

# **Using Satellite-Era Reanalysis Datasets for Synoptic Pattern Recognition of South Texas Heavy Rainfall Events**

## Introduction

Floods due to heavy rainfall, not associated with tropical cyclones, have been one of the greatest threats to lives and property in South Texas for years. In order to aid forecasters with predicting such events, pattern recognition maps depicting several synoptic scale meteorological variables were created.

24-hour observed rainfall amounts of three-inches or greater for the Corpus Christi (43 stations), Victoria (40 stations), and Laredo (32 stations) TX areas between 1/1/1979 and 7/31/2016 were considered. This period was chosen to coincide with the six "satellite-era" reanalysis datasets used in this study.

# Data, Methodology, and Conclusion

An event was defined as having two or more stations within the same area (e.g., Victoria) on the same day observe three or more inches of rain and/or if at least one station within the same area experienced three inches or more of rain on consecutive days. Corpus Christi, Victoria, and Laredo TX observed 47, 52, and 11 such events between 9/19/1979 and 5/16/2016. Reanalysis data was processed using NOAA Weather and Climate Toolkit, ArcGIS 10.3, and Python scripts. An analysis time of  $\pm$  30 minutes of 1200 UTC was used.

Data		iset	et Source		Initial Resolution		<b>Final Resolution</b>
	CFSR		NCEP's CFS Version 1		T382 (~ 38 km), 64 levels		0.36° x 0.36°
	CFSV2		NCEP's CFS Version 2		T574 (~ 27 km), 64 levels		0.36° x 0.36°
	MERRA		NASA's GEOS-5 Model		2/3° Ion x 0.5° lat, 72 levels		5/8° x 5/8°
-	MERRA-2		NAS	A's GEOS-5 Model	5/8° lon x 0.	5° lat, 72 levels	5/8° x 5/8°
	ERA-Interim		ECMWF	's IFS Version Cy31r2	T255 (~ 80	km), 60 levels	0.36° x 0.36°
	JRA-55		JMA's GSM Model (12/09)		T319 (~ 55 km), 60 levels		1.25° x 1.25°
	PWAT	<mark>2 m De</mark>	w Point	MSLP/10 m Winds	850 mb	500 mb	250 mb
] A 2 W	1.4-1.9"; s high as 2" in the / Gulf of Mexico	62-74 °F as 76 °F Gulf of	F; As high T in the W f Mexico	Converging 5-15 kt SE/E/NE winds indicates a likely boundary across S/SE TX.; High pressure centered over the Carolinas produces a wid open Gulf of Mexico.	<ul> <li>~10-20 kt</li> <li>S/SE LLJ</li> <li>originating</li> <li>from the</li> <li>Western</li> <li>Caribbean</li> </ul>	Trough NM/W TX to NW Mexico (CRP/VCT); Zonal flow with a Weak Trough over W TX (LRD)	Trough NM to Central Mexico (CRP/VCT), Weak Trough W TX (LRD); Subtropical Jet (30-50 kt with 45-60 kt Jet Streak Ark-La-Tex Area)

### References

Bosilovich, Michael G., et. al., 2015: MERRA-2: Initial Evaluation of the Climate. *NASA/TM-2015-104606*, Vol. **43**, 153 pp.

Dee, D.P., et. al., 2011: The ERA-Interim reanalysis: configuration and performance of the data assimilation system. Quart. J. R. Met. Soc., 137, 553-

Harada, Y., H. Kamahori, C. Kobayashi, H. Endo, S. Kobayashi, Y. Ota, H. Onoda, K. Onogi, K. Miyaoka, and K. Takahashi, 2016: The JRA-55 Reanalysis: Representation of atmospheric circulation and climate variability. J. Met. Soc. Jap., 94, 269-302.

Kobayashi, S., Y. Ota, Y. Harada, A. Ebita, M. Moriya, H. Onoda, K. Onogi, H. Kamahori, C. Kobayashi, H. Endo, K. Miyaoka, and K. Takahashi, 2015: The JRA-55 Reanalysis: General Specifications and Basic Characteristics. J. *Met. Soc. Jap.*, **93(1)**, 5-48.

Molod, A., Takacs, L., Suarez, M., and Bacmeister, J., 2015: Development of the GEOS-5 atmospheric general circulation model: evolution from MERRA to MERRA2. *Geosci. Model Dev.*, **8**, 1339-1356.

Rienecker, M., et.al., 2011: MERRA - NASA's Modern-Era Retrospective Analysis for Research and Applications. J. Climate, 24, 3624-3648.

Saha, Suranjana, et. al., 2010: The NCEP Climate Forecast System Reanalysis. Bull. Amer. Meteor. Soc., 91(8), 1015-1057.

Saha, Suranjana, et. al., 2014: The NCEP Climate Forecast System Version 2. J. Climate, 27, 2185-2208.

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**Composite Synoptic Pattern Recognition Maps for** 3"+ Rainfall Events in Corpus Christi, TX (1979-2016)

**NCEP Climate Forecast System Reanalysis/Version 2 (CFSR/CFSV2)** 



**Composite Synoptic Pattern Recognition Maps for** 3"+ Rainfall Events in Victoria, TX (1991-2016)

**NCEP Climate Forecast System Reanalysis/Version 2 (CFSR/CFSV2)** 



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**Composite Synoptic Pattern Recognition Maps for** 3"+ Rainfall Events in Laredo, TX (2009-2015)

**NCEP Climate Forecast System Reanalysis/Version 2 (CFSR/CFSV2)** 

