

Overview of Experience and Knowledge Gained Through Quality Control of Extreme Precipitation Data Used in NOAA Atlas 14

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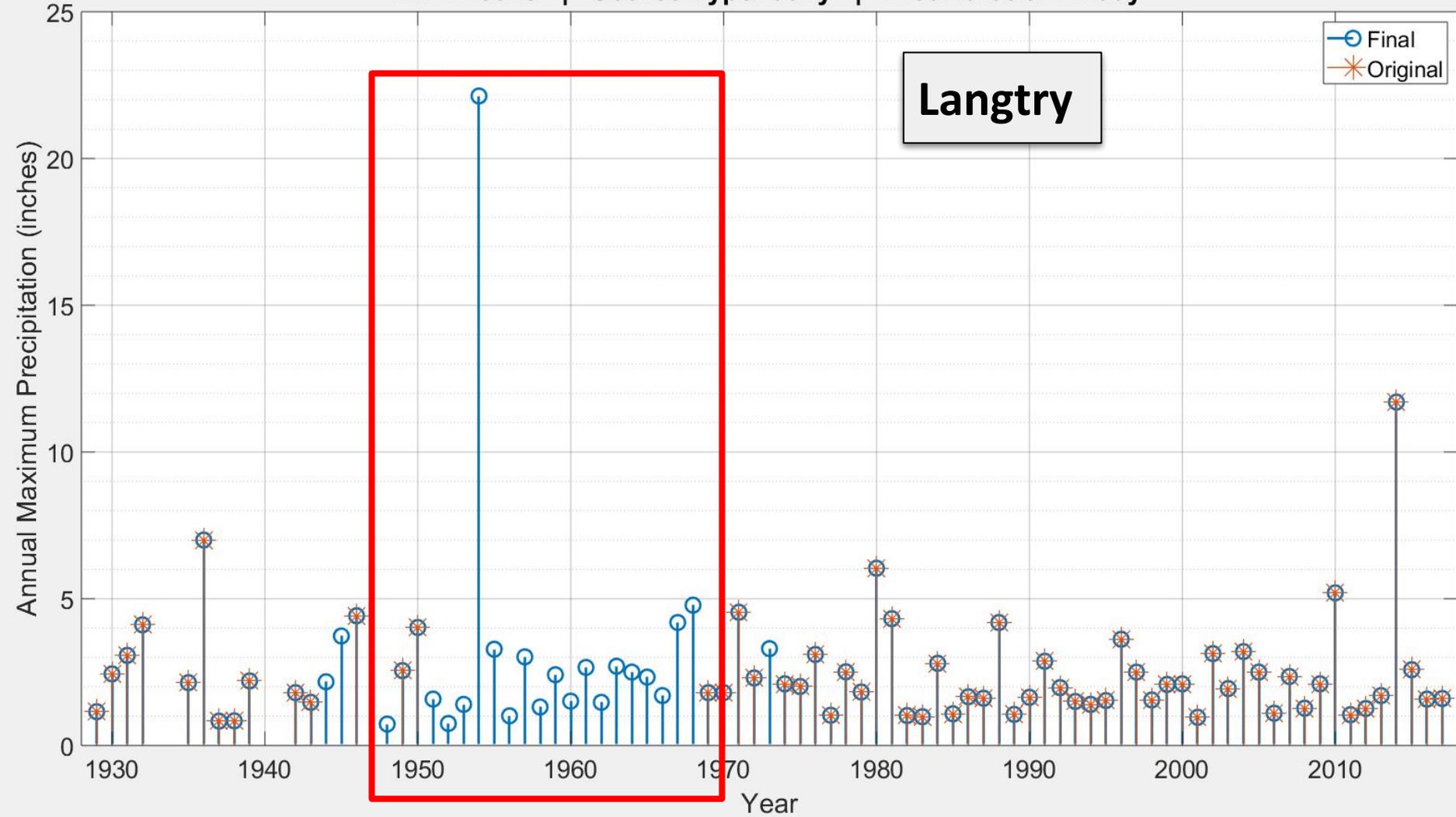


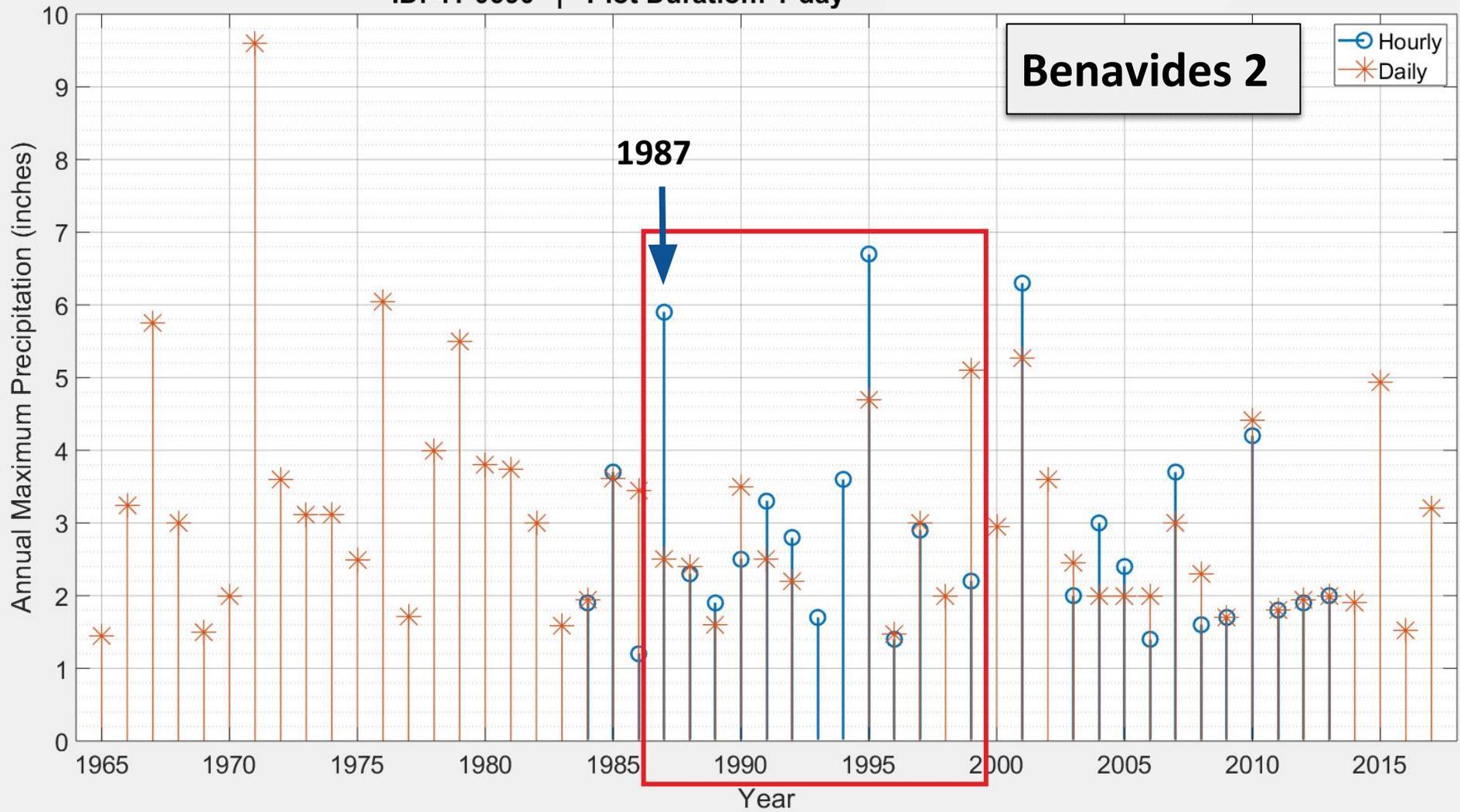
Outline

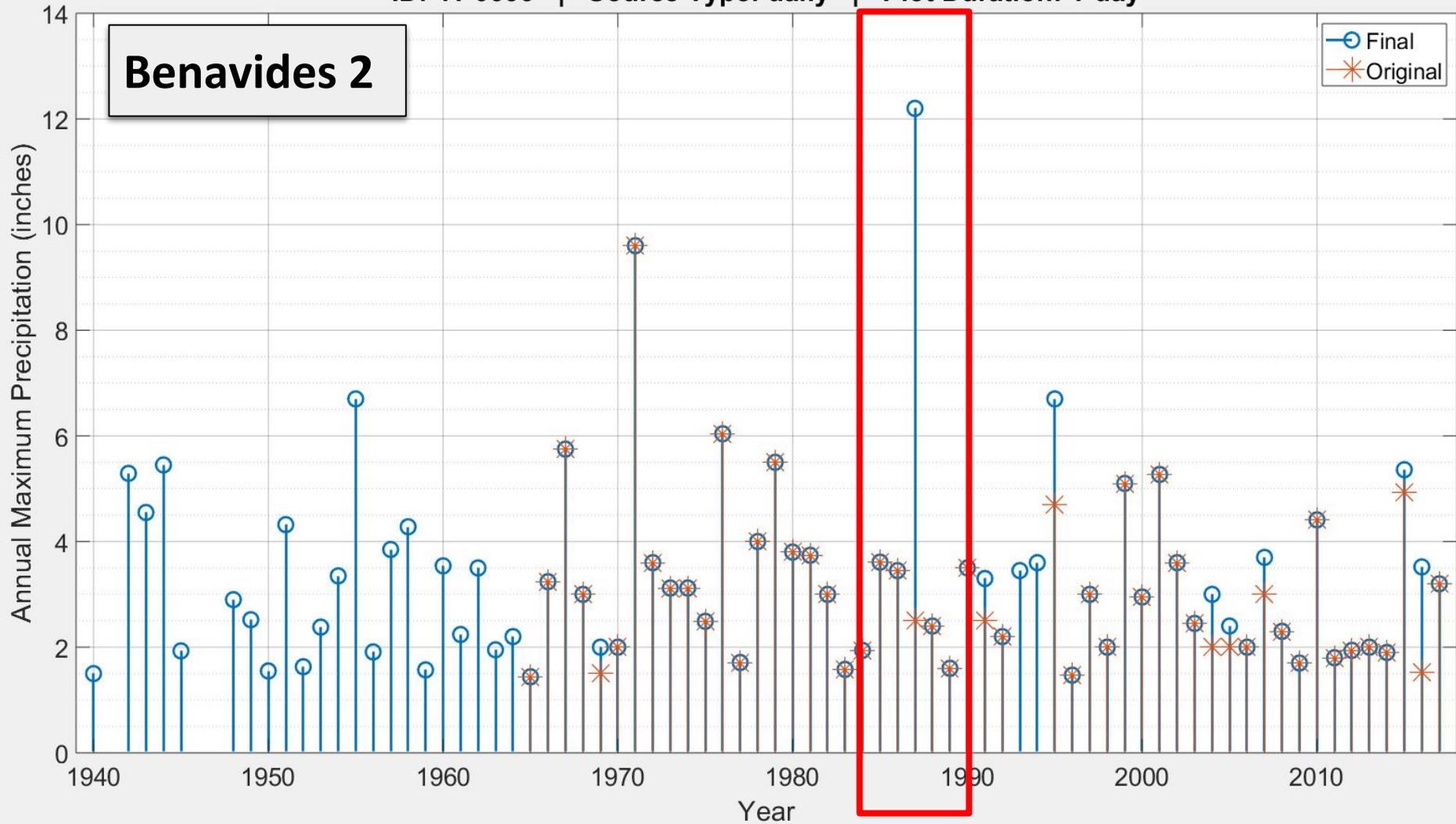
- Co-located stations
- Missing extreme rainfall events
- Pre-1948 hourly data
- Q flags in hourly precipitation (dsi-3240)
- WeatherCoder 3
- Metadata QA/QC
- Gridded (Daymet & PRISM)

Co-located Stations

- Data from both standard and automated gauges exist at same location (GHCN-daily, DSI-3240, etc).
- These gauges often have identical metadata
- Used to QA/QC annual maxima (AM)
- Ensure period of record (POR) and data consistency



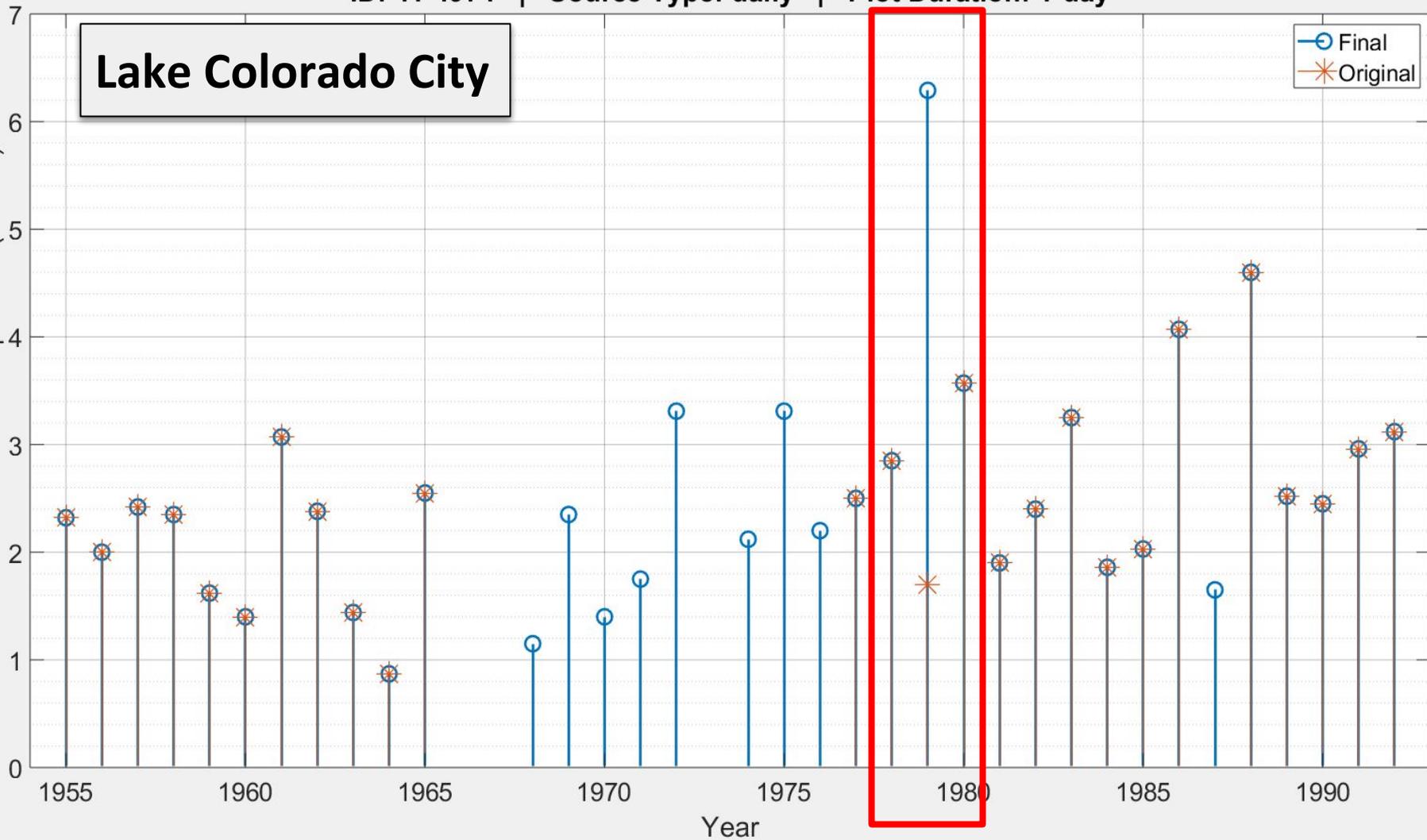


Benavides 2

Lake Colorado City

Final
Original

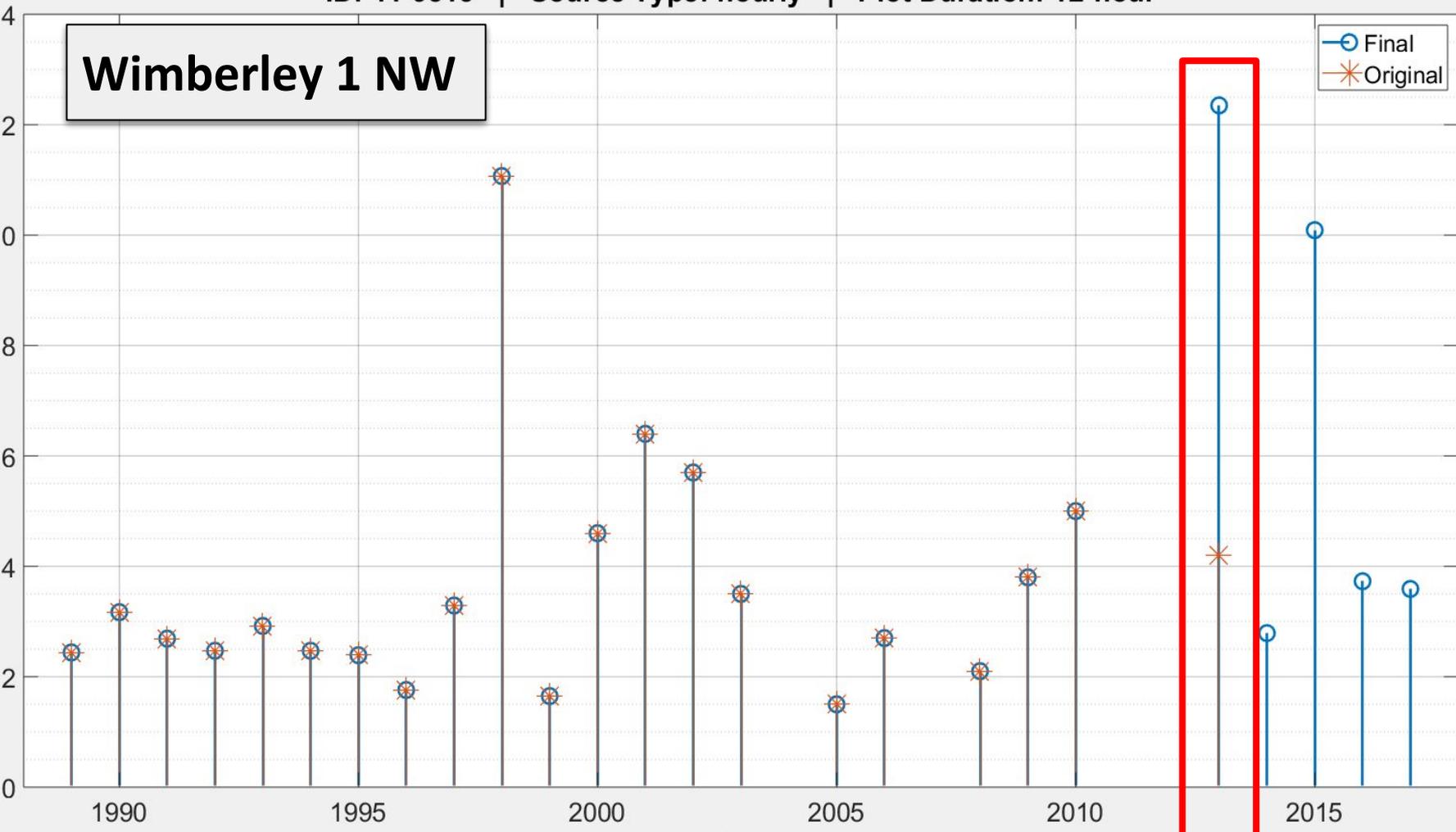
Annual Maximum Precipitation (inches)



Wimberley 1 NW

Final
Original

Annual Maximum Precipitation (inches)

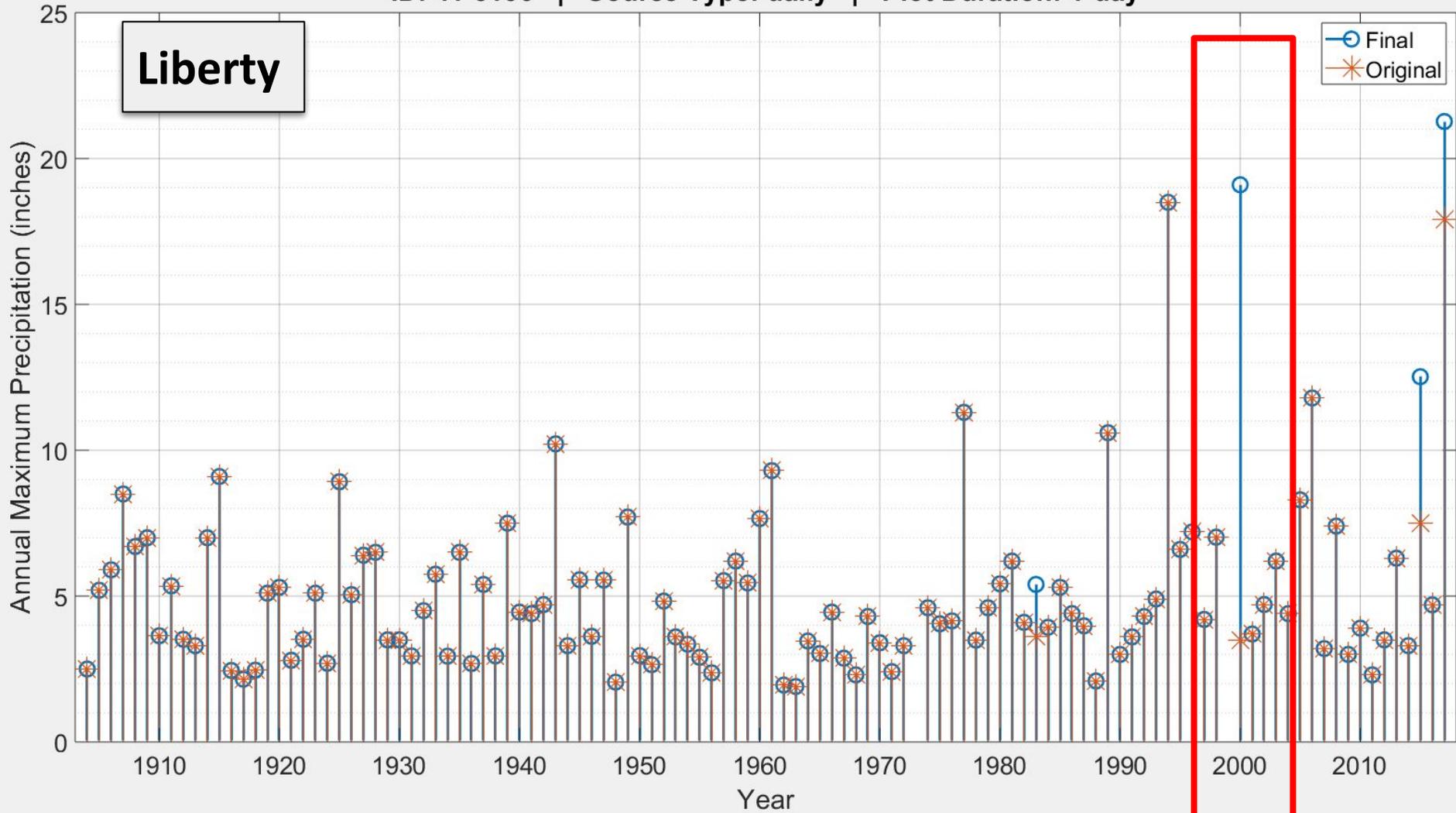


Year

Missing Extremes

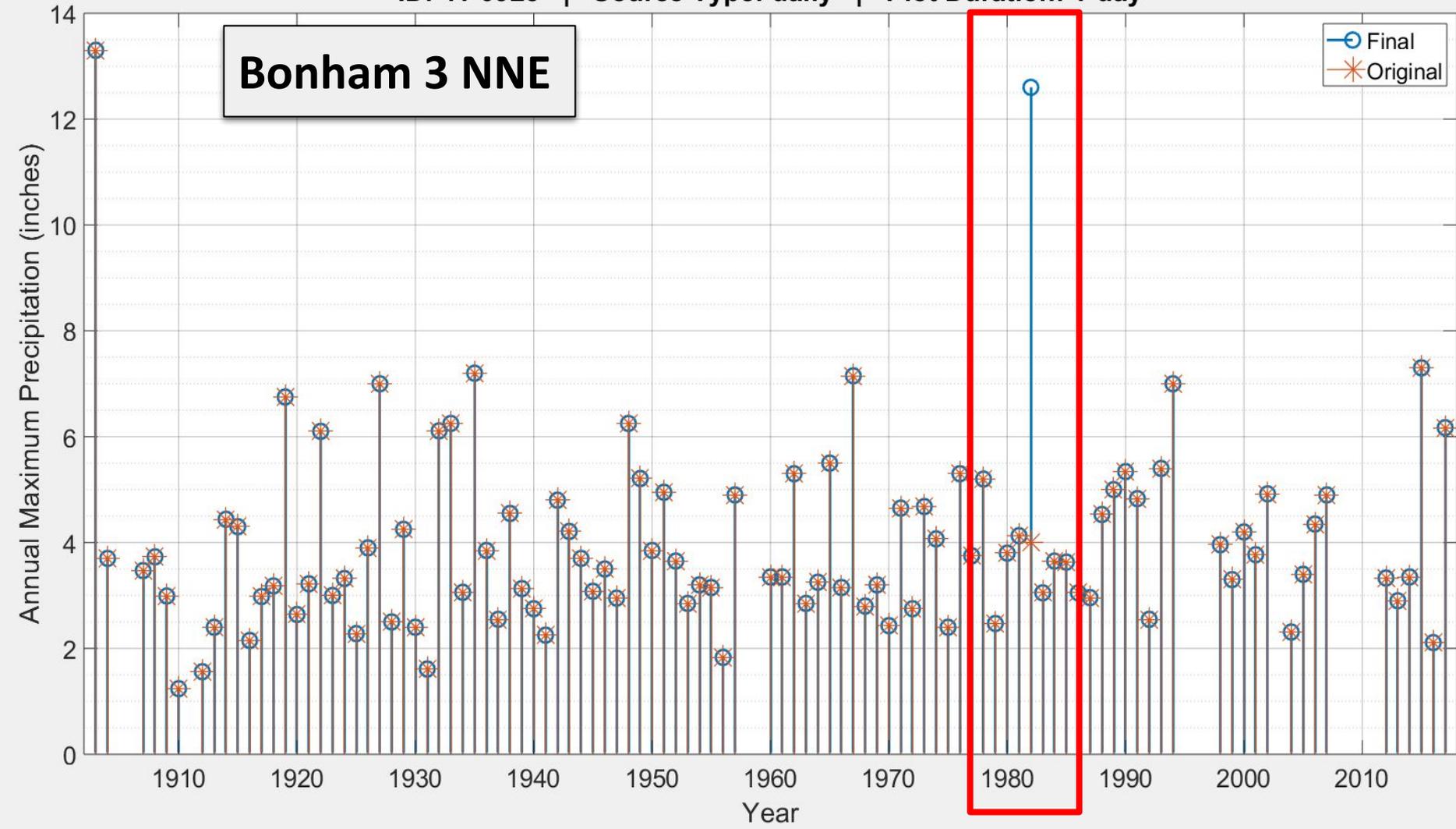
- Three of the Top 5 largest daily rainfall events missing in pre-1941 data archive for Texas
 - 24+ inches, Hearne, June 28, 1899
 - 23.11 inches, Taylor, Sept. 9-10, 1921
 - 18 inches, Brackettville (Ft. Clark), June 15, 1899
- Potential causes for missing extremes:
 - Human error
 - Data exists, but not currently in digital archive
 - Gauge malfunction / overflow

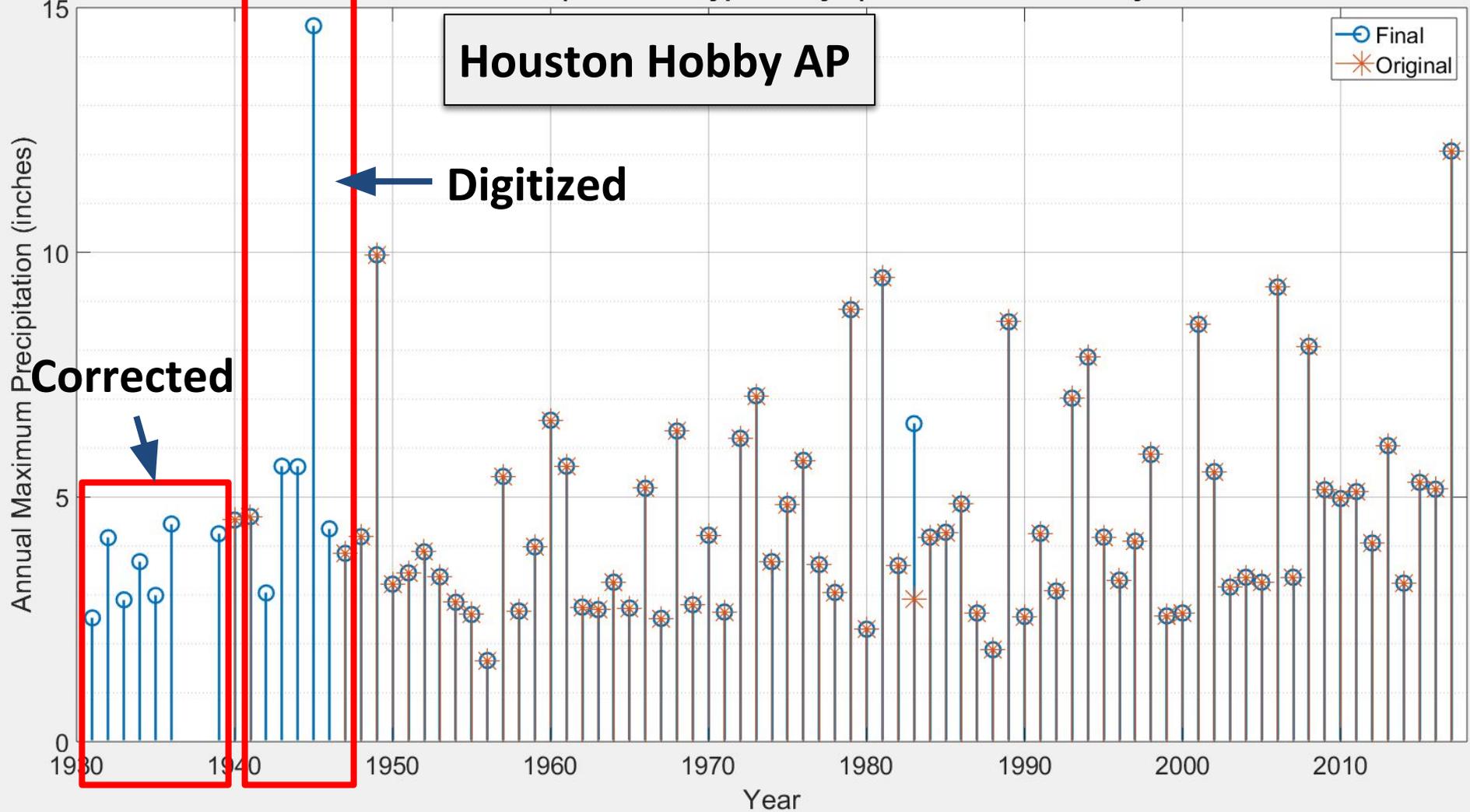
Liberty



1	84	71	71	
2	69	62	62	3.50
3	82	64	64	1.08
4	82	70	70	
5	84	66	66	1.58
6	84	71	71	
7	85	72	72	
8	87	72	72	
9	86	72	72	
10	89	72	72	
11	85	77	77	
12	88	77	77	
13	88	62	62	
14	88	69	69	
15	86	62	62	
16	87	69	69	

17	86	74	74	
18	86	74	74	
19	89	75	75	
20	81	67	67	19.1
21	86	67	67	
22	89	70	70	
23	89	71	71	
24	90	77	77	
25	90	76	76	
26	89	78	78	
27	92	78	78	
28	92	72	72	
29	93	75	75	
30	94	75	75	
31	92	74	74	
SUM	84	71	SUM	25.26

Bonham 3 NNE



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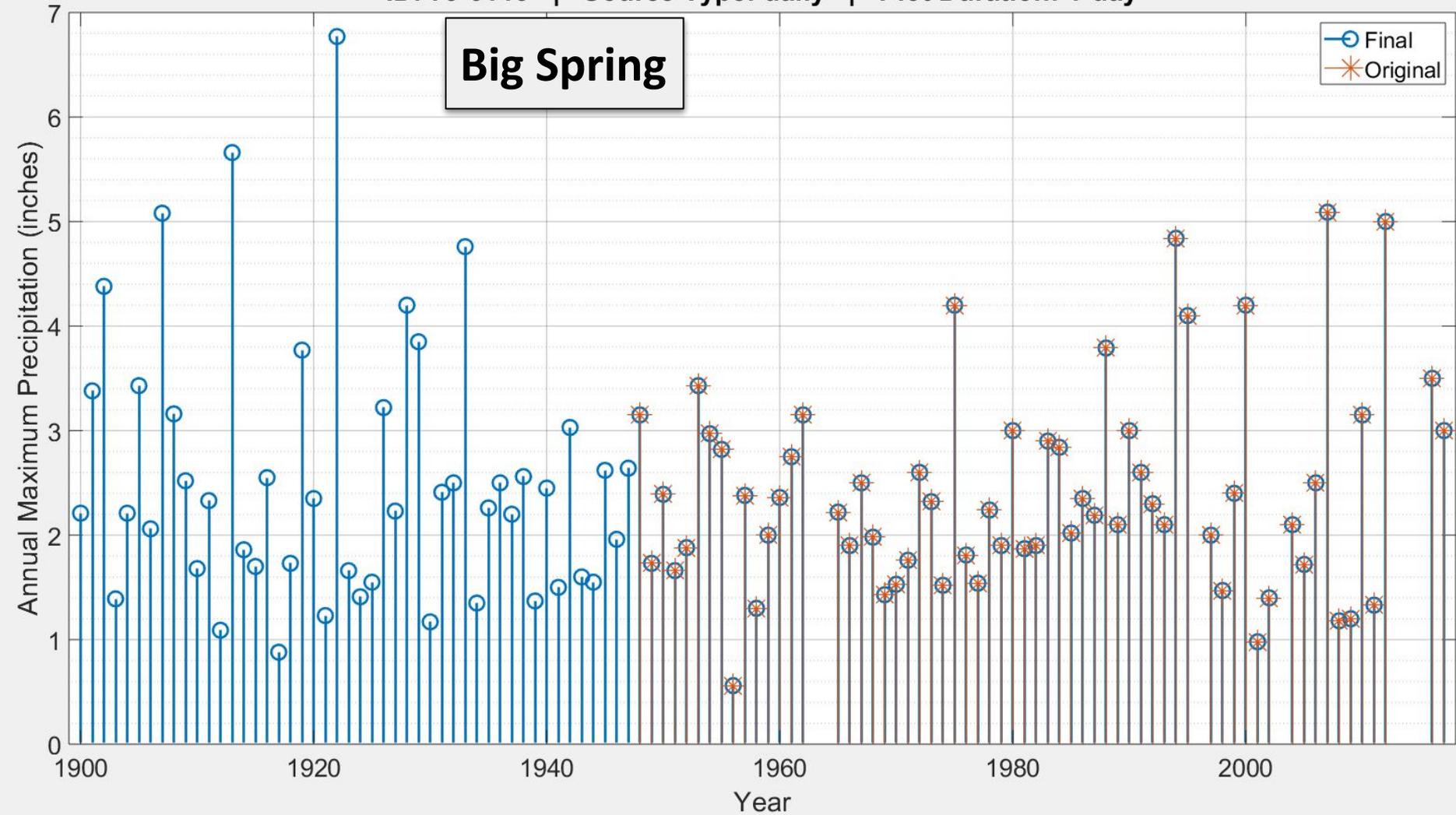
0.91
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0.36
4.17
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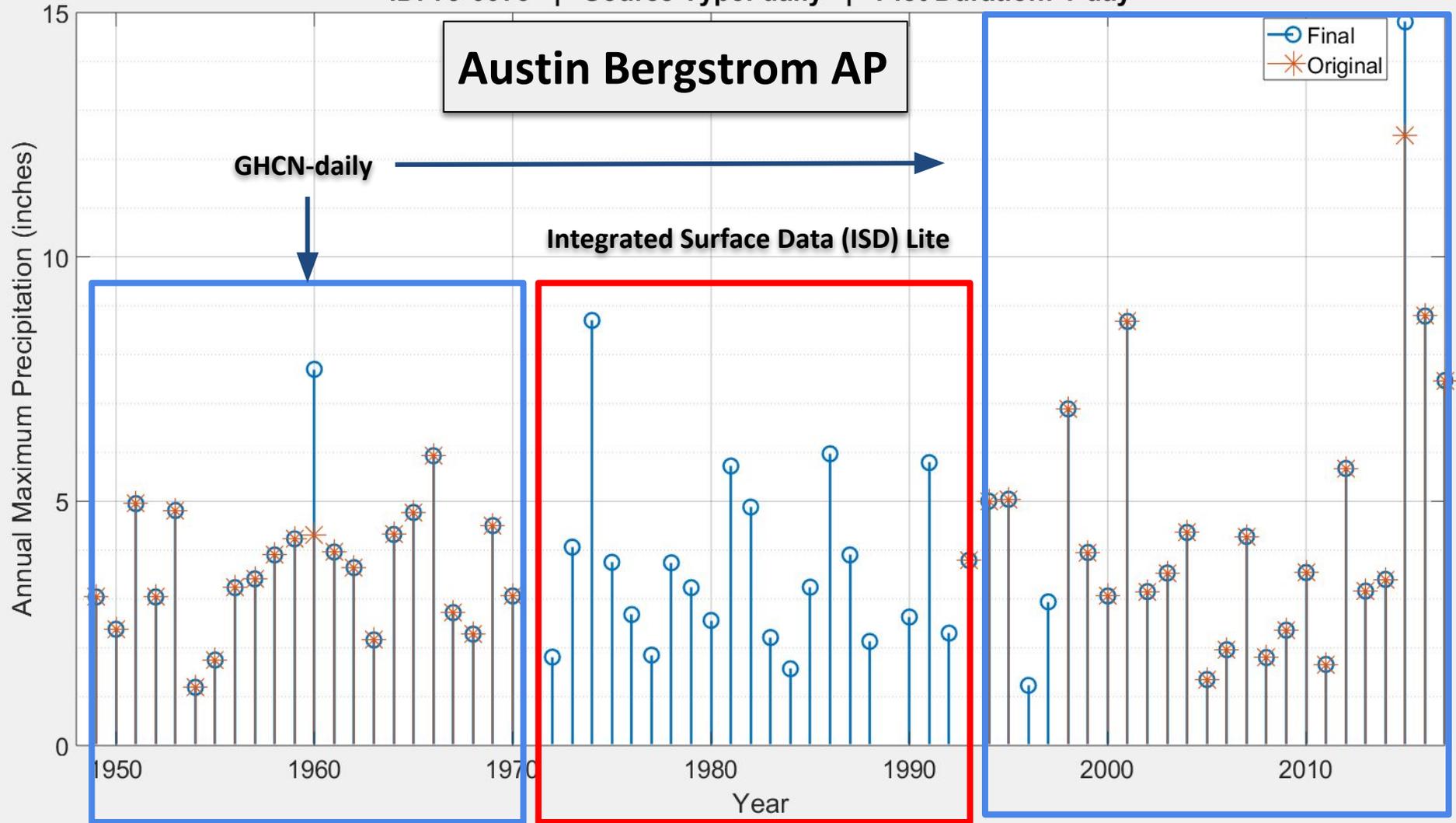
17
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Sum

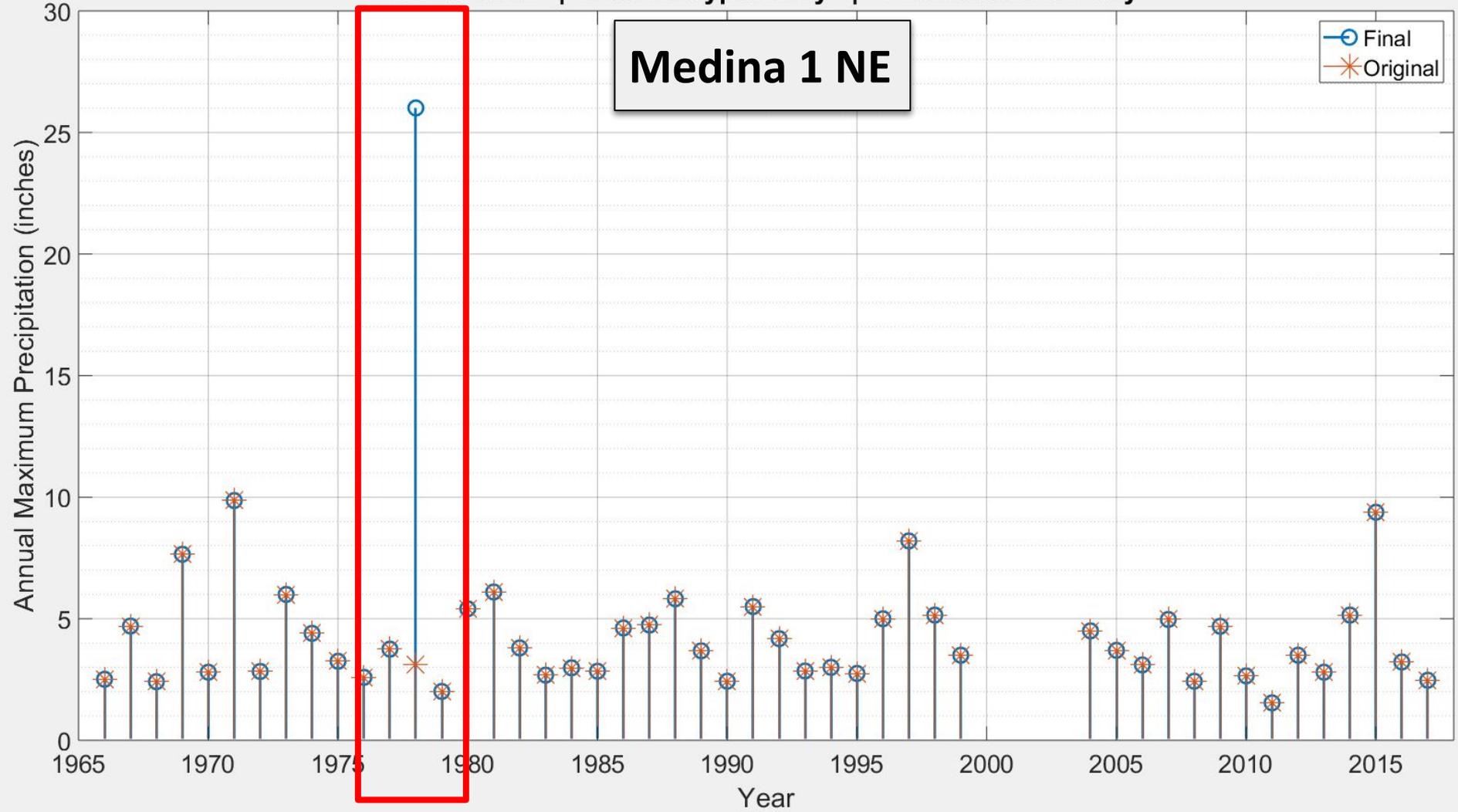
0.05
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0.10
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0.06
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Summary

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0.01
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0.01
0.36
4.17
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0.13
M
T
0.10
0.04
T
0.06
5.84

Big SpringFinal
Original





6.0
M
~~2.4~~

(Twenty four plus inches)

IF MORE SPACE IS NEEDED, USE ADDITIONAL FORM

REMARKS

The rain gage was
running over when read
at 8:00 am Thursday 8-4-78.
However local people
had only 5 to 6 tenths of
an inch of rain the second
night in town. About 5" up
to river.

Pre-1948 Hourly Data

- Hydrologic Bulletin
- Work Projects Administration (WPA) forms
- Surface Weather Observation forms
- Local Climatological Data (paper forms)

Hydrologic Bulletin

- Hourly precipitation records typically begin in 1948, except in FL/TX
- Additional data exists from ~1940-1948 in scanned paper form
- Texas HPD is missing most of 1947 (1/1-9/30)
- For NA14 Volume 10 (Northeastern States), HDSC selectively digitized hourly stations
 - Prioritized first order stations
 - Other stations as time allowed

September 1946 - San Antonio, TX

Lower Mississippi-West Gulf District

HOURLY PRECIPITATION

Station	A. M. Hour Ending												P. M. Hour Ending												Total	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12		
25th																										
San Antonio (AP)									.01	.01	.01	.04				.03	2.88	.24	.03		.01		.01	3.27		
San Antonio Nursery SCS-#1R	†	-	-	-	-	-	-	-	-	-	-	-												†1.55	1.55	
26th																										
San Antonio (AP)						.06					.01	.01									.05	.92	.96	.53	1.26	3.80
San Antonio Nursery SCS-#1R								†																		
27th																										
San Antonio (AP)	1.12	.67	.83	.32	.01	.06	.08	.03	.01																3.13	
San Antonio Nursery SCS-#1R	-	-	-	-	-	-	-	-	-	†13.03															†13.03	

19460925 01:00 999.99 a

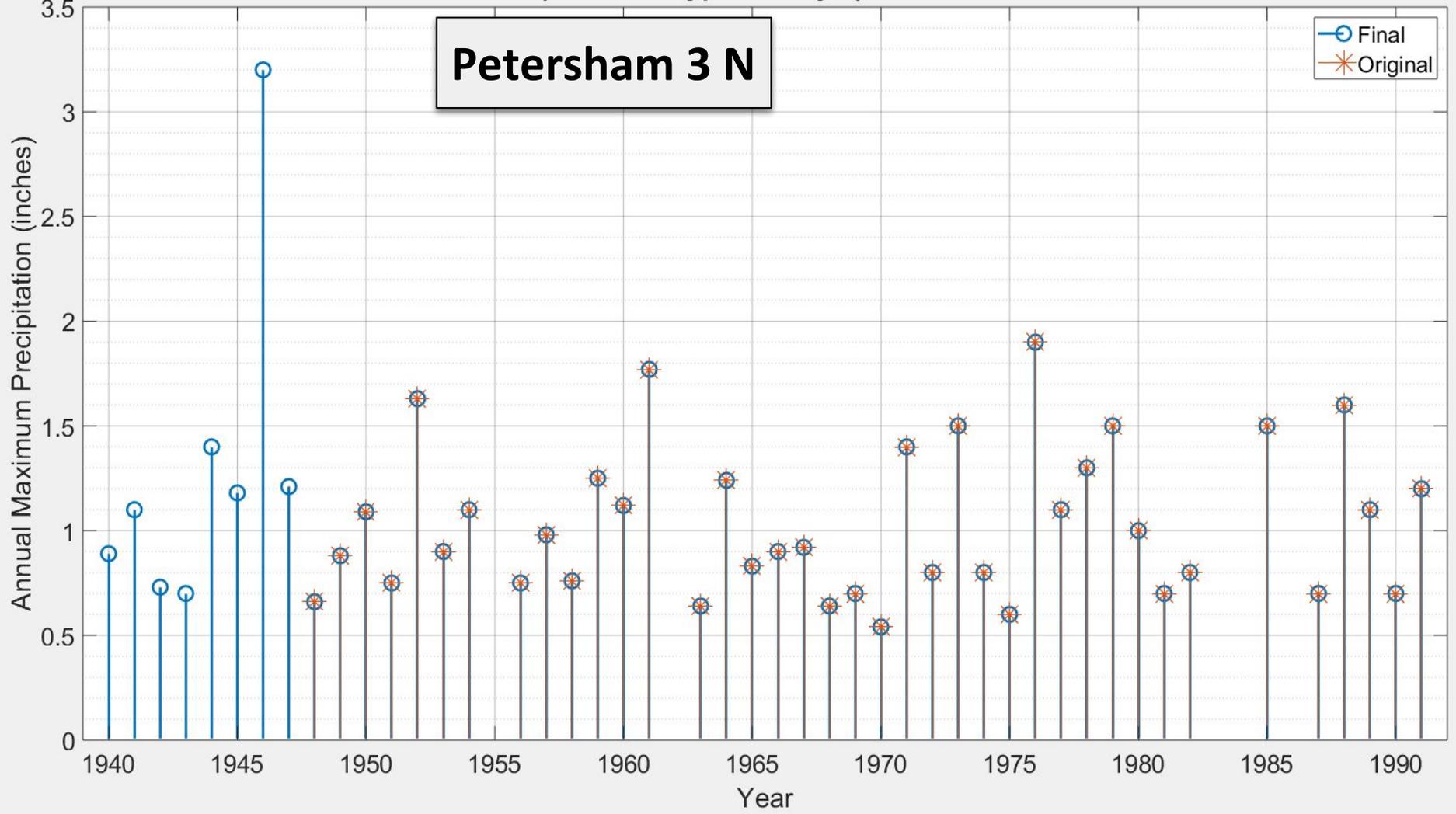
19460926 00:00 1.55 A

19460929 01:00 999.99 a

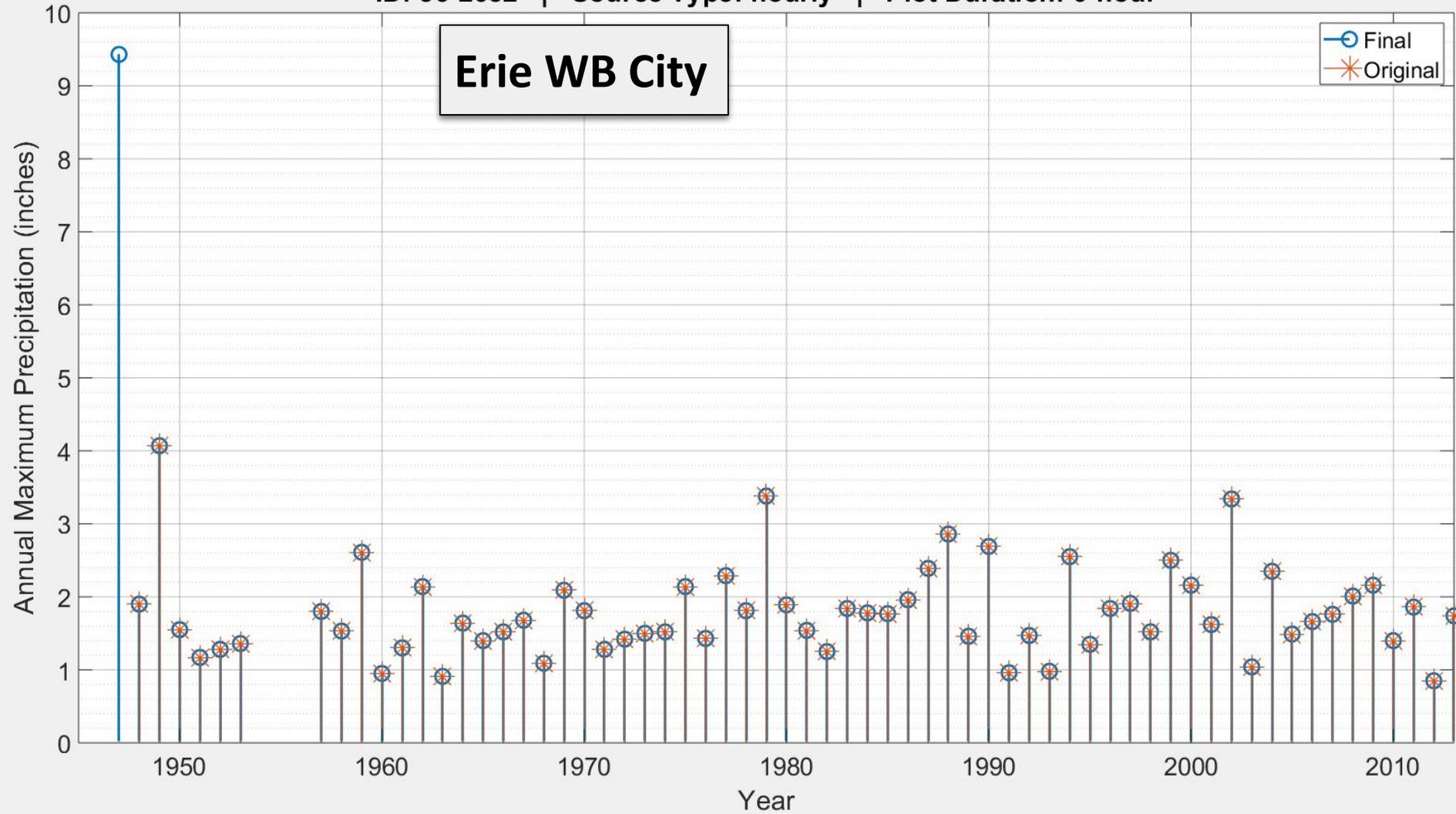
19460930 00:00 0.04 A

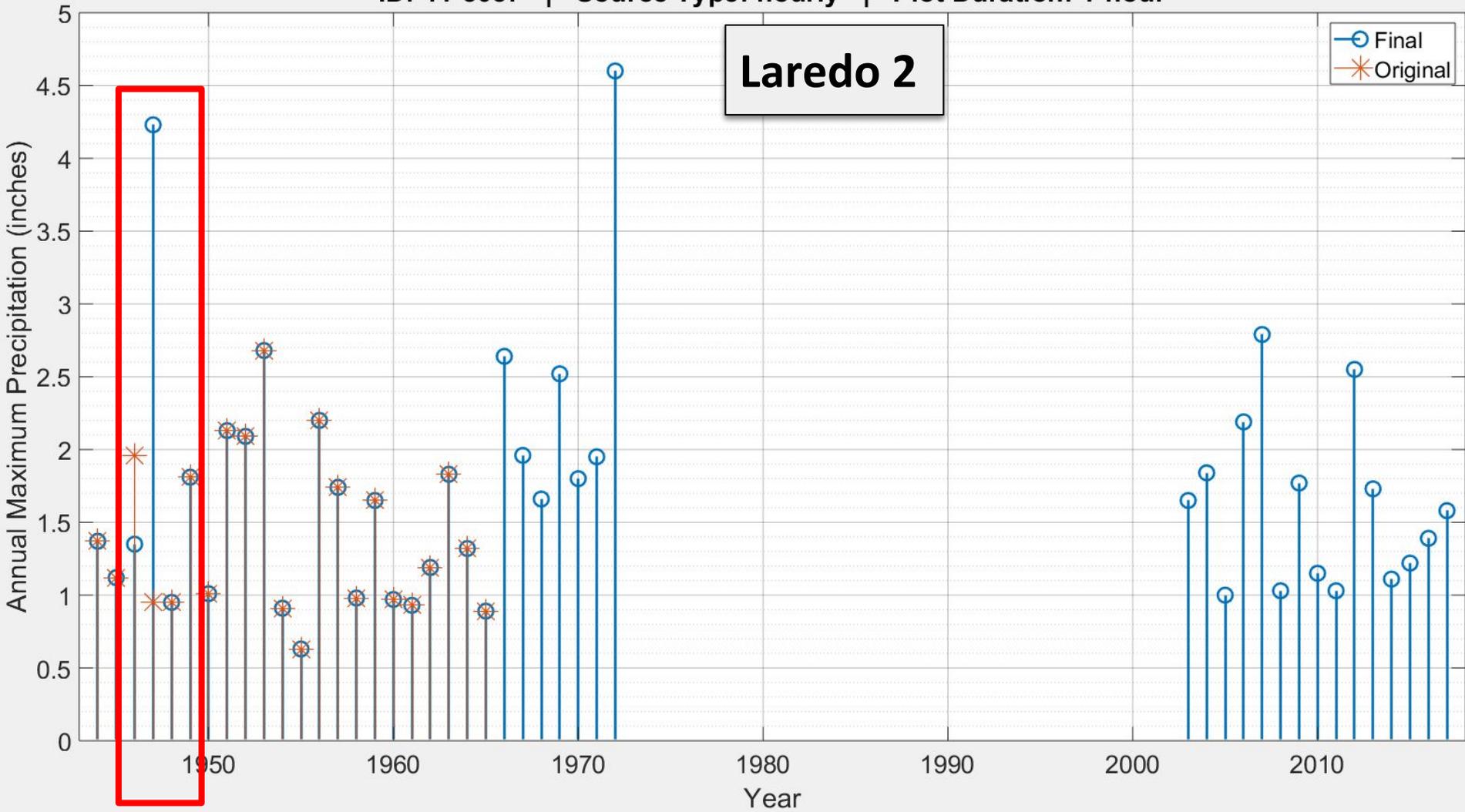
← DSI-3240 Climate Data Online (CDO)

Petersham 3 N

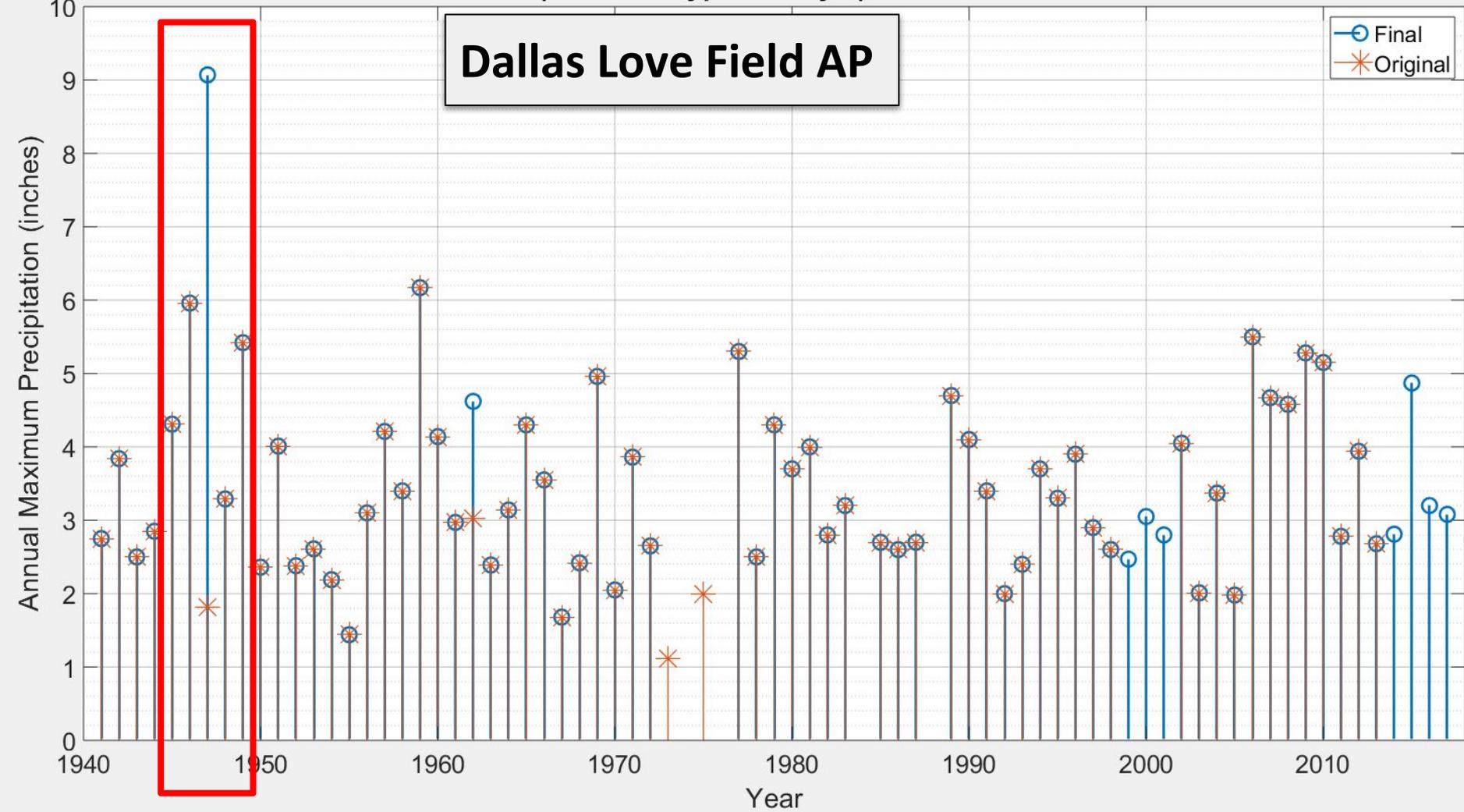


Erie WB City





Dallas Love Field AP



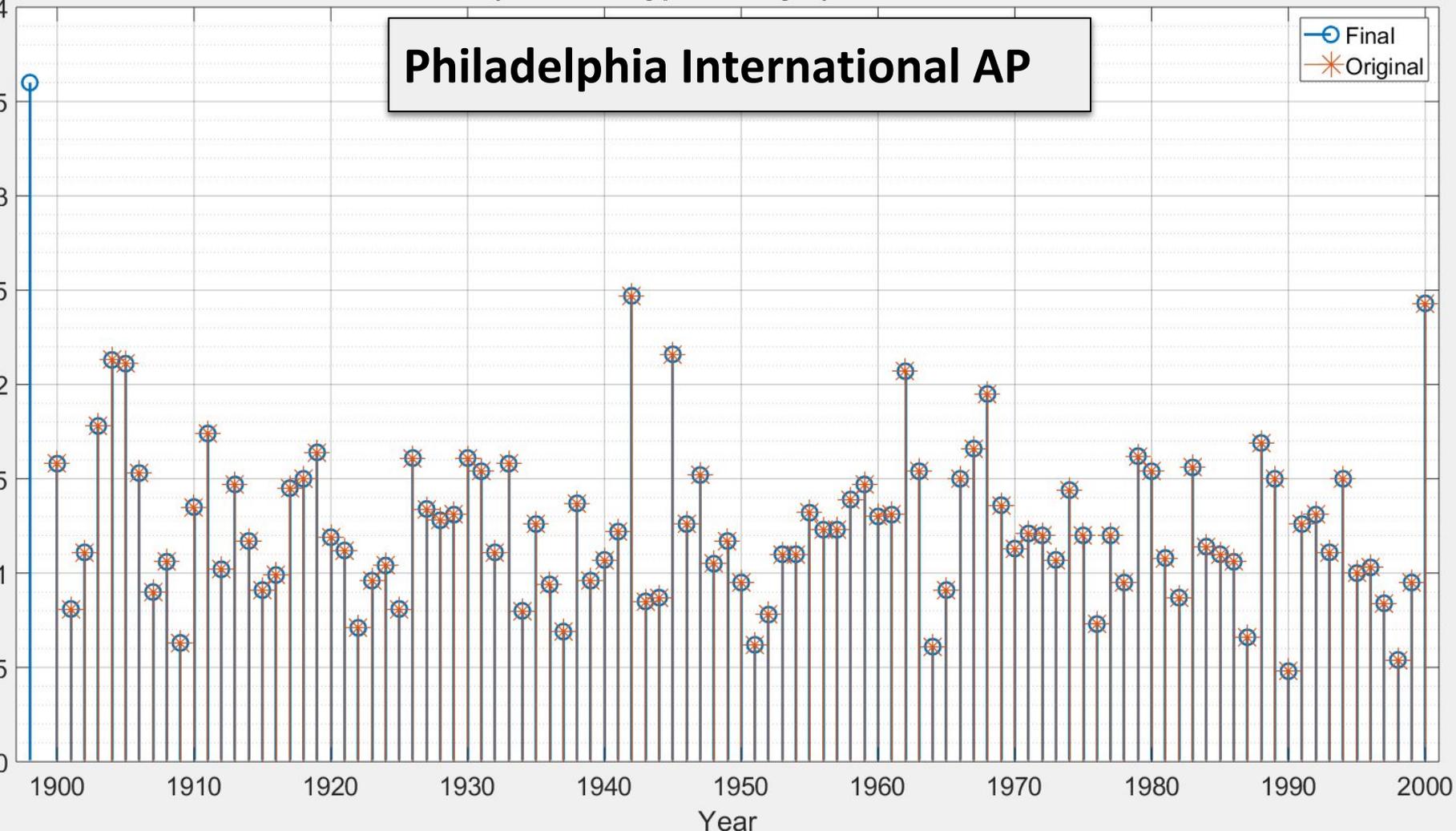
WPA Forms

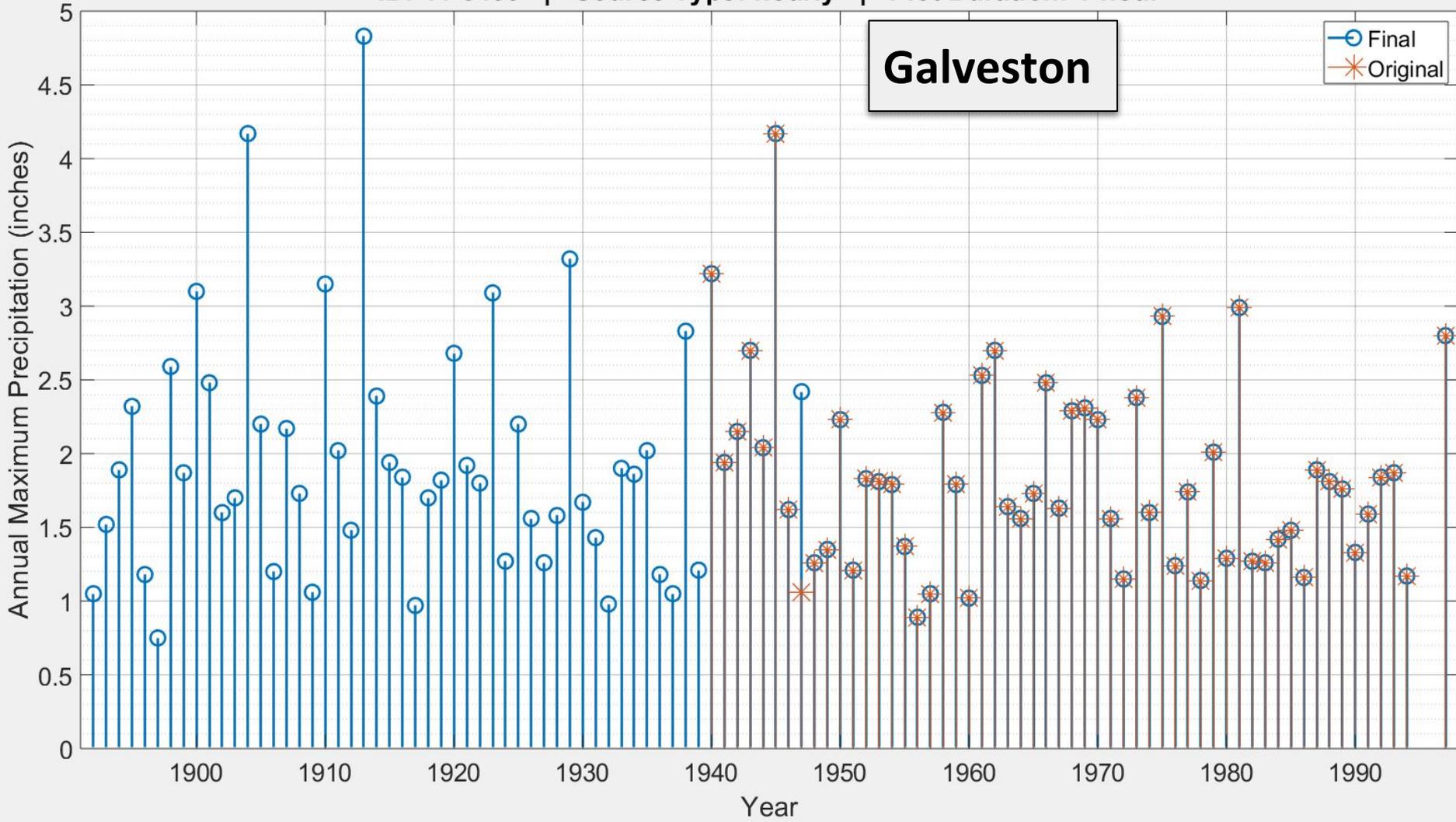
- Available at many first-order stations
- Approximately 1890-1941
- DSI-3240 does contain two stations back to ~1900
 - Philadelphia, PA
 - Asheville, NC
- Starting in NA14 Volume 10, HDSC digitized many of these forms
 - All first order stations digitized in Volume 11 (Texas), with the help of interns at USACE

Philadelphia International AP

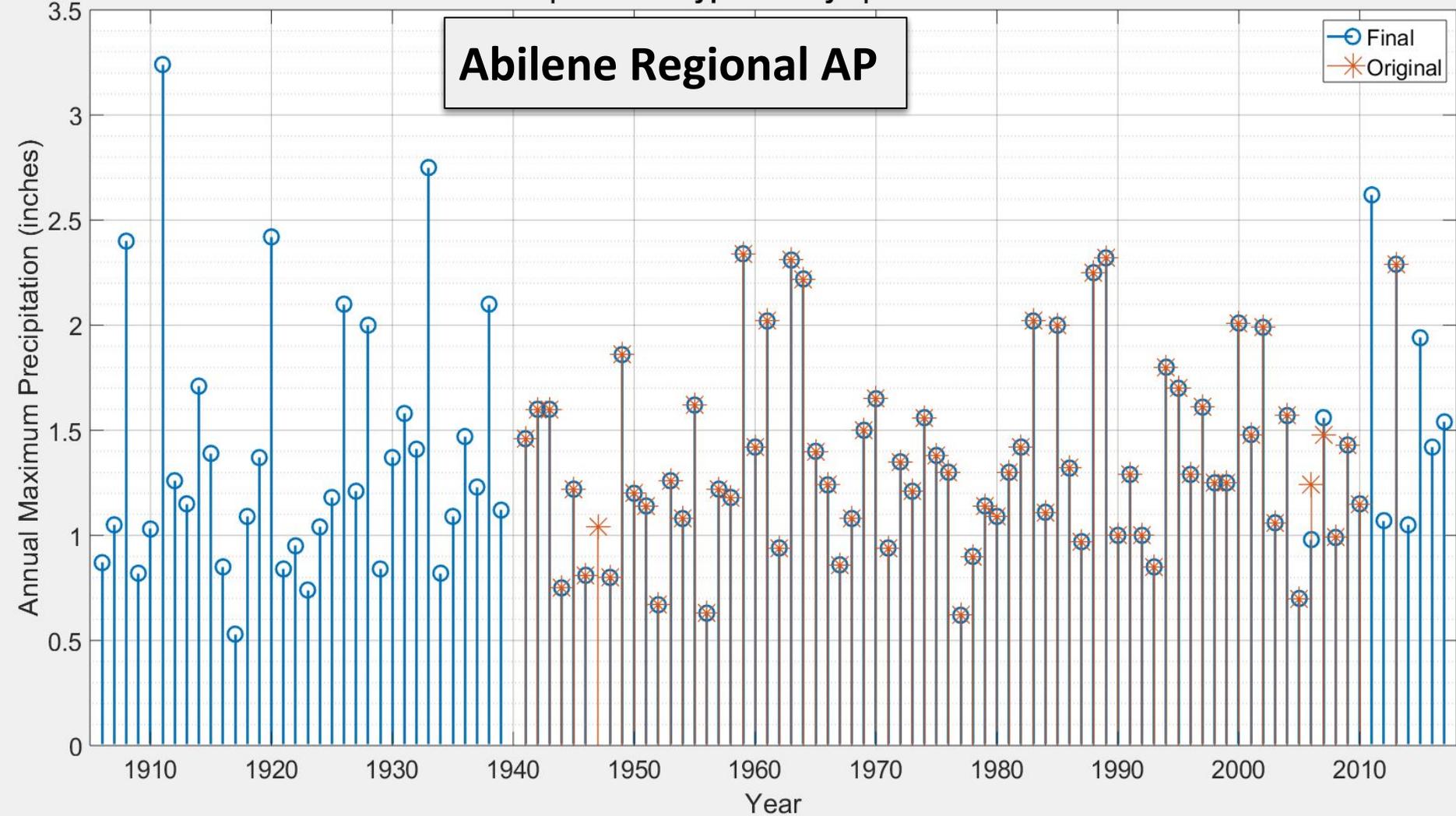
Final
Original

Annual Maximum Precipitation (inches)





Abilene Regional AP

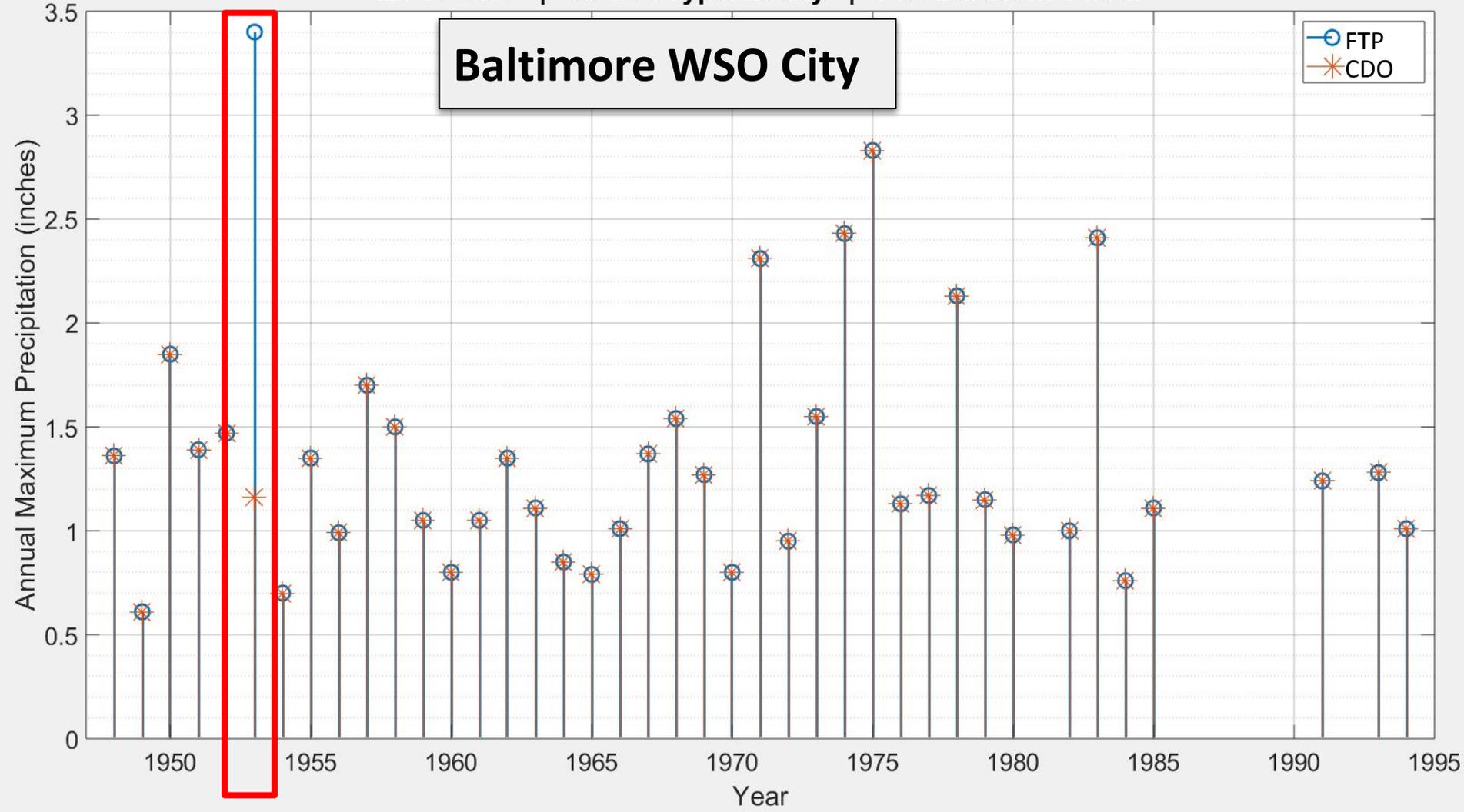


Q Flags - DSI-3240 Hourly Precipitation

- From dsi-3240 documentation:

Q: Pre 1996 usage - Indicates value failed an extreme value test (value will be present). Data are to be used with caution. Extreme tests used are 1) value was not an accumulated amount and was higher than the one-hour statewide 100 year return period precipitation amount or 2) if they value was an accumulated amount and was higher than the 24 hour statewide extreme precipitation total.
- Differences in Climate Data Online (CDO) and FTP:
 - https://www.ncdc.noaa.gov/cdo-web/search?datasetid=PRECIP_HLY#
 - ftp://ftp.ncdc.noaa.gov/pub/data/hourly_precip-3240/
- NA14 used CDO before Volume 10 (FTP 10 & 11)

Baltimore WSO City



Q Flags - COOP 180470

CDO (contains no value, no flag):

STATION, DATE, HPCP, Measurement Flag, Quality Flag
COOP:180470, 19530628 18:00, 1.00, ,

FTP raw (contains high value, but flagged for user to verify):

HPD18047000HPCPHI19530600280031800 00100 1900 00340 Q2500 00100P

If formatted similar to CDO:

STATION, DATE, HPCP, Measurement Flag, Quality Flag
COOP:180470, 19530628 18:00, 1.00, ,
COOP:180470, 19530628 19:00, 3.40, , Q

WeatherCoder 3

- Transition from mailed paper forms to electronic
- New problems with observations
 - Empty / missing data instead of 0s
 - Typos (seem more prevalent early 2000s)
 - Multi-day precipitation not recorded properly

REMARKS
(SPECIAL OBSERVATIONS, ETC.)

Out of town

Out of town

Out of town

Rain guage had 7.20". Out of town from 5/19 to 6/4.

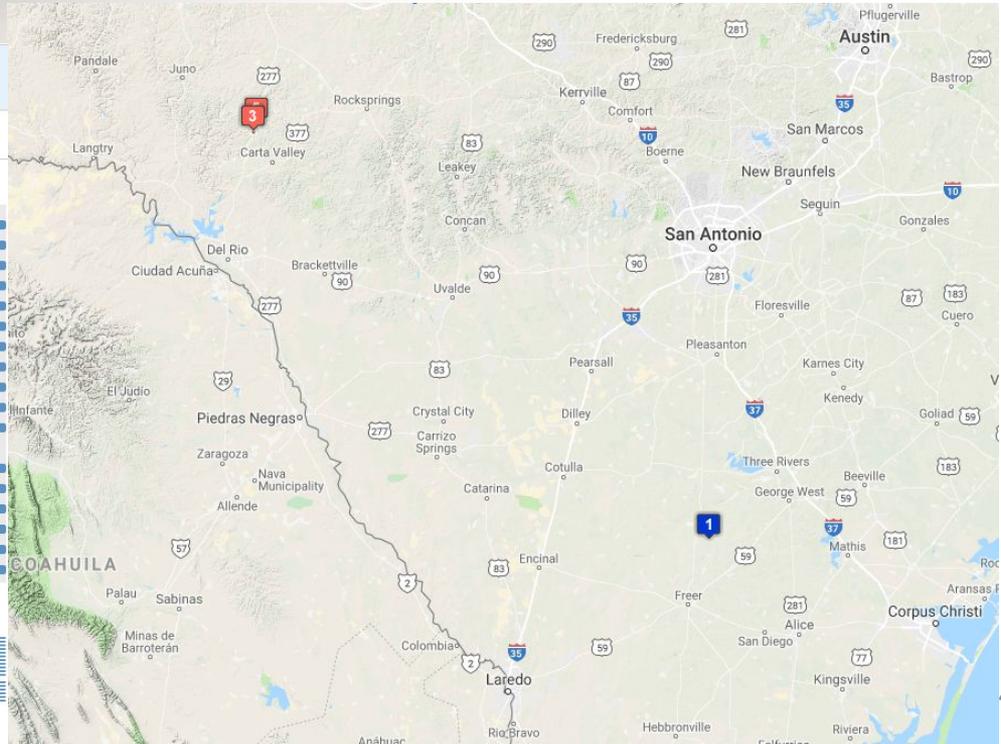
Metadata check

- Loma Alta - COOP 415303
- <https://www.ncdc.noaa.gov/homr/#ncdcstnid=20024555&tab=MSHR>
- Two different gauges

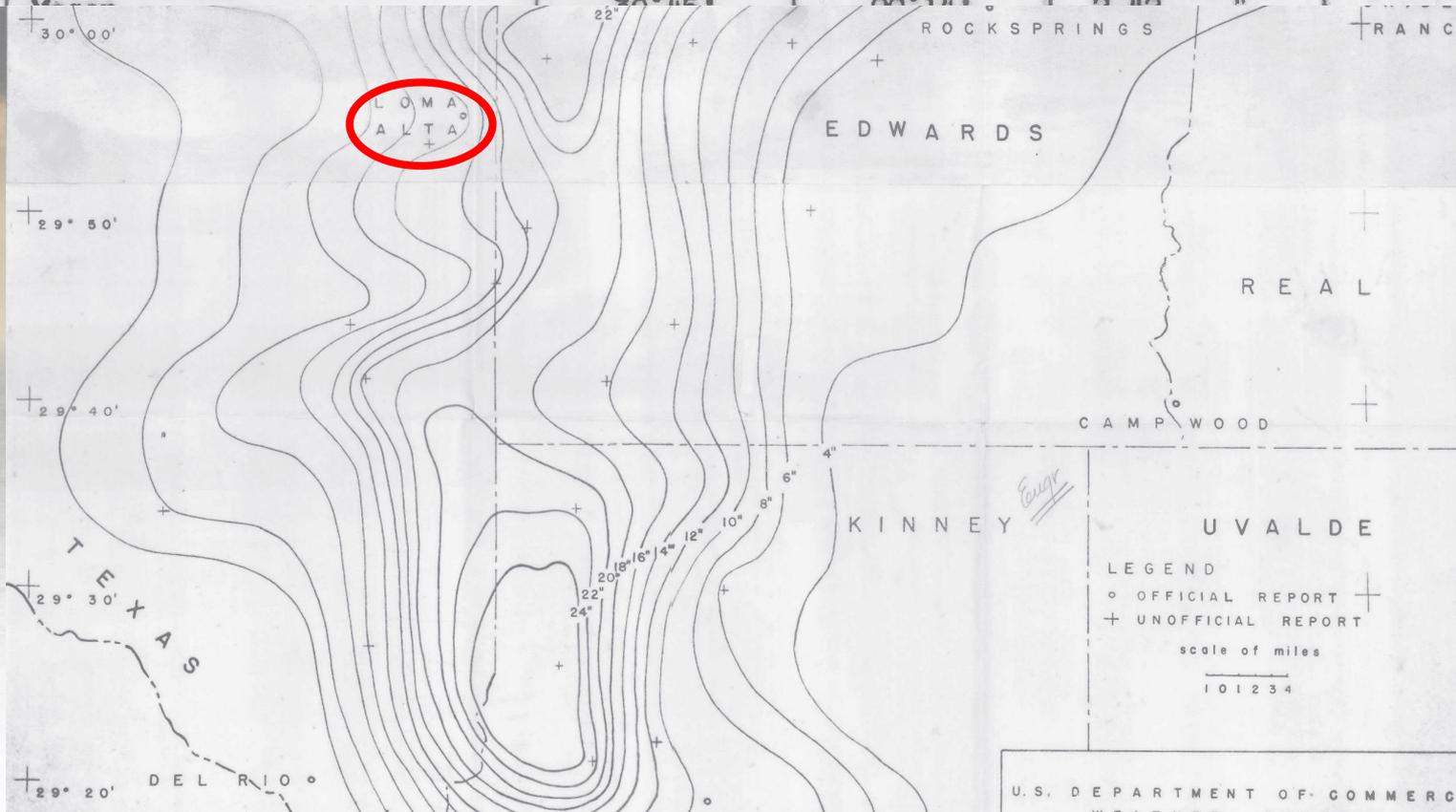
LOMA ALTA, TX 1941-12-21 to Present								
Station-Level (MSHR) Data		Element-Level (PHR) Data		Location Data		Misc Data		
	1/1/1950	1/1/1960	1/1/1970	1/1/1980	1/1/1990	1/1/2000	Present	
Coop Name	LOMA ALTA						LOMA ALTA	
Principal Name	LOMA ALTA						LOMA ALTA	
State/Province	TX						TX	
County	VAL VERDE						MCMULLEN	
Country	UNITED STATES						UNITED STATES	
GHCND ID	USC00415303						USC00415303	
COOP ID	415303						415303	
NWSLI ID							SVST2	
NCDC ID	20024555						20024555	
Latitude	29.9...	29.91667					28.1569	28.1569
Longitude	-100...	-100.76667					-98.51...	-98.5141
Relocations							435	
Elevation: Ground	1900 1903 1923						-6	
UTC Offset	TX-0... TX-... TX-05. TRANS...						TX-05 TX-09. SO...	
Climate Division							SOUTHERN	
NWS Region							CRP	
NWS WFO							COOP	
Network: COOP	COOP						COOP	

	1/1/1950	1/1/1960	1/1/1970	1/1/1980	1/1/1990	1/1/2000	Present
Historical							
Current							

	1/1/1950	1/1/1960	1/1/1970	1/1/1980	1/1/1990	1/1/2000	Present



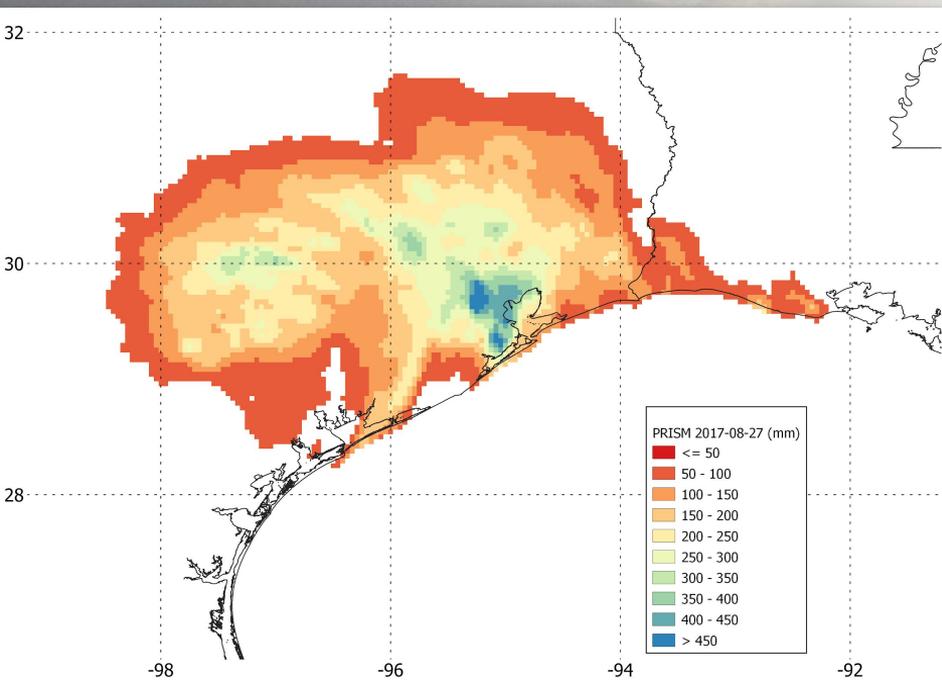
28	Junction	30° 29'	99° 48'	3.89	"
29	Kerrville	30° 01'	99° 07'	3.42	"
30	LaPrvor	28° 56'	99° 51'	1.49	"
31	Loma Alta	29° 55'	100° 46'	11.95	" Recording gage
32	London	30° 38'	99° 37'	4.09	"
33	Lynxhaven	29° 58'	99° 28'	3.44	"
34	Martin Ranch	30° 38'	99° 11'	2.44	"
35		30° 15'	99° 11'	2.44	"



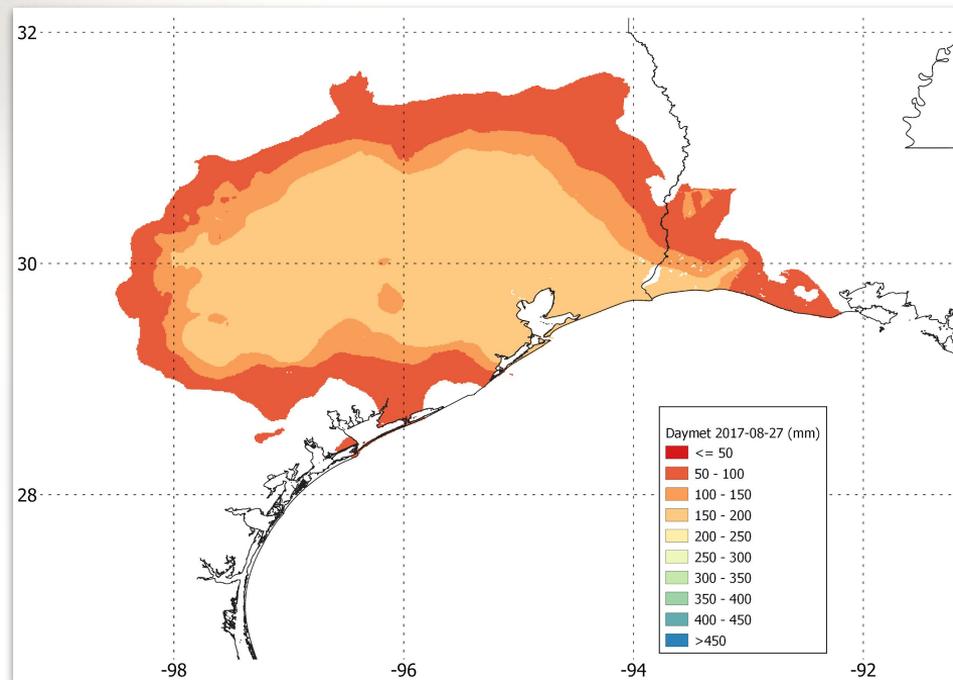
Gridded

- HDSC looks to gridded data to aid with QA/QC, especially with more recent gauge data
- Two observations we made:
 - Daymet : 1-day Precipitation capped at 200 mm
 - to be fixed in future update
 - <https://daymet.ornl.gov/>
 - PRISM Reanalysis (AN81m, AN81d)
 - dataset not climatologically consistent - disclosed clearly in documentation
 - http://www.prism.oregonstate.edu/documents/PRISM_datasets.pdf

PRISM



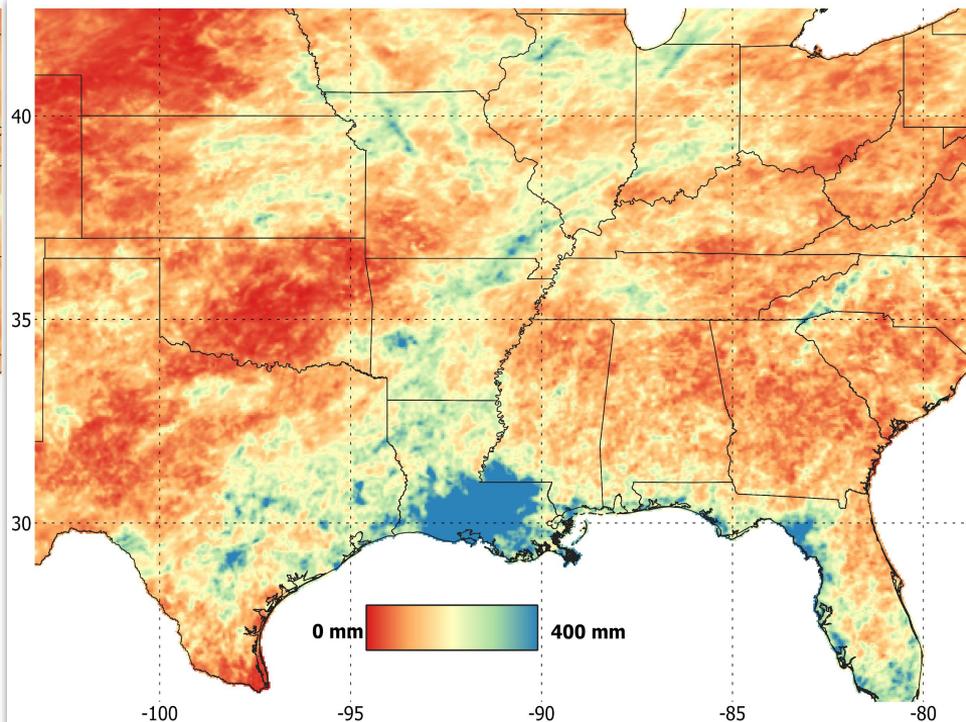
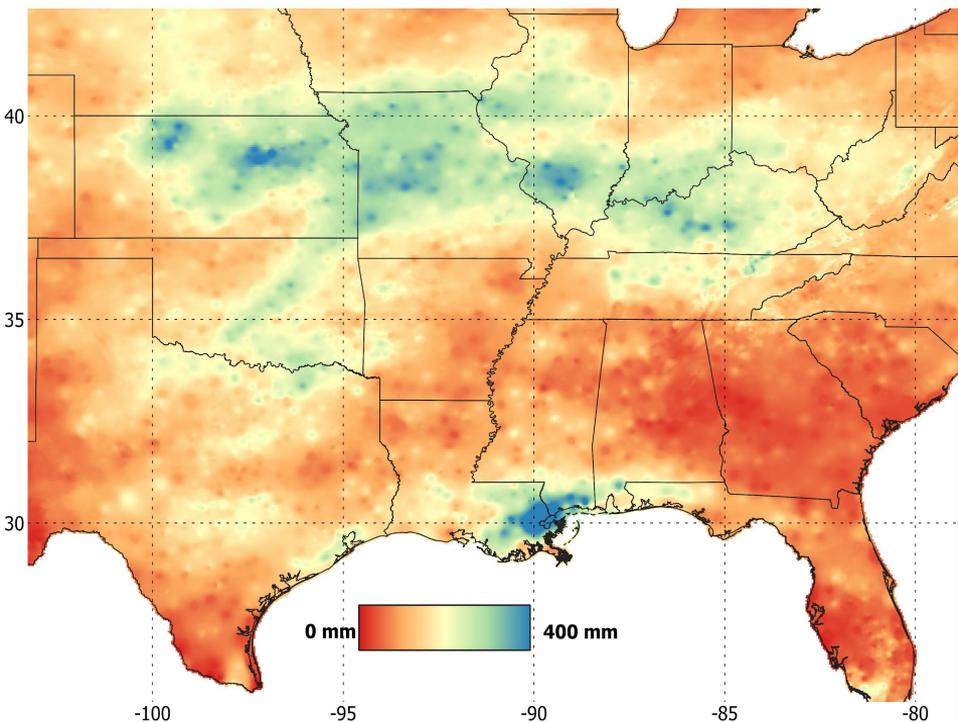
Daymet



PRISM Reanalysis (eg. AN81m)

May 1995

August 2016



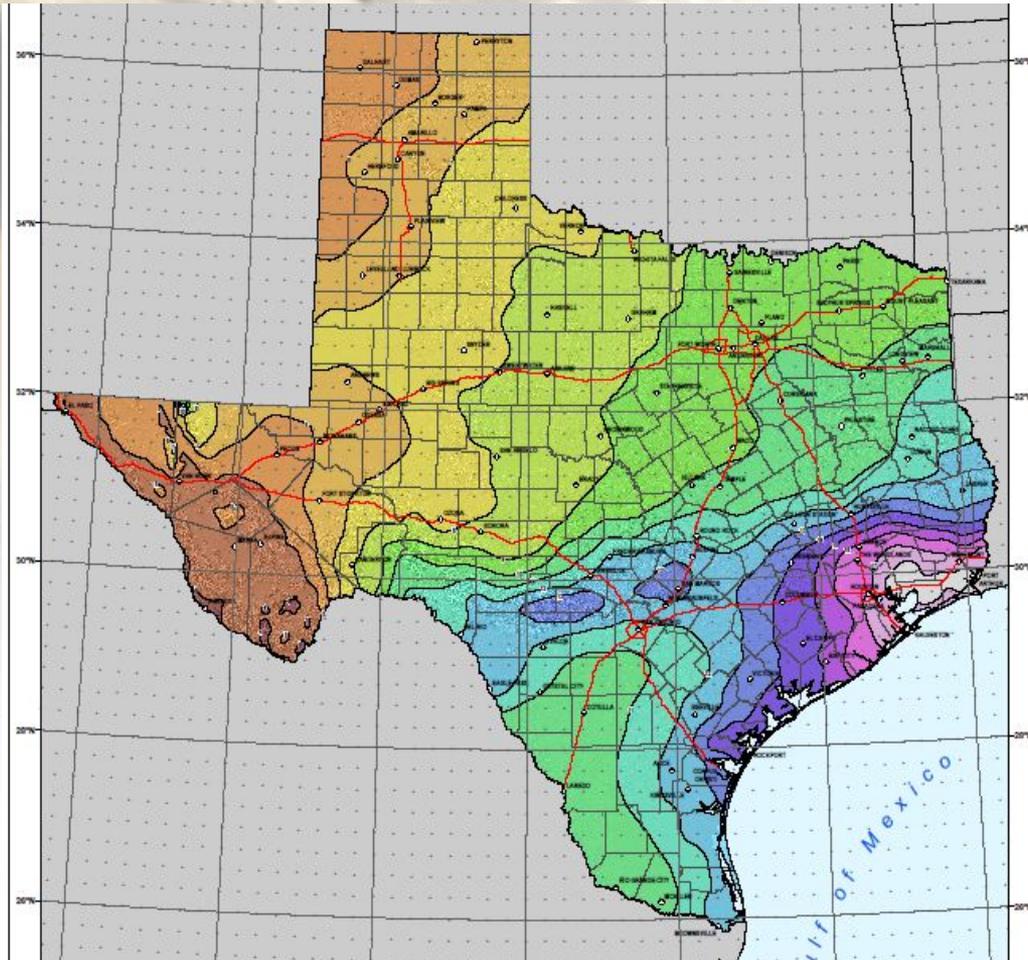
PRISM Reanalysis (AN81m, AN81d)

- Not climatological consistent
 - Be careful using for certain cases (eg. areal reduction factors, frequency analysis)
- Documentation: http://www.prism.oregonstate.edu/documents/PRISM_datasets.pdf
 - “Caveats: Dataset should not be used to calculate multi-decadal climate trends. Grids may contain non-climatic variations due to station equipment and location changes, openings and closings, and the ***use of RADAR data for ppt starting in 2002***. Screening stations for adherence to a “PRISM day” criterion does help to minimize time of tmin and tmax observation bias. However, the downside is that this results in the exclusion of a large percentage of stations from the analysis, especially early in the record. For example, in 1981, non-PRISM day COOP temperature stations outnumbered PRISM day stations by about 2 to 1. The two groups were about equal in size in 1990. By 2010, PRISM day COOP stations outnumbered non-PRISM day stations by about 3 to 1. ”

Summary

- Small glimpse into data QA/QC
 - Only showed a few NCEI-related datasets
- Significant value in digitizing data
 - Pre-1948 hourly data
 - Historical storm reports for missing extremes
- Complete digital data set is critical for future updates of Atlas 14

Questions?



New Bedford

