



*Supplement of*

## **Probabilistic flood inundation mapping through copula Bayesian multi-modeling of precipitation products**

**Francisco Javier Gomez et al.**

*Correspondence to:* Francisco Javier Gomez (fjgomez1@crimson.ua.edu) and Hamid Moradkhani (hморadkhani@ua.edu)

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Table S1. Summary of stations used for boundary conditions and validation.

Gauge station name	Source	ID station	CoordX	CoordY
Galveston Entrance	NOAA	877134	333460.0534	3247507.171
Eagle Point	NOAA	8771013	314383.5569	3262861.854
Morgans Point	NOAA	8770613	308213.9904	3285397.388
Clear Creek @ I-45	HCFWS	ID113	294859.9137	3266188.535
Horsepen Bayou @ Bay Area Boulevard	HCFWS	ID249	296314.0666	3274426.618
Willow Spring Bayou @ Fairmont Parkway	HCFWS	ID273	295758.8266	3281892.139
Berry Bayou @ Forest Oaks Boulevard	HCFWS	ID323	282867.2778	3285058.503
Manchester	NOAA	8770777	280846.6949	3290481.59
Buffalo Bayou @ Turning Basin	USGS/HCFWS	08074710/ID2209	278217.2605	3292982.437
Brays Bayou @ Lawndale Street	HCFWS	ID413	277062.1297	3290305.769
Halls Bayou @ Airline Drive	HCFWS	ID1689	268555.2201	3309337.225
Greens Bayou @ US 59	USGS/HCFWS	08076000/ID1643	277390.6362	3311994.568
Greens Bayou @ Mount Houston Parkway	HCFWS	ID1559	283859.7117	3308871.155
Halls Bayou @ Tidwell Road	HCFWS	ID1674	279451.5829	3304233.431
Carpenters Bayou @ I-10	HCFWS	ID1419	292367.3544	3295388.789
Greens Bayou @ Normandy Street	HCFWS	ID1610	286737.0098	3295949.707
Cedar Bayou @ SH 146	HCFWS	ID1719	314722.7981	3294856.314
Goose Creek @ Baker Road	USGS/HCFWS	08067525/ID1539	306651.8879	3295048.076
Halls Bayou @ Jensen Drive	HCFWS	ID1679	274511.8023	3305751.408
Carpenters Bayou @ US 90	HCFWS	ID1459	291272.2179	3302790.149
Little Vince Bayou @ Jackson Avenue	HCFWS	ID943	287136.3213	3288185.133
Big Island Slough @ Fairmont Parkway	HCFWS	ID233	299087.3324	3281944.932
Armand Bayou @ GenoaRed Road	HCFWS	ID223	295336.8561	3280063.741
Carpenters Bayou @ Waillisville Road	HCFWS	ID1443	291395.3891	3299651.95
Hunting Bayou @ I-10	HCFWS	ID823	284630.9719	3295540.868
Hunting Bayou @ Loop 610	HCFWS	ID829	280787.8913	3298034.571
Hunting Bayou @ Lockwood Drive	HCFWS	ID839	276693.456	3299813.897
Little Vince Bayou @ Burke Road	HCFWS	ID239	288723.8638	3285723.538
Vince Bayou @ West Ellaine Avenue	HCFWS	ID919	285564.071	3286980.312
San Jacinto River near Sheldon	HCFWS	ID719	297695.1234	3306926.516

Coordinates X and Y are in UTM 15N

Table S2. Summary of AIC and xv-CIC calculations for copula selection

Precipitation Product	Transitional cluster			Upper cluster			Coastal cluster		
	Copula	AIC	xv-CIC	Copula	AIC	xv-CIC	Copula	AIC	xv-CIC
CMORPH	Frank	-15418.73	7712.99	Frank	-5511.80	2746.93	Frank	-1036.32	565.18
	<b>Gumbel</b>	<b>-16869.39</b>	<b>8381.99</b>	<b>Gumbel</b>	<b>-5587.73</b>	<b>2775.68</b>	Gumbel	-1081.66	528.54
	Clayton	-9638.16	1495.16	Clayton	-4303.88	1496.02	Clayton	-948.32	241.73
	Gaussian	-14612.51	7283.04	Gaussian	-5516.04	2743.30	Gaussian	-1180.03	583.68
	t-Student	-14985.4	7542.58	t-Student	-5434.09	2710.77	<b>t-Student</b>	<b>-1203.27</b>	<b>590.23</b>
Daymet	Frank	-12108.17	6058.08	Frank	-4940.24	2466.08	Frank	-1060.82	576.87
	<b>Gumbel</b>	<b>-14005.23</b>	<b>6957.23</b>	<b>Gumbel</b>	<b>-5156.39</b>	<b>2560.01</b>	Gumbel	-1111.98	538.34
	Clayton	-7369.22	989.24	Clayton	-3996.15	1508.76	Clayton	-954.03	228.80
	Gaussian	-11866.77	5944.99	Gaussian	-5084.03	2530.97	Gaussian	-1198.18	590.08
	t-Student	-12145.55	6085.74	t-Student	-4988.44	2525.78	<b>t-Student</b>	<b>-1228.36</b>	<b>607.39</b>
ERAS	Frank	-15022.56	7508.60	Frank	-5556.28	2772.03	Frank	-980.94	537.85
	<b>Gumbel</b>	<b>-17052.40</b>	<b>8501.59</b>	Gumbel	-5581.22	2763.49	Gumbel	-1035.40	507.12
	Clayton	-9029.39	740.86	Clayton	-4401.31	1455.72	Clayton	-934.19	263.16
	Gaussian	-14345.68	7178.26	<b>Gaussian</b>	<b>-5663.71</b>	<b>2819.80</b>	Gaussian	-1139.48	563.78
	t-Student	-12655.66	7252.86	t-Student	-5601.47	2805.90	<b>t-Student</b>	<b>-1161.13</b>	<b>572.32</b>
IMERG	Frank	-15738.77	7868.04	Frank	-5684.84	2840.02	Frank	-931.26	563.90
	<b>Gumbel</b>	<b>-17369.66</b>	<b>8648.35</b>	<b>Gumbel</b>	<b>-5745.37</b>	<b>2846.66</b>	Gumbel	-1076.38	523.49
	Clayton	-9353.34	781.37	Clayton	-4416.07	1520.69	Clayton	-945.89	246.91
	Gaussian	-14624.56	7320.27	Gaussian	-5669.30	2809.51	Gaussian	-1174.06	582.84
	t-Student	-14945.5	7481.88	t-Student	-5655.99	2787.60	<b>t-Student</b>	<b>-1197.82</b>	<b>592.60</b>
NCEP Stage IV	Frank	-16158.52	8079.58	Frank	-5047.36	3124.47	Frank	-1160.38	577.64
	<b>Gumbel</b>	<b>-17654.66</b>	<b>8804.14</b>	<b>Gumbel</b>	<b>-6417.06</b>	<b>3190.01</b>	Gumbel	-1128.06	548.34
	Clayton	-9128.51	79.94	Clayton	-4497.60	1270.74	Clayton	-949.64	234.27
	Gaussian	-14560.65	7280.32	Gaussian	-6075.65	3011.95	Gaussian	-1211.56	598.97
	t-Student	-14900.45	7824.7	t-Student	-6151.63	3152.65	<b>t-Student</b>	<b>-1236.59</b>	<b>611.10</b>
MRMS	Frank	-16462.43	8233.20	Frank	-5778.04	3223.08	Frank	-1137.57	565.22
	<b>Gumbel</b>	<b>-17968.00</b>	<b>8971.62</b>	<b>Gumbel</b>	<b>-6579.40</b>	<b>3277.06</b>	Gumbel	-1099.25	535.10
	Clayton	-9131.78	-293.65	Clayton	-4550.20	1173.84	Clayton	-944.94	251.00
	Gaussian	-14592.32	7305.32	Gaussian	-6181.27	3069.95	Gaussian	-1189.42	583.26
	t-Student	-14787.2	7824.78	t-Student	-6248.07	3104.09	<b>t-Student</b>	<b>-1213.37</b>	<b>598.72</b>
NLDAS	Frank	-16418.08	8069.31	Frank	-5879.33	3286.16	Frank	-1040.16	568.55
	<b>Gumbel</b>	<b>-17627.51</b>	<b>8786.11</b>	<b>Gumbel</b>	<b>-6584.05</b>	<b>3291.19</b>	Gumbel	-1098.19	539.15
	Clayton	-8897.18	-302.44	Clayton	-4617.87	1126.77	Clayton	-948.94	226.81
	Gaussian	-14369.88	7191.48	Gaussian	-6247.16	3100.89	Gaussian	-1190.16	588.37
	t-Student	-15427.14	7914.14	t-Student	-6375.15	3087.85	<b>t-Student</b>	<b>-1214.57</b>	<b>602.62</b>