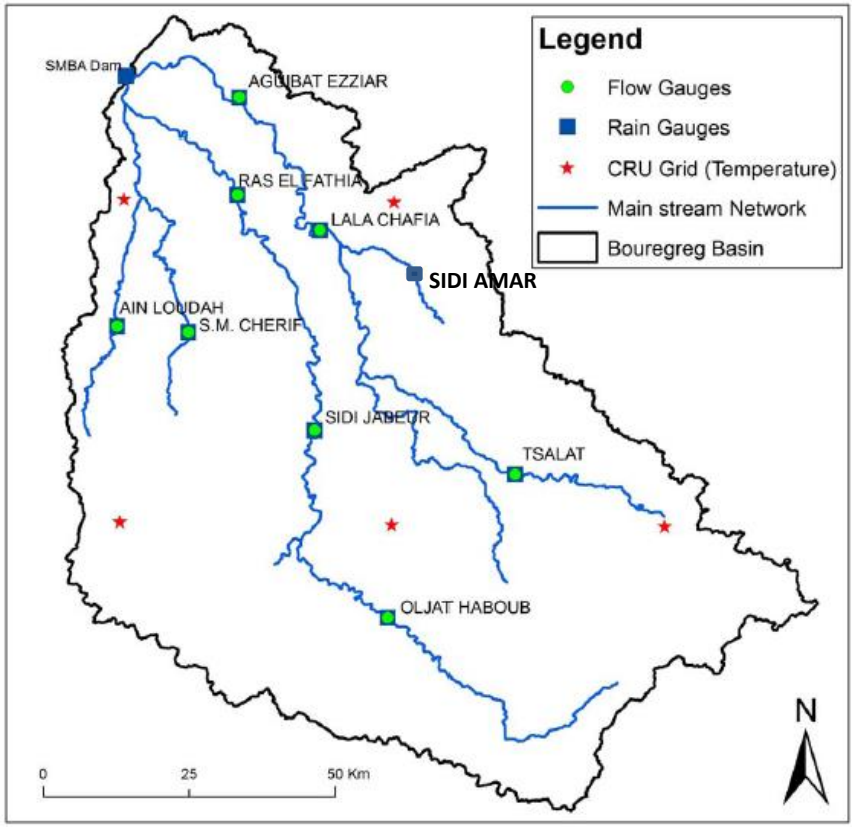
Bouregreg Basin Rain Gauge Data

Country	UID	lat	lon	name	dates	notes
Morocco(RG)[1]	203			Aguibat Ezzier	19770325–20130831	daily
	490			Ain Loudah	19720901–20130831	daily
	5032			Lalla Chafia	19720101–20130831	daily
	6346			Ras El Fathia	19770325–20130831	daily
	6833			Sidi Jabeur	19721001–20130831	daily
	6730			Sidi Amar	19771012–20130930	daily
	6650			Sidi Mohamed Cherif	19721101–20130930	daily
	8832			Tsalat	19770301–20130831	daily
	6174			Ouljet Haboub	19721101–20130930	daily

***No Data Period:** Aguibat Ezzier (20101201-20101231), Lalla Chafia (20121001-20121031), Sidi Amar (20050601-20090831), Ouljet Haboub (20020901-20060831)

Data received from CRTS during a NASA training session at SSAI in Lanham, MD in June, 2014.

We compare satellite precipitation products of TRMM TMPA, CMORPH, PERSIANN, and CHIRPS with rain gauge measurements at the following stations.



(Reference: Fadil et al., 2011, IGIS)

TRMM TMPA:
http://disc.sci.gsfc.nasa.gov/precipitation/documentation/TRMM_README

CMORPH:
http://www.cpc.ncep.noaa.gov/products/janowiak/cmorph_description.html

PERSIANN:
http://chrs.web.uci.edu/persiann/data.html

CHIRPS:
http://chg.geog.ucsb.edu/data/

name	Aguibat Ezziar	Ain Loudah	Lalla chafia	Ras El Fathia	Sidi Jabeur	Tsalat	Sidi Mohamed Cherif	Sidi Amar	Oljat Haboub
lon	-6.542489	-6.757643	-6.385005	-6.540271	-6.427149	-6.023458	-6.624558	-6.207559	-6.249703
lat	33.909298	33.554405	33.707452	33.758468	33.394703	33.334815	33.549969	33.623165	33.113007

Details on temporal and spatial resolutions of available NRT (near real time) precipitation data Products. However, some data have not been uploaded up to date in their archive based on the following links.

On September 23, 2014 the following was noted.

(1a) TRMM (3B42RT): 3 hourly/0.25 deg, uploaded to Sept. 23, 2014
(1b) TRMM (3B42): 3hourly/0.25 deg to daily, uploaded to June 30, 2014
http://gdata1.sci.gsfc.nasa.gov/daac-bin/G3/gui.cgi?instance_id=rt_intercomp

(2a) CMORPH (RAW): 3 hourly/0.25 deg to 30 min/8 km, uploaded to Sept. 20, 2014
ftp://ftp.cpc.ncep.noaa.gov/precip/CMORPH_V0.x/RAW/
(2b) CMORPH (CRT): 3 hourly/0.25 deg to 30 min/8 km, uploaded to Dec. 31, 2013
ftp://ftp.cpc.ncep.noaa.gov/precip/CMORPH_V1.0/CRT/

(3a) PERSIANN: 3 hourly/0.25 deg, uploaded to Feb. 28, 2014
http://chrs.web.uci.edu/persiann/data.html
(3b) PERSIANN-CSS: 3 hourly/0.04deg, uploaded to Dec. 31, 2010
http://chrs.web.uci.edu/PERSIANN-CCS/data.html

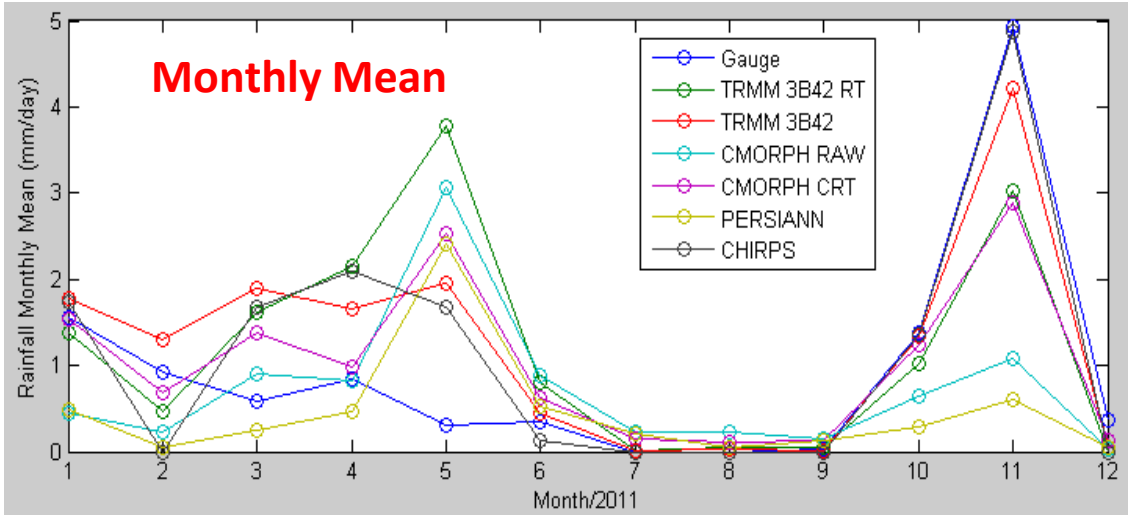
(4) CHIRPS (Africa): daily/0.25deg to 6 hourly/0.05 deg, uploaded to Aug. 31, 2014
The final CHIRPS product is complete sometime after the 15th of the following month.
ftp://chg-ftpout.geog.ucsb.edu/pub/org/chg/products/CHIRPS-latest/africa_6-hourly/

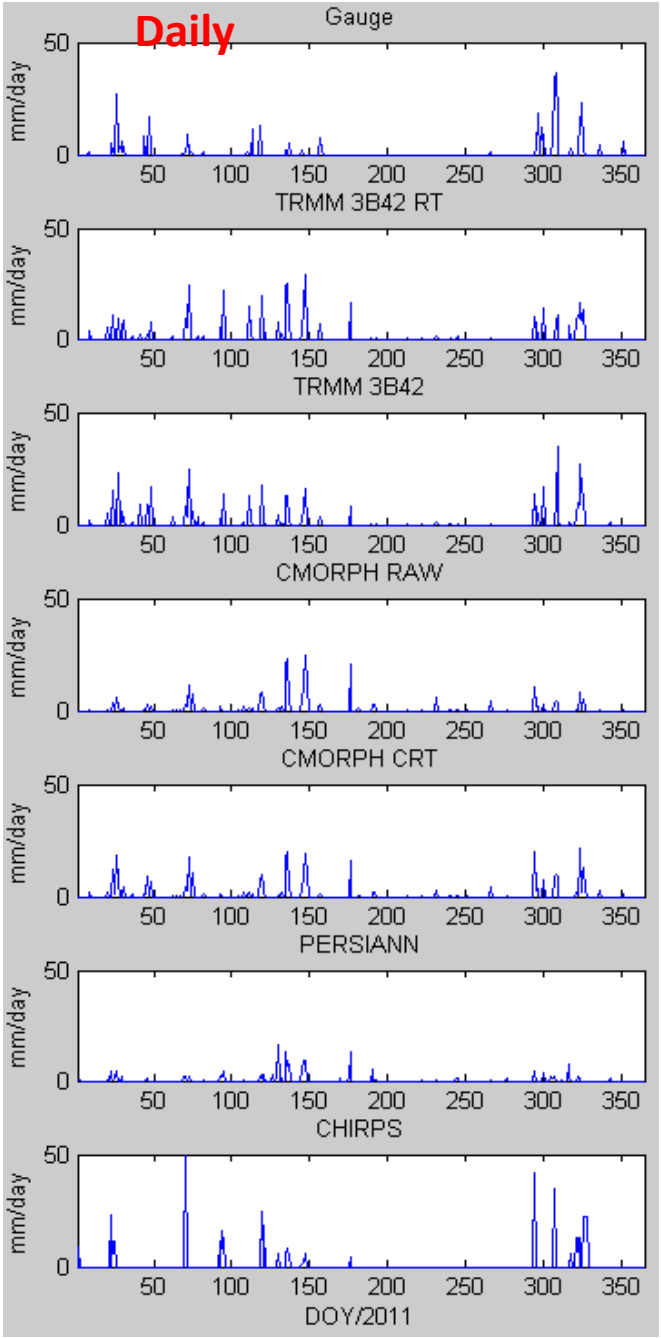
(1a) Aguibat Ezziar (2011 data)

unit: mm/day

Daily	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	0.93	3.91	36.60	0.00	1.00
TRMM 3B42 RT (3 hourly)	1.20	4.01	28.98	0.00	0.18
TRMM 3B42 (daily)	1.22	4.15	34.88	0.00	0.32
CMORPH RAW (daily)	0.73	2.76	24.66	0.00	0.18
CMORPH CRT (daily)	1.03	3.37	21.81	0.00	0.39
PERSIANN (3 hourly)	0.46	1.71	16.09	0.00	0.07
CHIRPS-1.8 Africa (daily)	1.13	5.17	52.00	0.00	0.15

Monthly	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	0.94	1.36	4.94	0.00	1.00
TRMM 3B42 RT (3 hourly)	1.20	1.26	3.79	0.00	0.51
TRMM 3B42 (daily)	1.22	1.24	4.21	0.01	0.87
CMORPH RAW (daily)	0.72	0.82	3.07	0.02	0.12
CMORPH CRT (daily)	1.03	0.94	2.89	0.10	0.71
PERSIANN (3 hourly)	0.46	0.65	2.41	0.05	0.05
CHIRPS-1.8 Africa (daily)	1.13	1.46	4.87	0.00	0.88



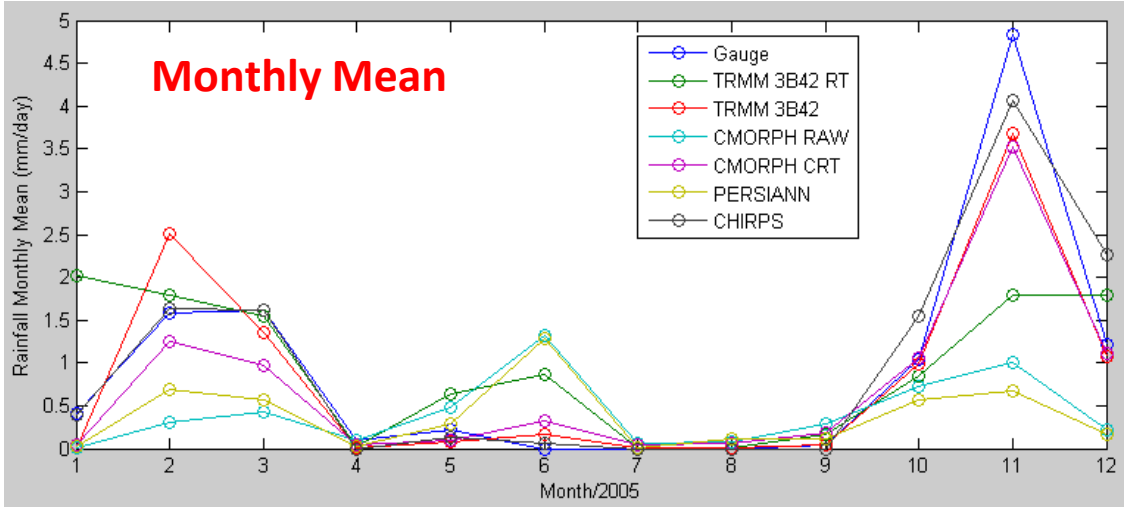


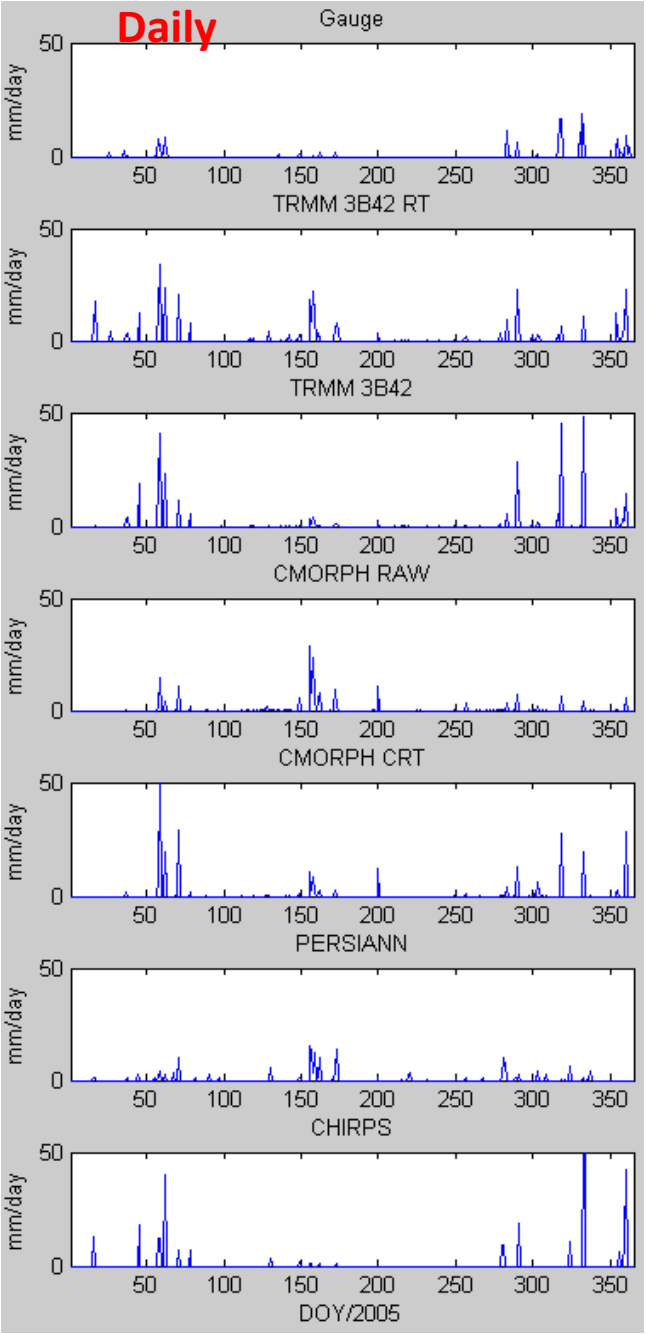
(1b) Aguibat Ezziar (2005 data)

unit: mm/day

Daily	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	0.91	3.92	45.50	0.00	1.00
TRMM 3B42 RT (3 hourly)	0.95	3.78	37.71	0.00	0.30
TRMM 3B42 (daily)	0.81	4.04	37.28	0.00	0.51
CMORPH RAW (daily)	0.42	1.65	15.49	0.00	0.33
CMORPH CRT (daily)	0.72	4.07	58.66	0.00	0.43
PERSIANN (3 hourly)	0.37	1.41	12.23	0.00	0.08
CHIRPS-1.8 Africa (daily)	0.97	6.47	100.00	0.00	0.19

Monthly	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	0.92	1.39	4.83	0.00	1.00
TRMM 3B42 RT (3 hourly)	0.96	0.80	2.02	0.00	0.61
TRMM 3B42 (daily)	0.83	1.19	3.68	0.00	0.95
CMORPH RAW (daily)	0.42	0.41	1.32	0.01	0.41
CMORPH CRT (daily)	0.73	1.00	3.52	0.04	0.98
PERSIANN (3 hourly)	0.38	0.39	1.29	0.01	0.34
CHIRPS-1.8 Africa (daily)	0.98	1.28	4.07	0.00	0.95



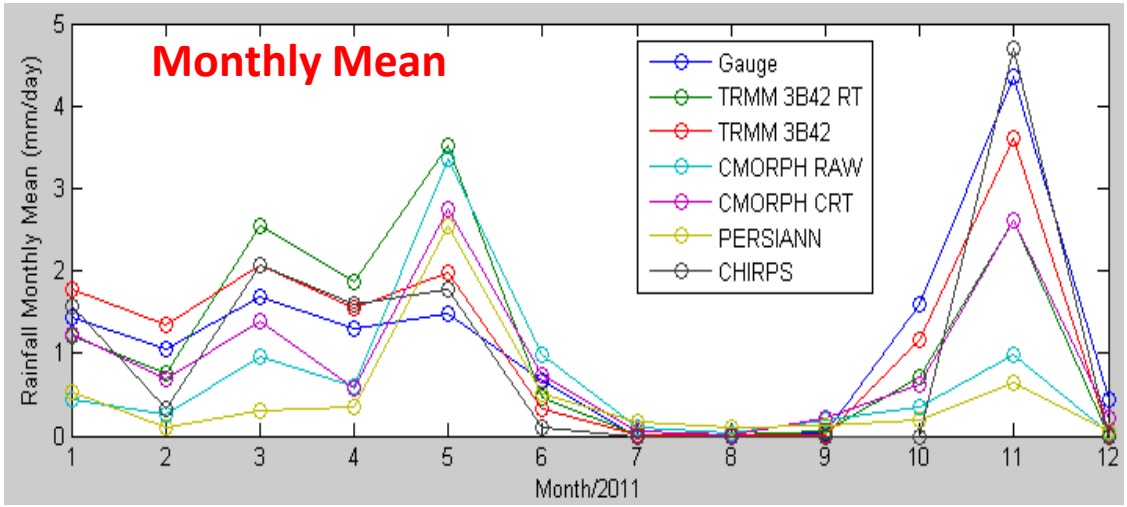


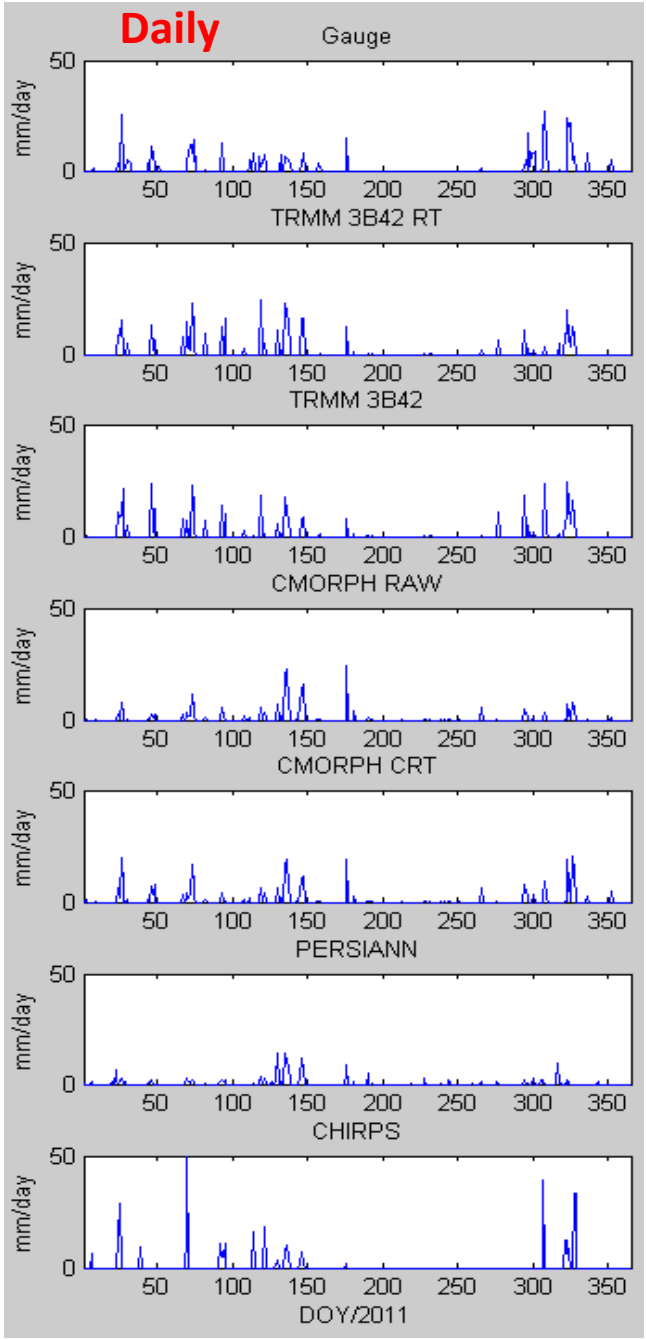
(2a) Ain Loudah (2011 data)

unit: mm/day

Daily	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	1.17	3.69	26.60	0.00	1.00
TRMM 3B42 RT (3 hourly)	1.15	3.79	24.48	0.00	0.48
TRMM 3B42 (daily)	1.15	3.90	24.54	0.00	0.58
CMORPH RAW (daily)	0.70	2.67	24.32	0.00	0.45
CMORPH CRT (daily)	0.93	3.09	20.24	0.00	0.63
PERSIANN (3 hourly)	0.47	1.70	14.25	0.00	0.21
CHIRPS-1.8 Africa (daily)	1.01	4.88	50.00	0.00	0.24

Monthly	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	1.17	1.19	4.36	0.00	1.00
TRMM 3B42 RT (3 hourly)	1.15	1.21	3.53	0.00	0.70
TRMM 3B42 (daily)	1.16	1.13	3.61	0.01	0.94
CMORPH RAW (daily)	0.69	0.91	3.36	0.04	0.34
CMORPH CRT (daily)	0.92	0.92	2.74	0.02	0.79
PERSIANN (3 hourly)	0.47	0.68	2.54	0.05	0.28
CHIRPS-1.8 Africa (daily)	1.01	1.43	4.70	0.00	0.92



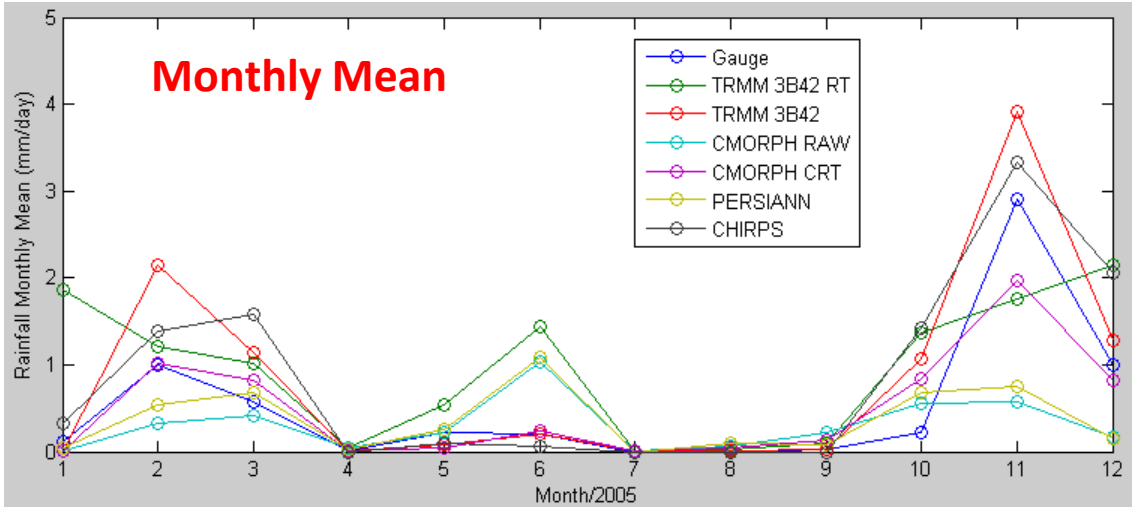


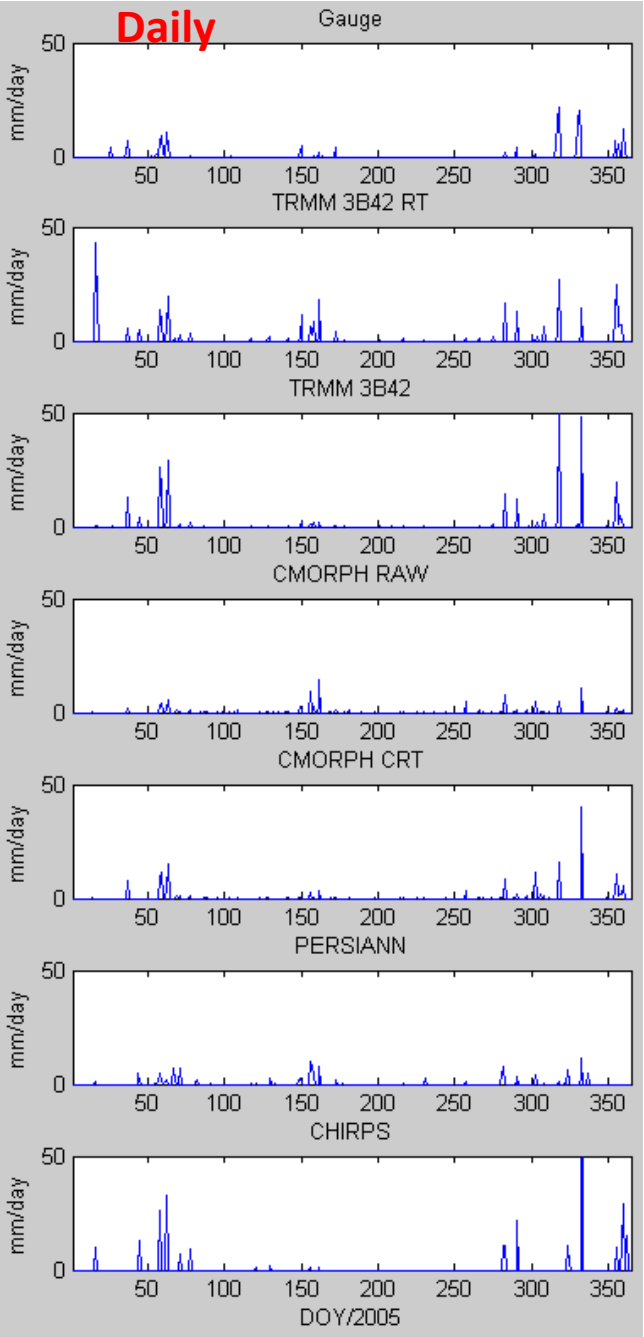
(2b) Ain Loudah (2005 data)

unit: mm/day

Daily	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	0.52	2.36	21.80	0.00	1.00
TRMM 3B42 RT (3 hourly)	0.96	3.92	43.08	0.00	0.33
TRMM 3B42 (daily)	0.81	4.77	57.36	0.00	0.47
CMORPH RAW (daily)	0.30	1.29	14.18	0.00	0.21
CMORPH CRT (daily)	0.49	2.74	40.30	0.00	0.31
PERSIANN (3 hourly)	0.36	1.37	11.08	0.00	0.05
CHIRPS-1.8 Africa (daily)	0.85	5.60	86.00	0.00	0.15

Monthly	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	0.52	0.83	2.90	0.00	1.00
TRMM 3B42 RT (3 hourly)	0.96	0.79	2.15	0.00	0.55
TRMM 3B42 (daily)	0.82	1.20	3.92	0.00	0.96
CMORPH RAW (daily)	0.30	0.30	1.04	0.00	0.32
CMORPH CRT (daily)	0.50	0.61	1.96	0.01	0.92
PERSIANN (3 hourly)	0.37	0.36	1.08	0.00	0.42
CHIRPS-1.8 Africa (daily)	0.86	1.09	3.33	0.00	0.90



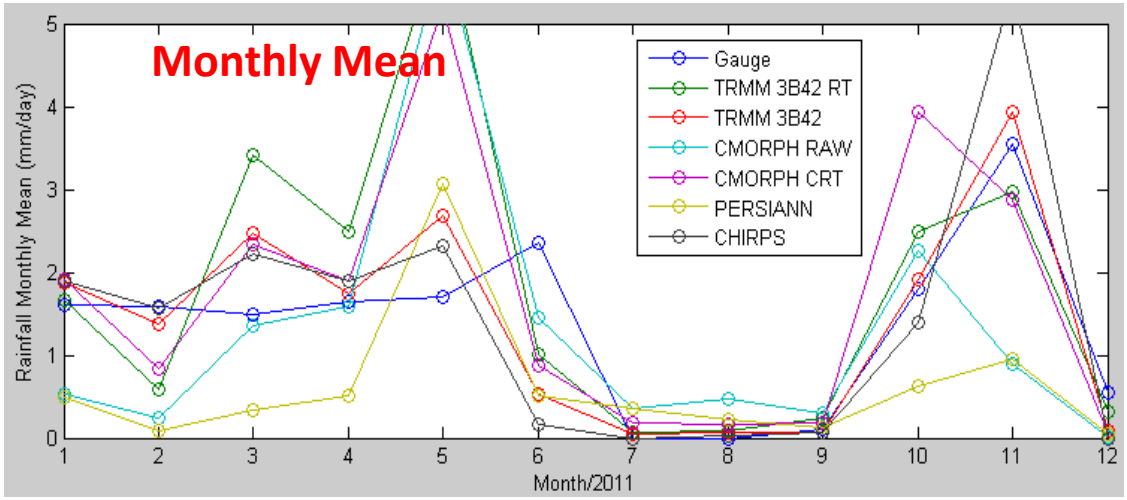


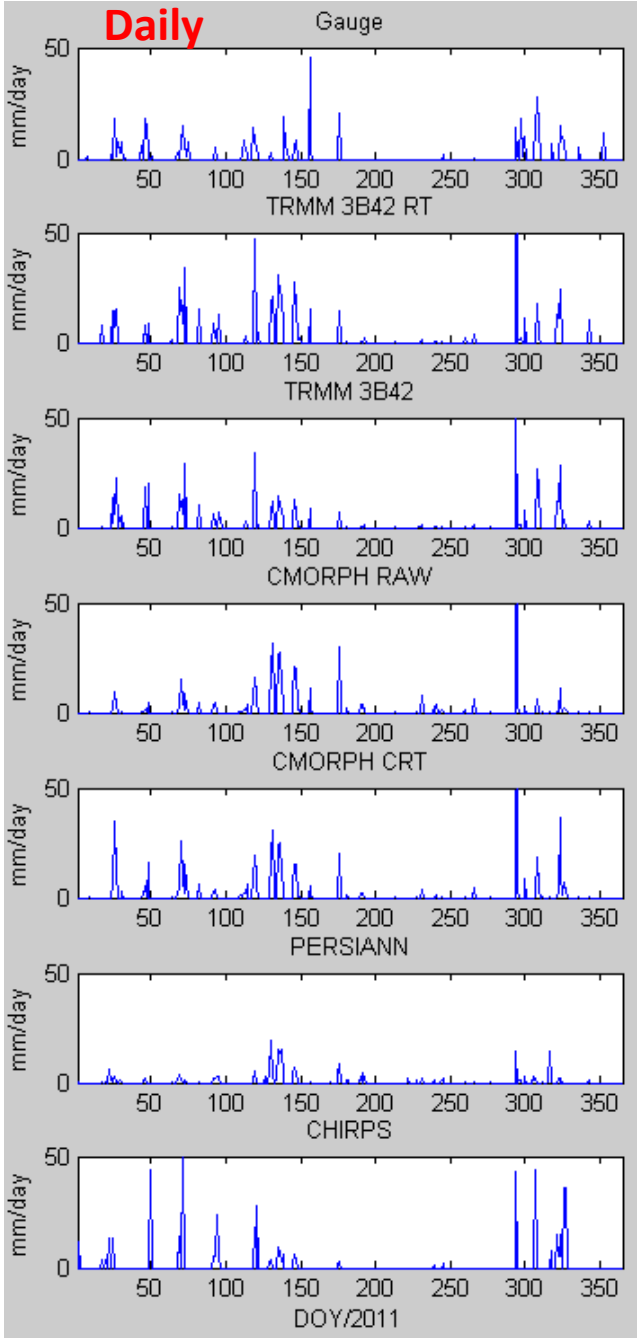
(3a) Lalla Chafia (2011 data)

unit: mm/day

Daily	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	1.36	4.34	45.60	0.00	1.00
TRMM 3B42 RT (3 hourly)	1.80	6.37	62.58	0.00	0.41
TRMM 3B42 (daily)	1.40	5.08	49.50	0.00	0.48
CMORPH RAW (daily)	1.29	5.19	64.33	0.00	0.37
CMORPH CRT (daily)	1.71	7.33	107.89	0.00	0.41
PERSIANN (3 hourly)	0.62	2.19	19.25	0.00	0.16
CHIRPS-1.8 Africa (daily)	1.41	6.22	55.00	0.00	0.23

Monthly	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	1.36	1.05	3.55	0.00	1.00
TRMM 3B42 RT (3 hourly)	1.79	1.83	6.19	0.06	0.54
TRMM 3B42 (daily)	1.40	1.27	3.93	0.04	0.82
CMORPH RAW (daily)	1.28	1.61	5.90	0.01	0.30
CMORPH CRT (daily)	1.70	1.66	5.21	0.04	0.59
PERSIANN (3 hourly)	0.61	0.82	3.08	0.05	0.34
CHIRPS-1.8 Africa (daily)	1.42	1.59	5.47	0.00	0.81



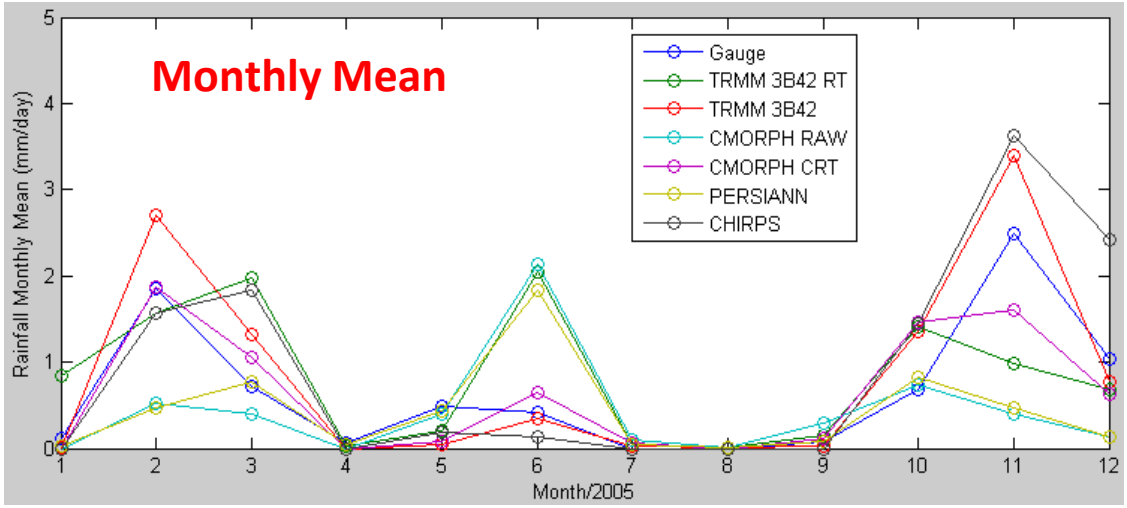


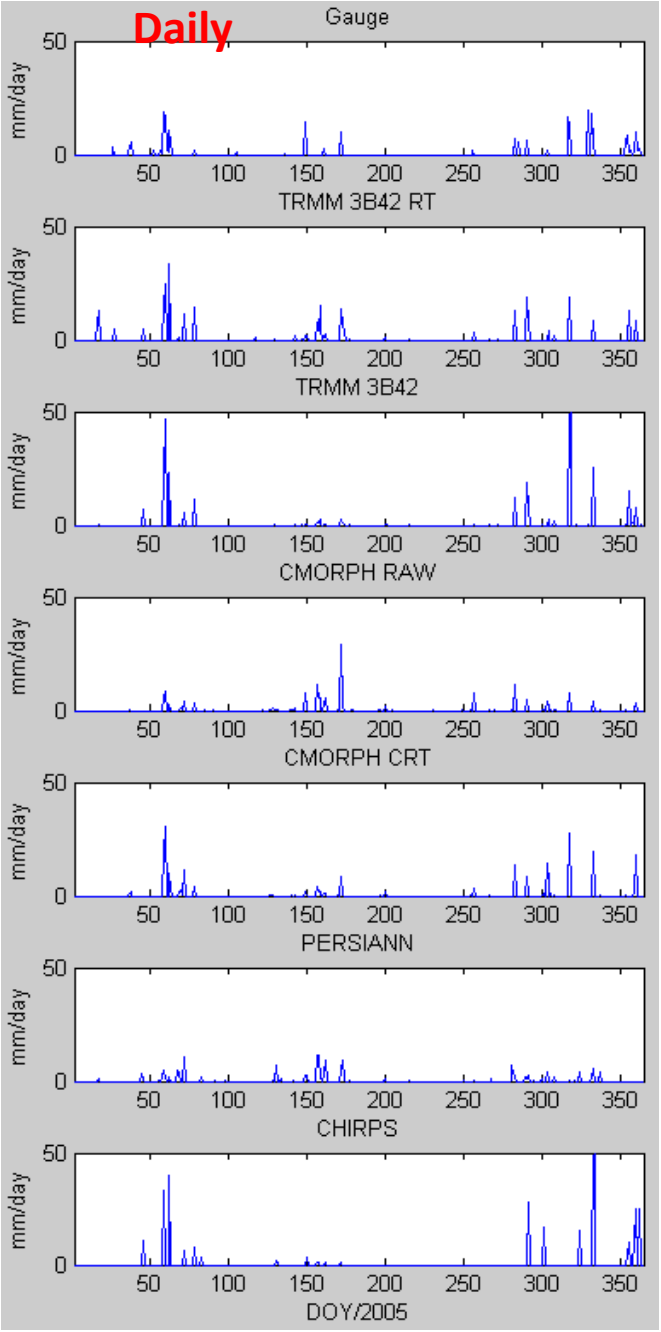
(3b) Lalla Chafia (2005 data)

unit: mm/day

Daily	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	0.65	2.66	19.60	0.00	1.00
TRMM 3B42 RT (3 hourly)	0.82	3.41	33.78	0.00	0.50
TRMM 3B42 (daily)	0.82	5.28	74.02	0.00	0.54
CMORPH RAW (daily)	0.42	2.06	29.11	0.00	0.44
CMORPH CRT (daily)	0.62	3.10	30.74	0.00	0.61
PERSIANN (3 hourly)	0.43	1.54	11.61	0.00	0.15
CHIRPS-1.8 Africa (daily)	0.93	6.25	94.00	0.00	0.29

Monthly	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	0.66	0.79	2.48	0.00	1.00
TRMM 3B42 RT (3 hourly)	0.83	0.77	2.05	0.00	0.44
TRMM 3B42 (daily)	0.83	1.16	3.39	0.00	0.96
CMORPH RAW (daily)	0.43	0.59	2.14	0.00	0.12
CMORPH CRT (daily)	0.63	0.70	1.87	0.00	0.85
PERSIANN (3 hourly)	0.43	0.53	1.84	0.02	0.19
CHIRPS-1.8 Africa (daily)	0.94	1.23	3.63	0.00	0.89



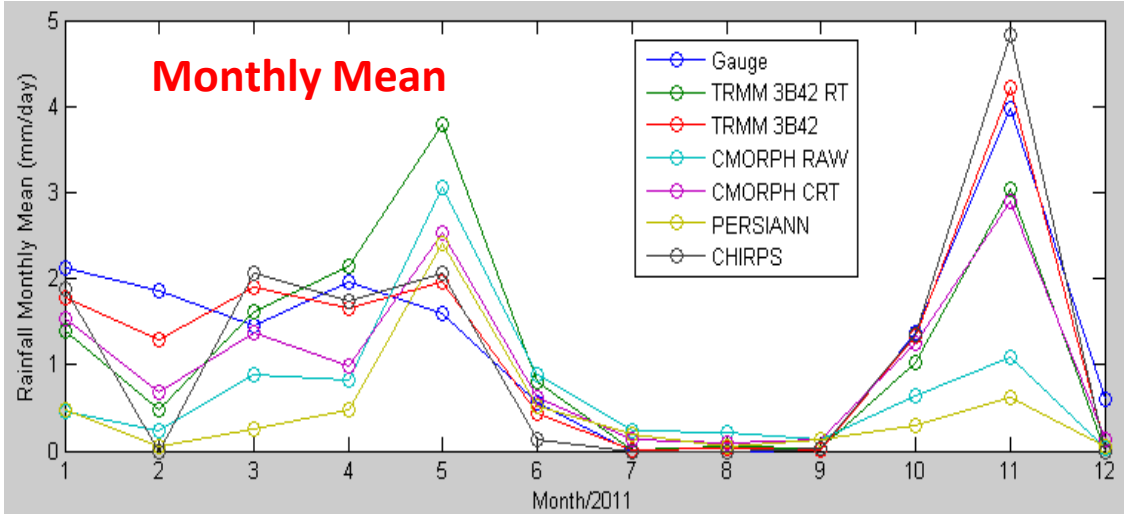


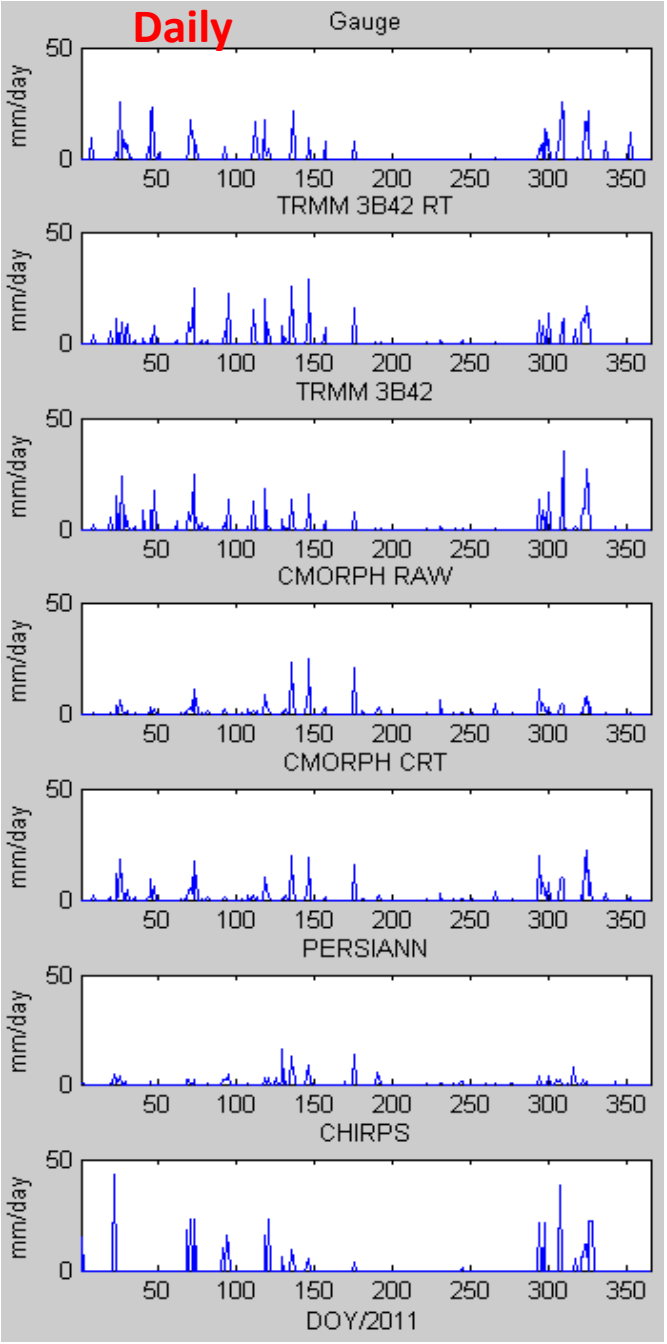
(4a) Ras El Fathia (2011 data)

unit: mm/day

Daily	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	1.29	4.02	25.20	0.00	1.00
TRMM 3B42 RT (3 hourly)	1.20	4.01	28.98	0.00	0.40
TRMM 3B42 (daily)	1.22	4.15	34.88	0.00	0.48
CMORPH RAW (daily)	0.73	2.76	24.66	0.00	0.40
CMORPH CRT (daily)	1.03	3.37	21.81	0.00	0.57
PERSIANN (3 hourly)	0.46	1.71	16.09	0.00	0.23
CHIRPS-1.8 Africa (daily)	1.18	4.87	43.00	0.00	0.23

Monthly	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	1.29	1.16	3.98	0.00	1.00
TRMM 3B42 RT (3 hourly)	1.20	1.26	3.79	0.00	0.73
TRMM 3B42 (daily)	1.22	1.24	4.21	0.01	0.96
CMORPH RAW (daily)	0.72	0.82	3.07	0.02	0.35
CMORPH CRT (daily)	1.03	0.94	2.89	0.10	0.84
PERSIANN (3 hourly)	0.46	0.65	2.41	0.05	0.28
CHIRPS-1.8 Africa (daily)	1.17	1.47	4.83	0.00	0.89



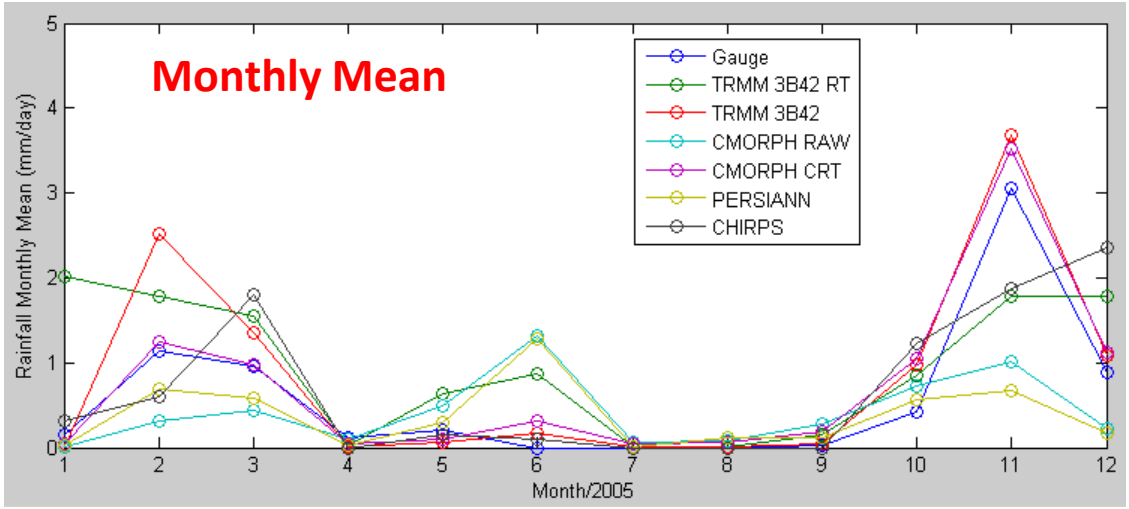


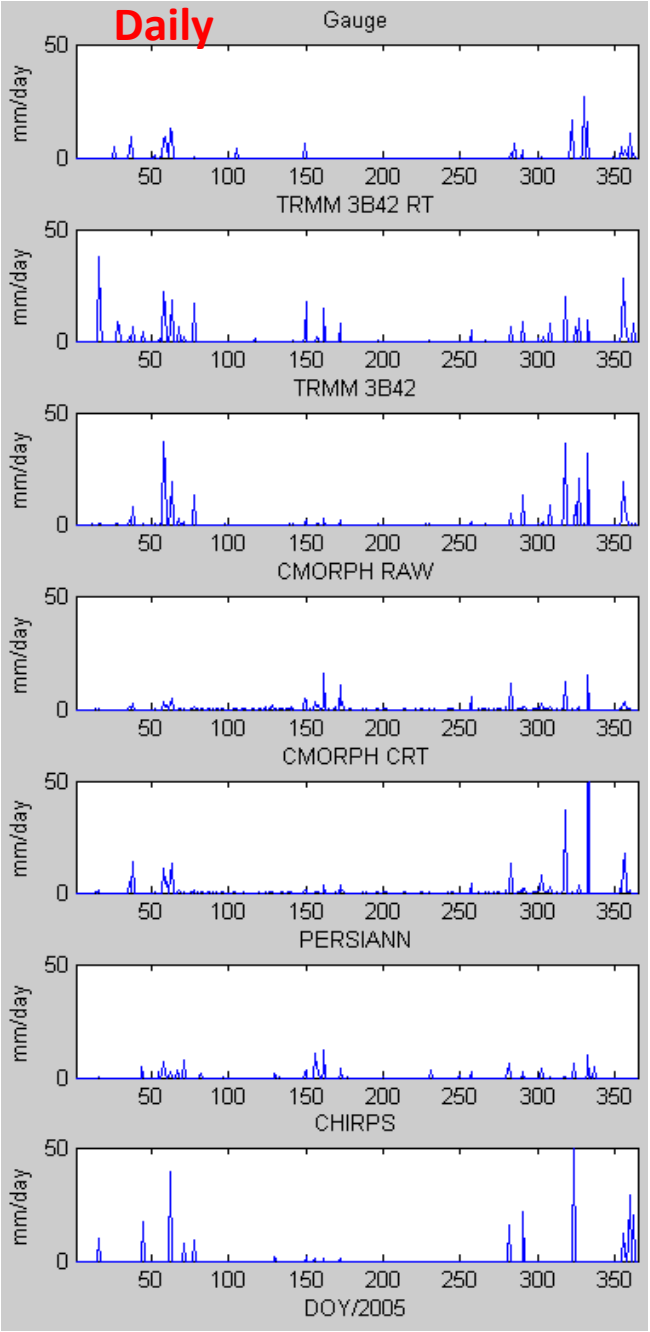
(4b) Ras El Fathia (2005 data)

unit: mm/day

Daily	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	0.57	2.55	26.70	0.00	1.00
TRMM 3B42 RT (3 hourly)	0.95	3.78	37.71	0.00	0.19
TRMM 3B42 (daily)	0.81	4.04	37.28	0.00	0.29
CMORPH RAW (daily)	0.42	1.65	15.49	0.00	0.17
CMORPH CRT (daily)	0.72	4.07	58.66	0.00	0.25
PERSIANN (3 hourly)	0.37	1.41	12.23	0.00	0.14
CHIRPS-1.8 Africa (daily)	0.71	4.46	56.00	0.00	0.19

Monthly	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	0.58	0.88	3.05	0.00	1.00
TRMM 3B42 RT (3 hourly)	0.96	0.80	2.02	0.00	0.61
TRMM 3B42 (daily)	0.83	1.19	3.68	0.00	0.95
CMORPH RAW (daily)	0.42	0.41	1.32	0.01	0.39
CMORPH CRT (daily)	0.73	1.00	3.52	0.04	0.98
PERSIANN (3 hourly)	0.38	0.39	1.29	0.01	0.33
CHIRPS-1.8 Africa (daily)	0.70	0.87	2.35	0.00	0.70



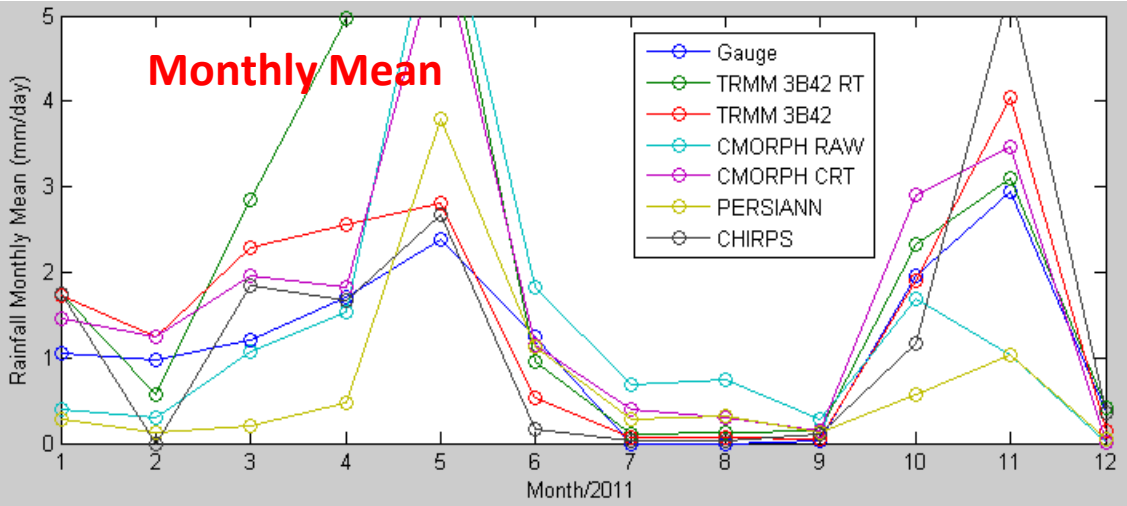


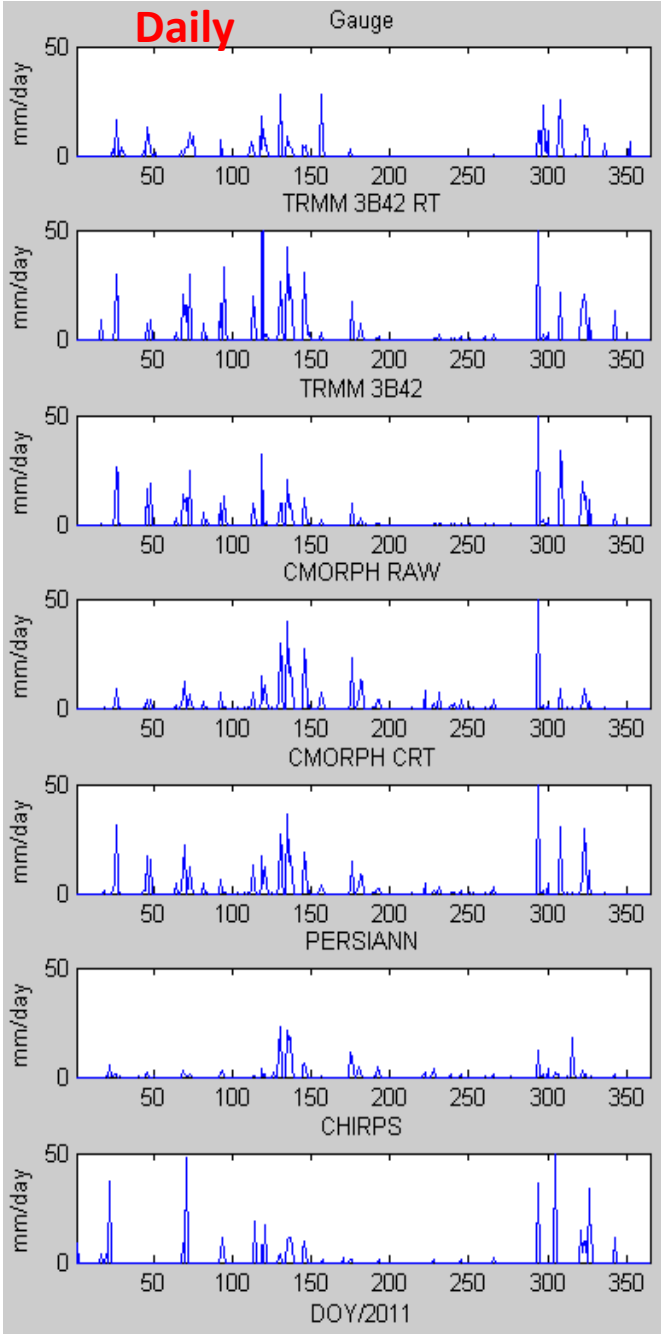
(5a) Sidi Jabeur (2011 data)

unit: mm/day

Daily	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	1.15	3.74	28.10	0.00	1.00
TRMM 3B42 RT (3 hourly)	1.98	6.99	66.90	0.00	0.42
TRMM 3B42 (daily)	1.45	5.26	52.97	0.00	0.47
CMORPH RAW (daily)	1.36	4.86	49.74	0.00	0.44
CMORPH CRT (daily)	1.73	6.45	83.18	0.00	0.53
PERSIANN (3 hourly)	0.70	2.66	23.28	0.00	0.33
CHIRPS-1.8 Africa (daily)	1.26	5.51	52.00	0.00	0.14

Monthly	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	1.16	0.97	2.95	0.00	1.00
TRMM 3B42 RT (3 hourly)	1.98	2.06	6.42	0.10	0.79
TRMM 3B42 (daily)	1.45	1.32	4.05	0.05	0.93
CMORPH RAW (daily)	1.35	1.77	6.66	0.00	0.55
CMORPH CRT (daily)	1.73	1.69	5.85	0.01	0.87
PERSIANN (3 hourly)	0.70	1.03	3.79	0.05	0.59
CHIRPS-1.8 Africa (daily)	1.26	1.58	5.33	0.00	0.84



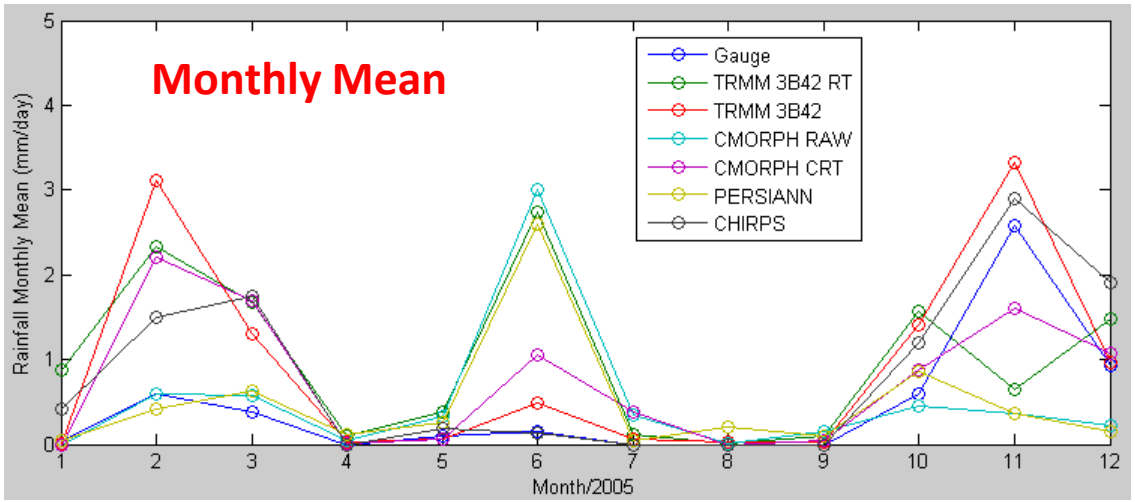


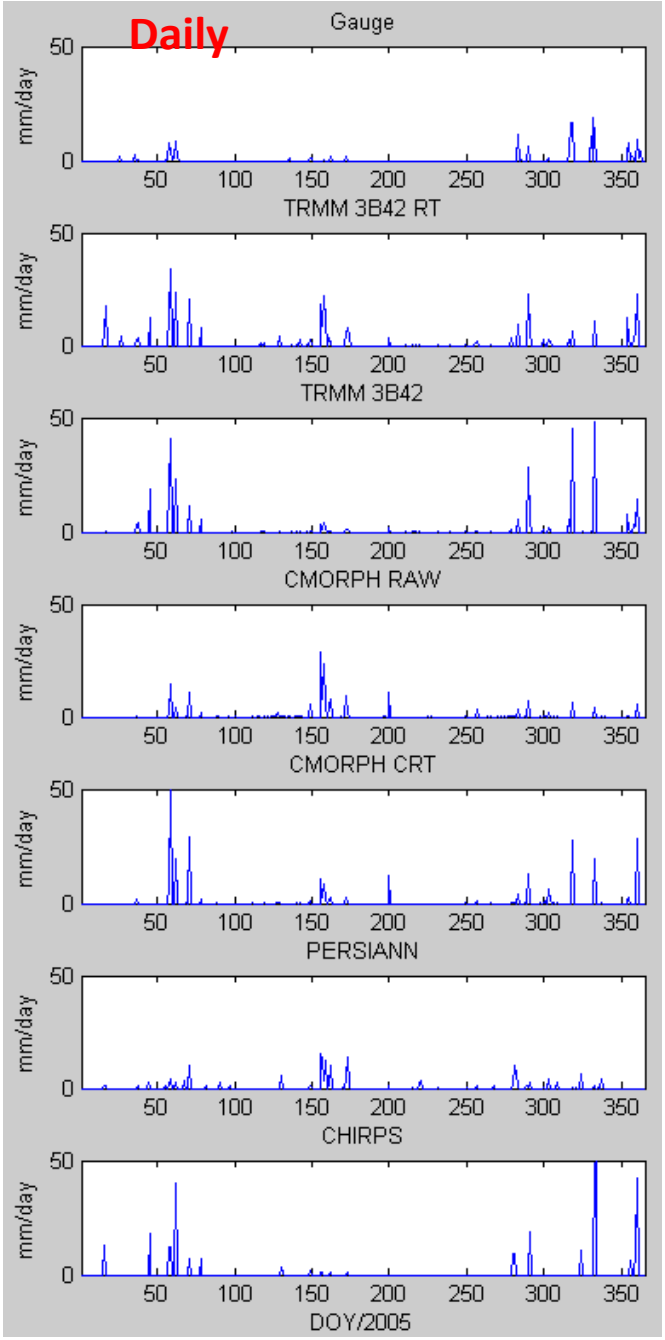
(5b) Sidi Jabeur (2005 data)

unit: mm/day

Daily	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	0.44	2.08	18.60	0.00	1.00
TRMM 3B42 RT (3 hourly)	0.99	3.79	33.81	0.00	0.37
TRMM 3B42 (daily)	0.88	4.83	48.30	0.00	0.57
CMORPH RAW (daily)	0.50	2.47	28.42	0.00	0.20
CMORPH CRT (daily)	0.74	4.19	52.62	0.00	0.45
PERSIANN (3 hourly)	0.48	1.87	15.64	0.00	0.04
CHIRPS-1.8 Africa (daily)	0.83	5.39	76.00	0.00	0.38

Monthly	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	0.45	0.74	2.57	0.00	1.00
TRMM 3B42 RT (3 hourly)	1.00	0.94	2.74	0.02	0.14
TRMM 3B42 (daily)	0.90	1.20	3.32	0.01	0.81
CMORPH RAW (daily)	0.51	0.81	3.00	0.00	-0.04
CMORPH CRT (daily)	0.75	0.78	2.20	0.00	0.59
PERSIANN (3 hourly)	0.48	0.71	2.61	0.04	-0.02
CHIRPS-1.8 Africa (daily)	0.83	0.98	2.90	0.00	0.89



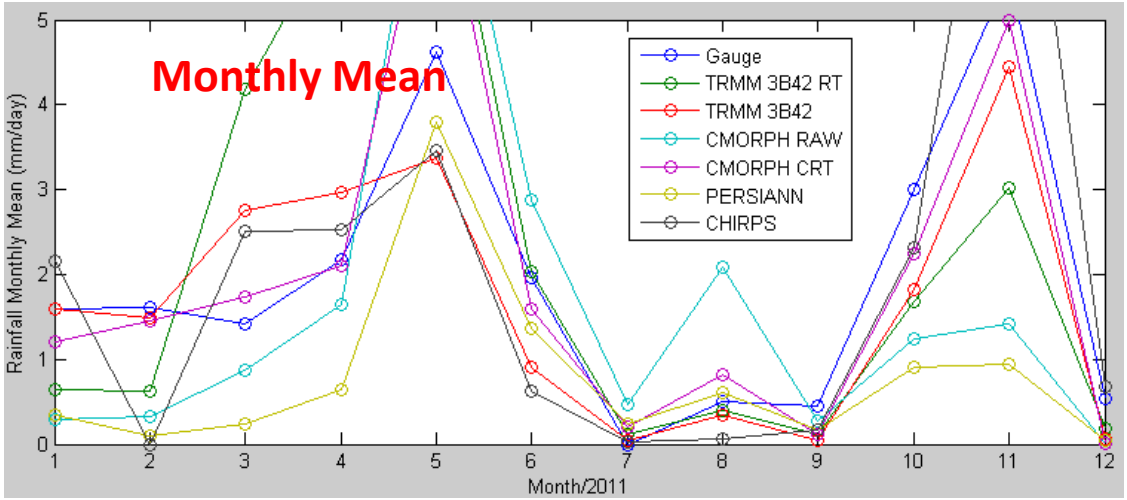


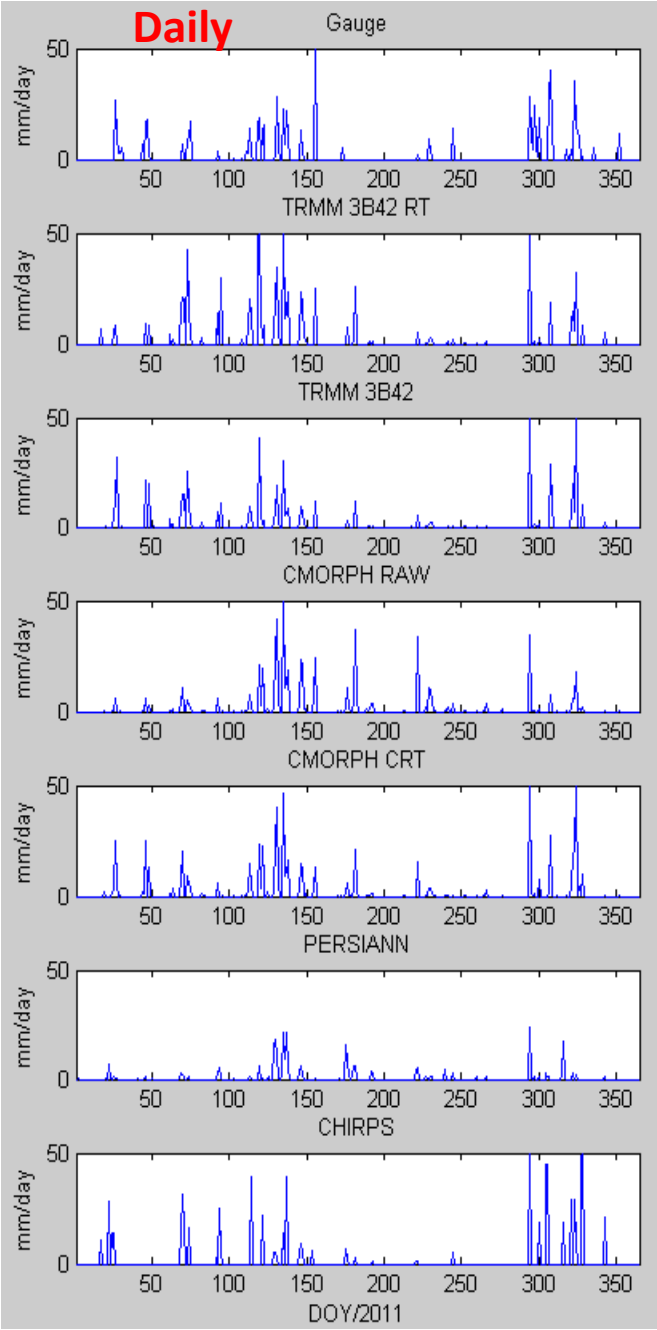
(6a) Tsalat (2011 data)

unit: mm/day

Daily	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	1.95	6.15	52.70	0.00	1.00
TRMM 3B42 RT (3 hourly)	2.23	7.72	75.45	0.00	0.53
TRMM 3B42 (daily)	1.65	6.02	53.84	0.00	0.56
CMORPH RAW (daily)	1.63	5.78	51.54	0.00	0.53
CMORPH CRT (daily)	1.96	6.89	60.46	0.00	0.63
PERSIANN (3 hourly)	0.79	2.91	23.96	0.00	0.32
CHIRPS-1.8 Africa (daily)	1.98	8.34	96.00	0.00	0.22

Monthly	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	1.95	1.71	5.57	0.00	1.00
TRMM 3B42 RT (3 hourly)	2.22	2.51	7.44	0.12	0.64
TRMM 3B42 (daily)	1.65	1.47	4.44	0.04	0.88
CMORPH RAW (daily)	1.62	2.16	7.91	0.00	0.56
CMORPH CRT (daily)	1.96	2.08	7.02	0.01	0.92
PERSIANN (3 hourly)	0.78	1.03	3.80	0.05	0.66
CHIRPS-1.8 Africa (daily)	1.97	2.55	9.10	0.00	0.87



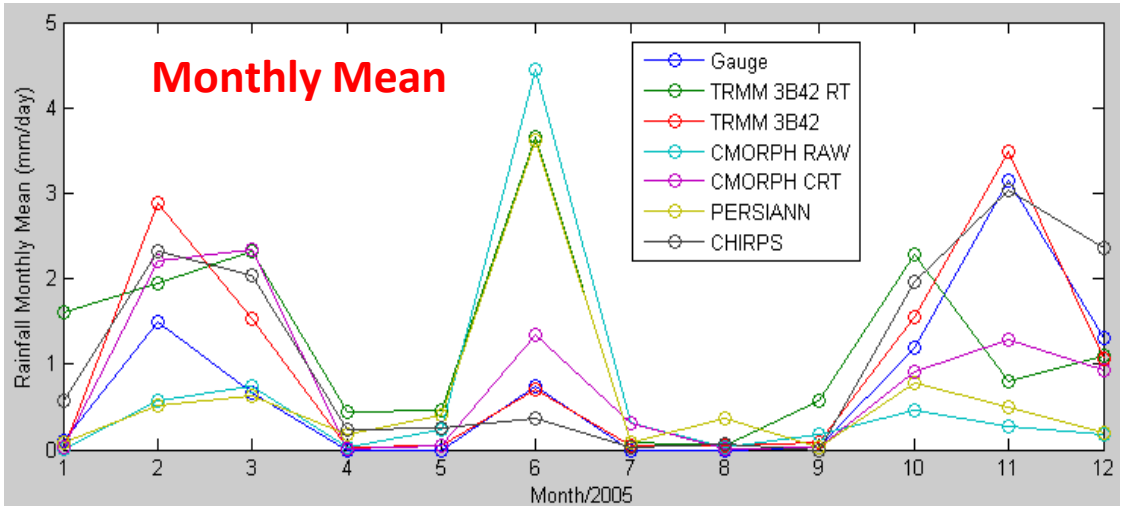


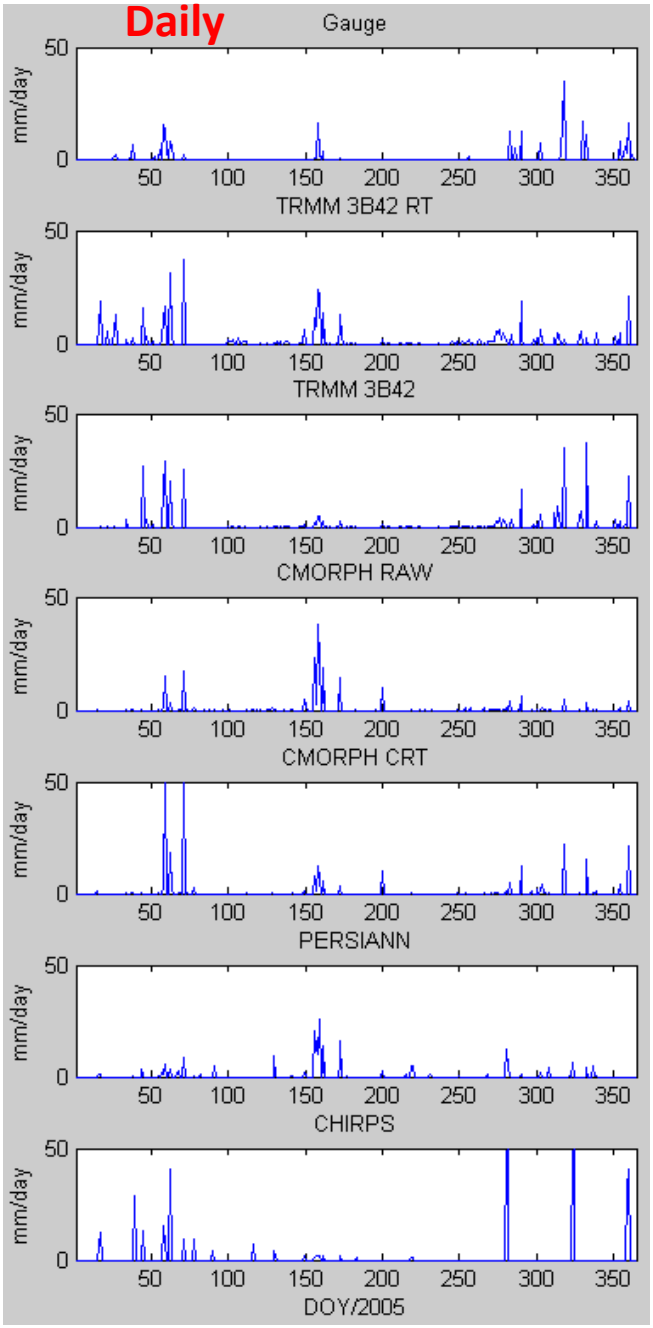
(6b) Tsalat (2005 data)

unit: mm/day

Daily	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	0.71	3.09	35.00	0.00	1.00
TRMM 3B42 RT (3 hourly)	1.27	4.08	37.05	0.00	0.36
TRMM 3B42 (daily)	0.94	4.21	37.47	0.00	0.63
CMORPH RAW (daily)	0.62	3.22	37.77	0.00	0.33
CMORPH CRT (daily)	0.78	4.59	57.28	0.00	0.51
PERSIANN (3 hourly)	0.61	2.50	25.44	0.00	0.11
CHIRPS-1.8 Africa (daily)	1.10	6.97	91.00	0.00	0.15

Monthly	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	0.72	0.95	3.14	0.00	1.00
TRMM 3B42 RT (3 hourly)	1.28	1.10	3.66	0.05	0.26
TRMM 3B42 (daily)	0.96	1.20	3.48	0.01	0.93
CMORPH RAW (daily)	0.62	1.23	4.45	0.01	0.07
CMORPH CRT (daily)	0.79	0.86	2.34	0.00	0.60
PERSIANN (3 hourly)	0.62	0.98	3.62	0.04	0.13
CHIRPS-1.8 Africa (daily)	1.10	1.13	3.03	0.00	0.89



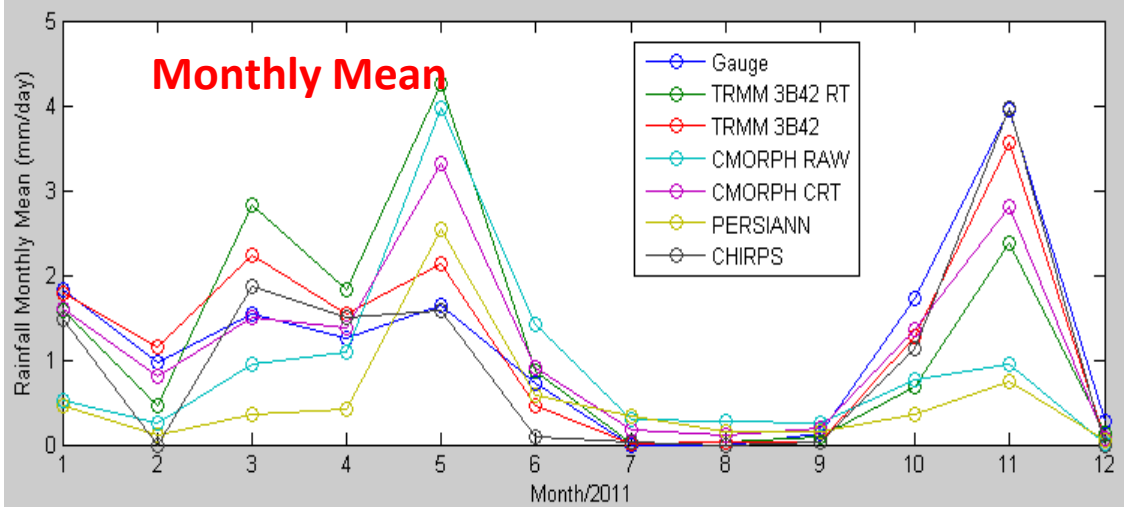


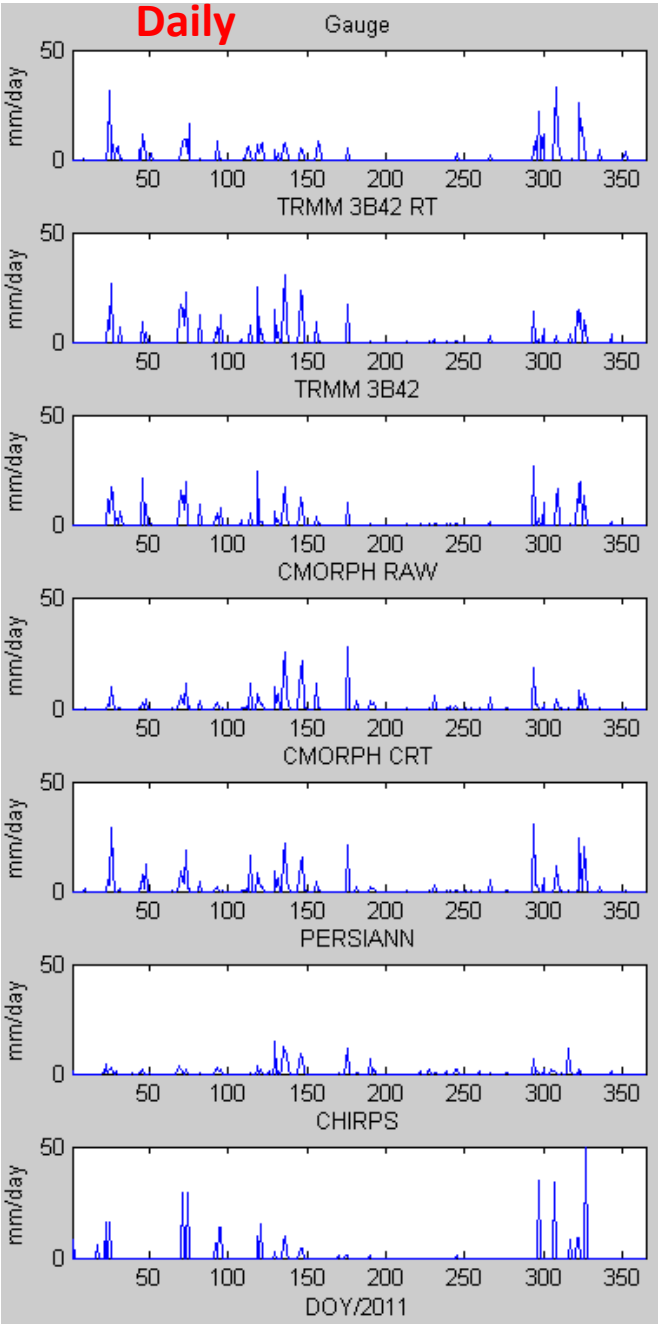
(7a) Sidi Mohamed Cherif (2011 data)

unit: mm/day

Daily	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	1.17	3.78	32.80	0.00	1.00
TRMM 3B42 RT (3 hourly)	1.27	4.26	30.51	0.00	0.36
TRMM 3B42 (daily)	1.19	3.90	26.97	0.00	0.49
CMORPH RAW (daily)	0.90	3.22	27.71	0.00	0.31
CMORPH CRT (daily)	1.19	3.99	30.75	0.00	0.44
PERSIANN (3 hourly)	0.53	1.77	14.38	0.00	0.21
CHIRPS-1.8 Africa (daily)	0.98	4.72	50.00	0.00	0.35

Monthly	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	1.17	1.12	3.95	0.00	1.00
TRMM 3B42 RT (3 hourly)	1.26	1.35	4.26	0.00	0.64
TRMM 3B42 (daily)	1.19	1.13	3.56	0.01	0.95
CMORPH RAW (daily)	0.90	1.06	3.98	0.01	0.32
CMORPH CRT (daily)	1.18	1.05	3.31	0.06	0.83
PERSIANN (3 hourly)	0.52	0.67	2.55	0.05	0.36
CHIRPS-1.8 Africa (daily)	0.97	1.21	3.97	0.00	0.95



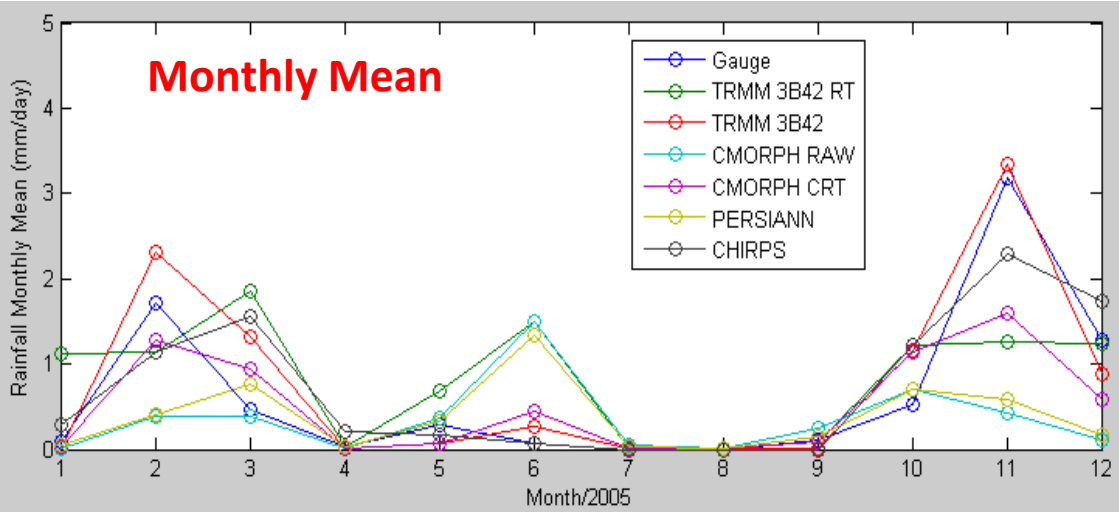


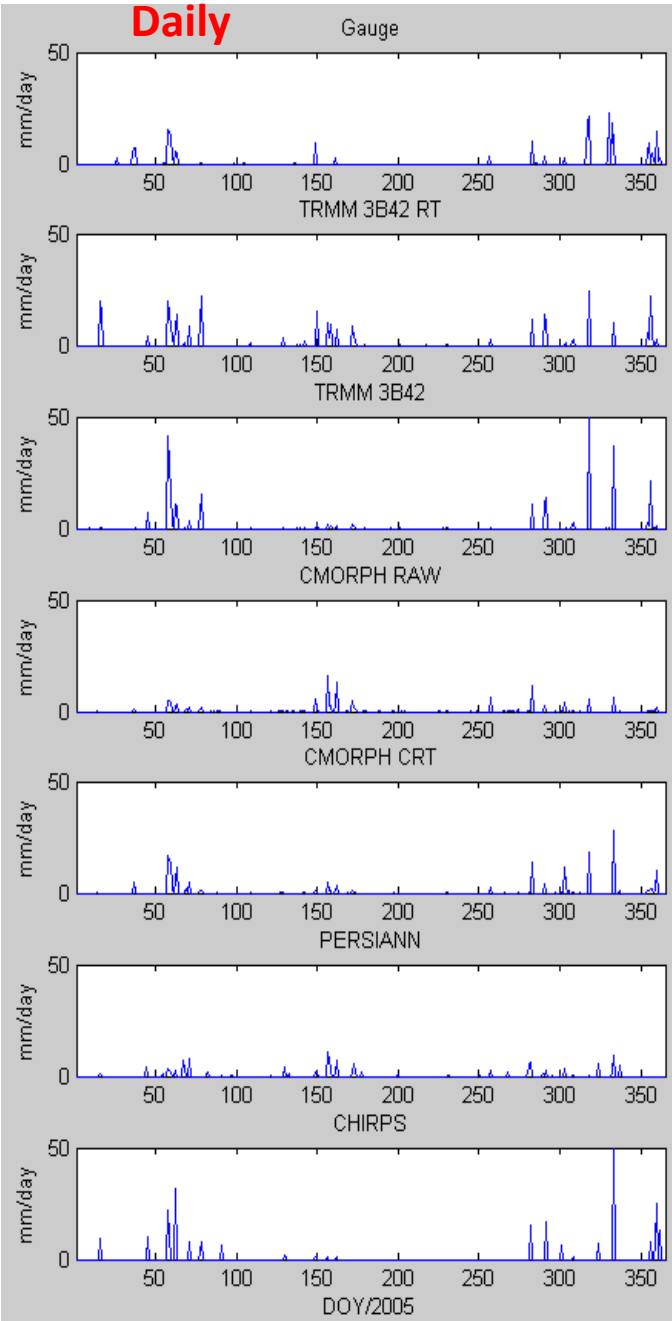
(7b) Sidi Mohamed Cherif (2005 data)

unit: mm/day

Daily	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	0.64	2.77	23.10	0.00	1.00
TRMM 3B42 RT (3 hourly)	0.84	3.31	24.60	0.00	0.38
TRMM 3B42 (daily)	0.77	4.71	59.53	0.00	0.55
CMORPH RAW (daily)	0.35	1.50	15.91	0.00	0.33
CMORPH CRT (daily)	0.51	2.48	27.83	0.00	0.58
PERSIANN (3 hourly)	0.38	1.36	11.00	0.00	0.12
CHIRPS-1.8 Africa (daily)	0.72	4.36	61.00	0.00	0.30

Monthly	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	0.65	0.97	3.18	0.00	1.00
TRMM 3B42 RT (3 hourly)	0.84	0.65	1.85	0.00	0.42
TRMM 3B42 (daily)	0.78	1.09	3.34	0.00	0.94
CMORPH RAW (daily)	0.35	0.42	1.49	0.01	0.05
CMORPH CRT (daily)	0.52	0.58	1.60	0.00	0.83
PERSIANN (3 hourly)	0.38	0.40	1.34	0.02	0.18
CHIRPS-1.8 Africa (daily)	0.72	0.82	2.30	0.00	0.84



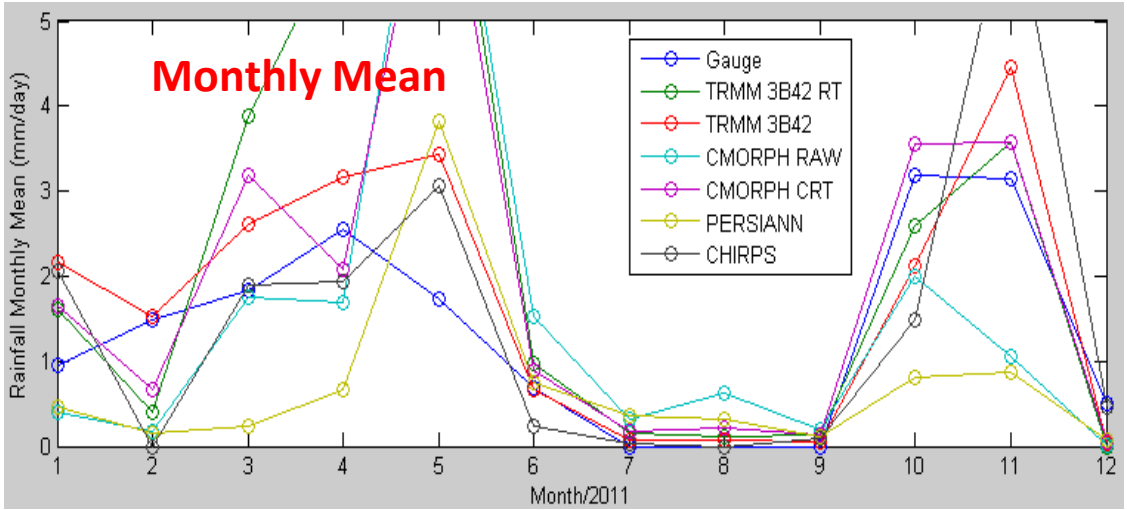


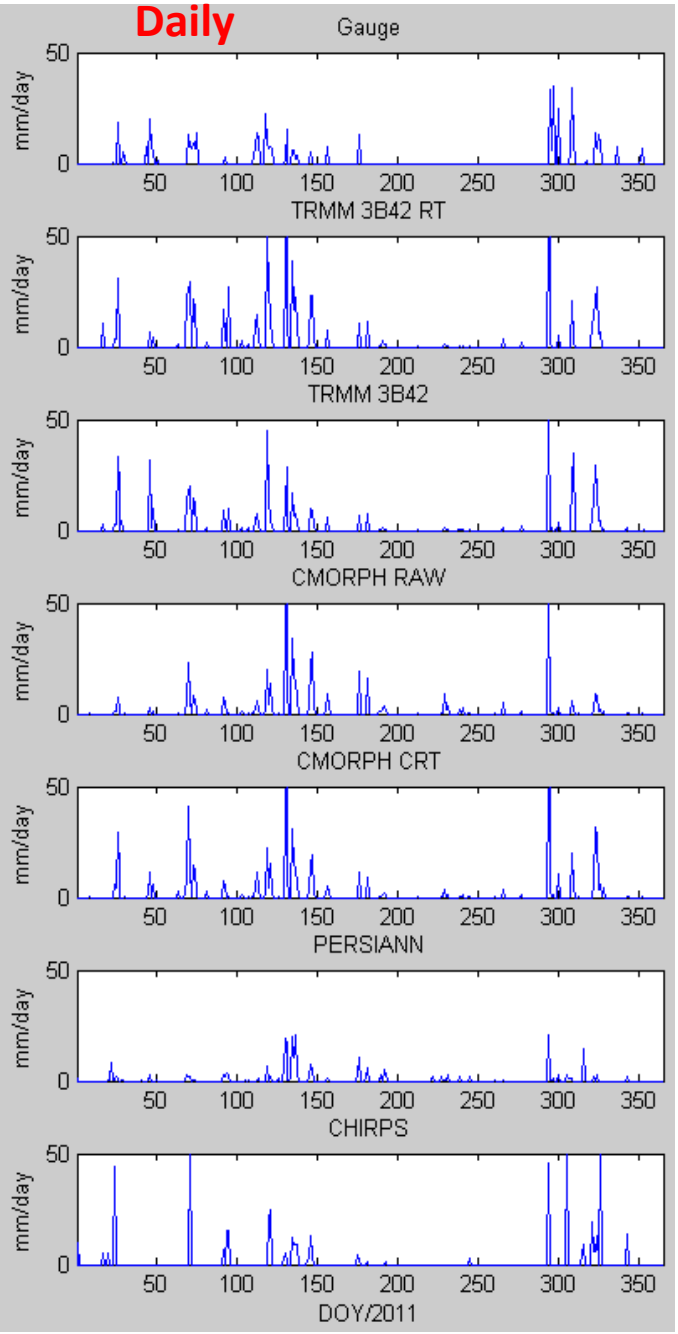
(8a) Sidi Amar (2011 data)

unit: mm/day

Daily	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	1.33	4.50	34.80	0.00	1.00
TRMM 3B42 RT (3 hourly)	2.32	8.28	74.19	0.00	0.37
TRMM 3B42 (daily)	1.69	6.14	58.58	0.00	0.45
CMORPH RAW (daily)	1.52	6.13	65.18	0.00	0.28
CMORPH CRT (daily)	1.99	7.83	94.36	0.00	0.38
PERSIANN (3 hourly)	0.72	2.70	20.76	0.00	0.17
CHIRPS-1.8 Africa (daily)	1.49	7.42	79.00	0.00	0.11

Monthly	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	1.34	1.18	3.18	0.00	1.00
TRMM 3B42 RT (3 hourly)	2.31	2.68	8.20	0.00	0.63
TRMM 3B42 (daily)	1.70	1.53	4.46	0.03	0.86
CMORPH RAW (daily)	1.51	2.27	8.36	0.01	0.31
CMORPH CRT (daily)	1.98	2.22	7.55	0.04	0.63
PERSIANN (3 hourly)	0.72	1.02	3.82	0.06	0.28
CHIRPS-1.8 Africa (daily)	1.49	1.92	6.60	0.00	0.71



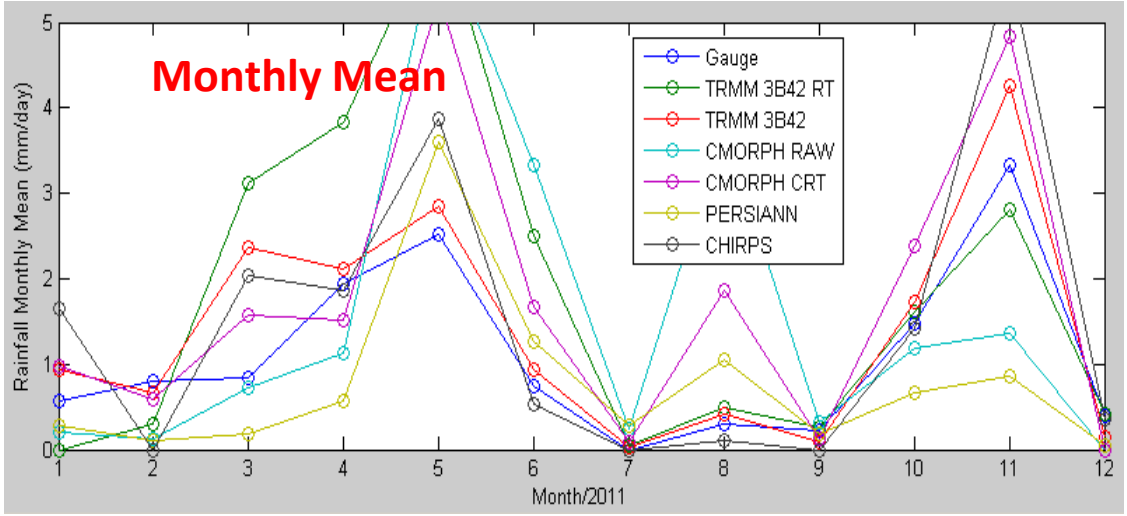


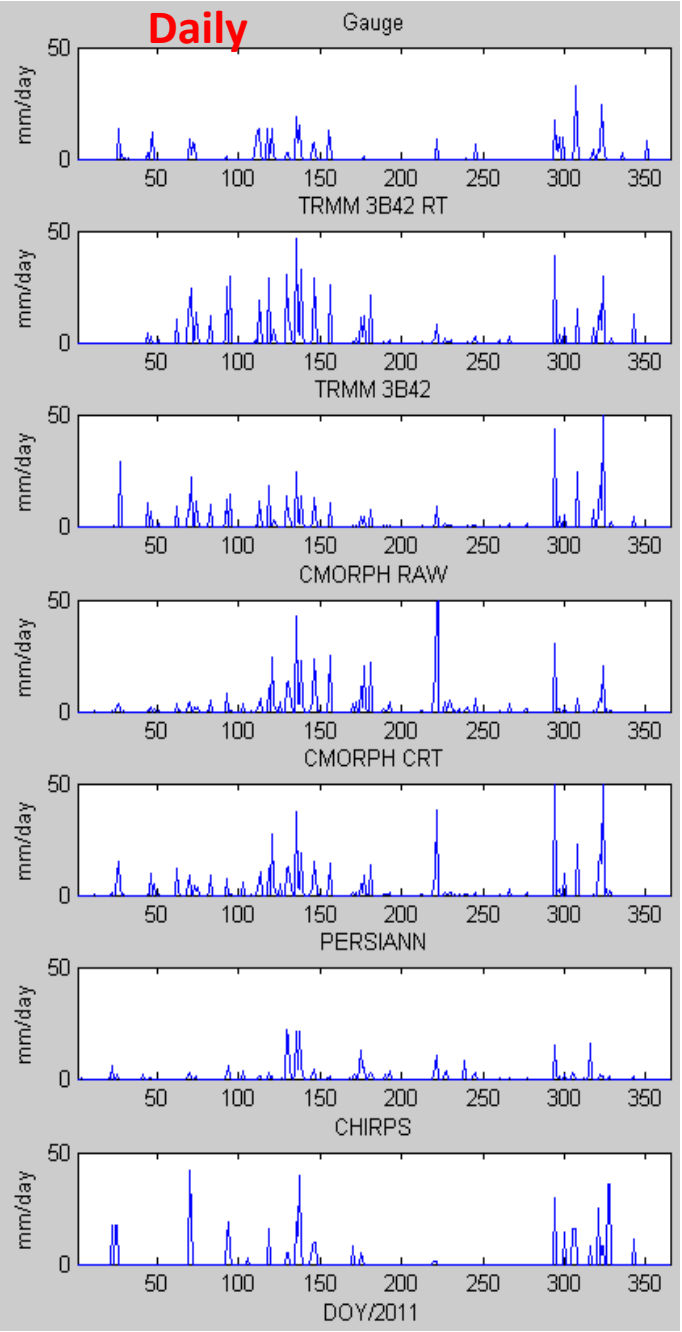
(9a) Oulat Haboub (2011 data)

unit: mm/day

Daily	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	1.09	3.54	32.60	0.00	1.00
TRMM 3B42 RT (3 hourly)	1.81	6.03	46.20	0.00	0.39
TRMM 3B42 (daily)	1.38	5.33	61.67	0.00	0.39
CMORPH RAW (daily)	1.55	5.80	70.07	0.00	0.41
CMORPH CRT (daily)	1.75	6.39	69.22	0.00	0.51
PERSIANN (3 hourly)	0.76	2.75	21.94	0.00	0.32
CHIRPS-1.8 Africa (daily)	1.46	5.52	42.00	0.00	0.37

Monthly	Mean	Std	Max	Min	Corr w/ Gauge
Gauge	1.09	1.02	3.33	0.00	1.00
TRMM 3B42 RT (3 hourly)	1.80	1.95	6.25	0.00	0.74
TRMM 3B42 (daily)	1.38	1.32	4.27	0.02	0.94
CMORPH RAW (daily)	1.54	1.90	6.15	0.00	0.38
CMORPH CRT (daily)	1.74	1.73	5.31	0.00	0.88
PERSIANN (3 hourly)	0.76	0.98	3.60	0.05	0.53
CHIRPS-1.8 Africa (daily)	1.45	1.76	5.63	0.00	0.92

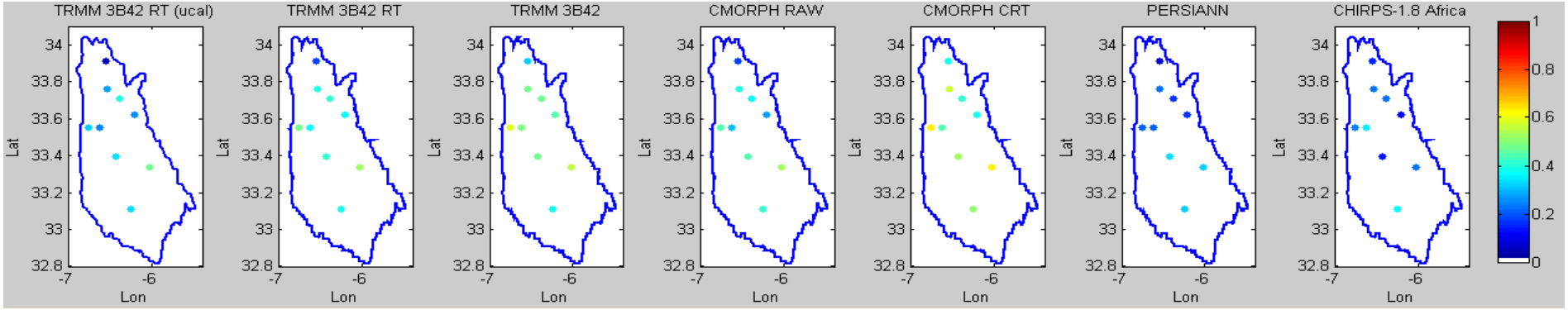




Correlation Distribution Maps with 9 Gauges (2011 data)

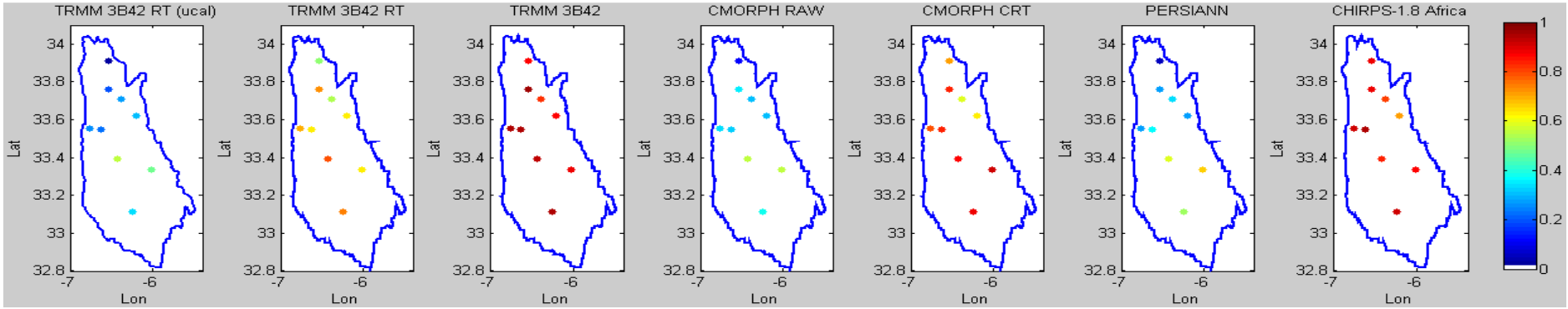
Daily

TRMM3B42RT(ucal)	TRMM3B42RT	TRMM3B42	CMORPH RAW	CMORPH CRT	PERSIANN	CHIRPS-1.8 Africa
0.30	0.39	0.47	0.37	0.50	0.22	0.23



Monthly Mean

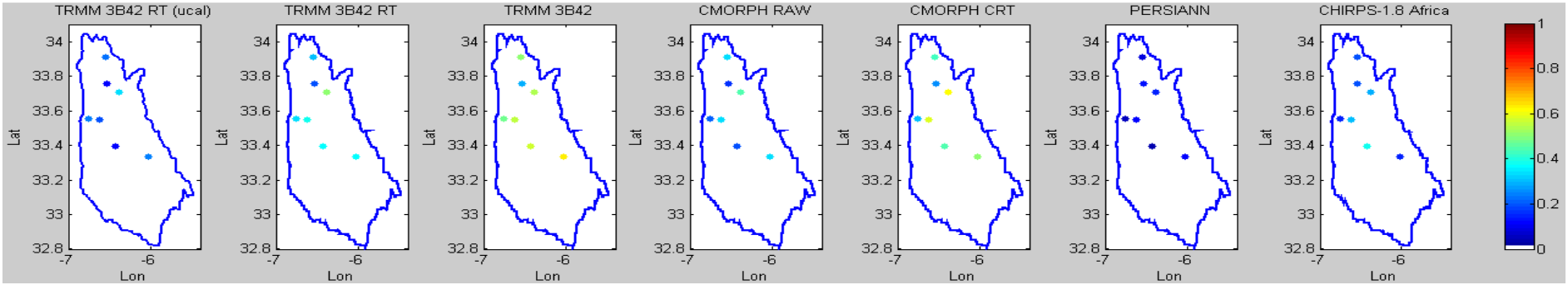
TRMM3B42RT(ucal)	TRMM3B42RT	TRMM3B42	CMORPH RAW	CMORPH CRT	PERSIANN	CHIRPS-1.8 Africa
0.30	0.66	0.91	0.36	0.78	0.37	0.87



Correlation Distribution Maps with 7 Gauges (2005 data)

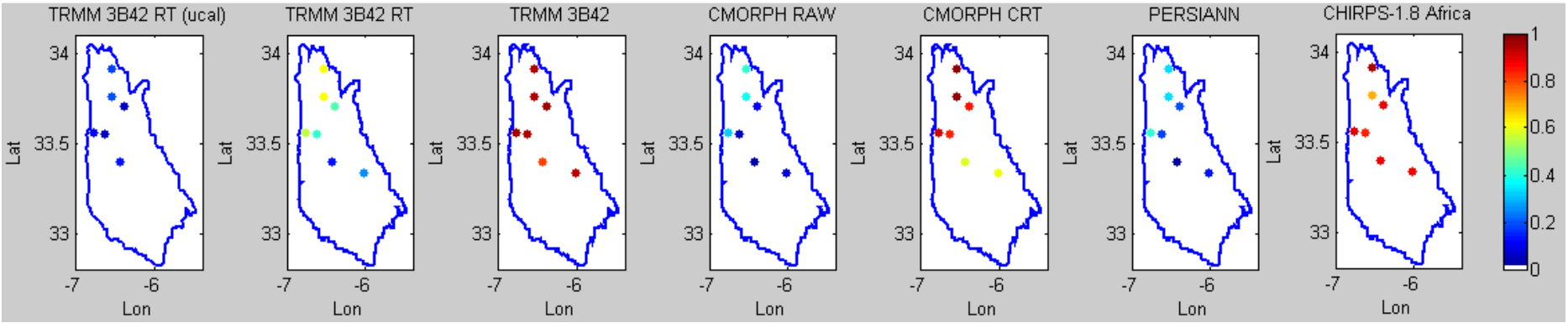
Daily

TRMM3B42RT(ucal)	TRMM3B42RT	TRMM3B42	CMORPH RAW	CMORPH CRT	PERSIANN	CHIRPS-1.8 Africa
0.21	0.35	0.51	0.29	0.49	0.10	0.24

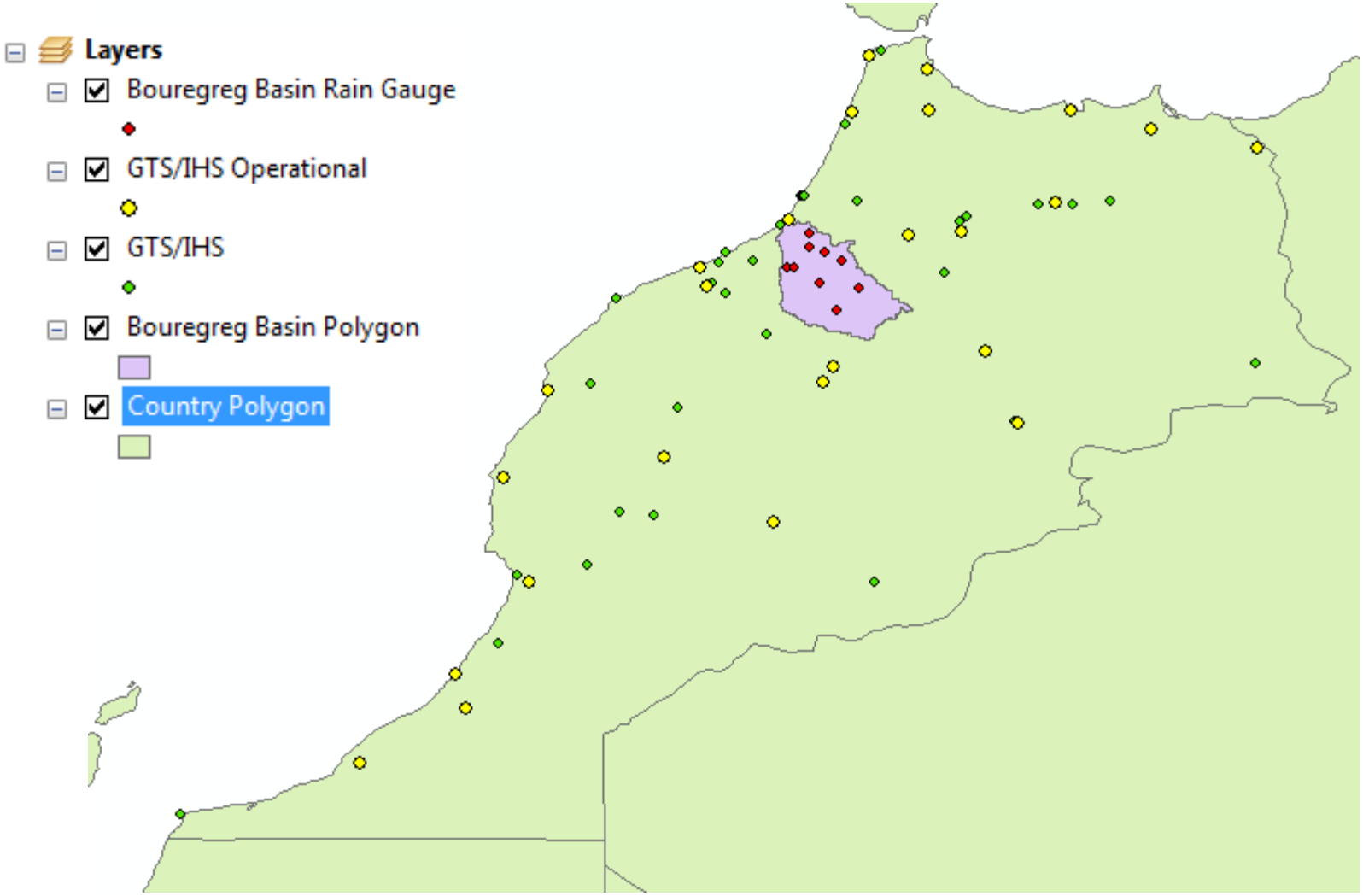


Monthly Mean

TRMM3B42RT(ucal)	TRMM3B42RT	TRMM3B42	CMORPH RAW	CMORPH CRT	PERSIANN	CHIRPS-1.8 Africa
0.11	0.43	0.93	0.20	0.82	0.23	0.87



Availability of GTS/HIS rainfall data



Reference: http://www7.ncdc.noaa.gov/CDO/cdopoemain.cmd?datasetabbv=DS3505&countryabbv=&georegionabbv=&resolution=40

Suggested Next Steps

- Real time satellite precipitation data including TMPA-3B42RT (ucal/calabrated), CMORPH RAW, and PERSIANN show low correlation with rain gauges in the Bouregreg Basin. Thus, in order derive rainfall estimates for accurate real time flood monitoring, a bias correction should be considered, even with the limited historical gauge measurements which have been provided to NASA.

- An interpolated rain gauge data product should be evaluated.

- If near real time rain gauge (GTS/HIS) data for the Bouregreg Basin can be provided, an optimally interpolated, merged satellite-rain gauge product should be evaluated.

- Also, high resolution, dynamic downscaling of global atmospheric models with satellite data assimilation should be evaluated. If this proves promising, then it may be further enhanced by merging rain gauge data using optimal interpolation.

- Data from the Moroccan precipitation radar network (ref. Martin Malkomes, 2014) should be evaluated for use with the CREST flood modeling system.