

# ***Do Atmospheric Rivers Sometimes Drive the Hydrological Roller Coaster Over Texas?\****



***Nelun Fernando (TWDB)***

**International Atmospheric Rivers Conference 2018**

**June 26, 2018**

*\*Unless specifically noted, this presentation does not necessarily reflect official Board positions or decisions.*

# Texas: *Hydrological Roller Coaster*

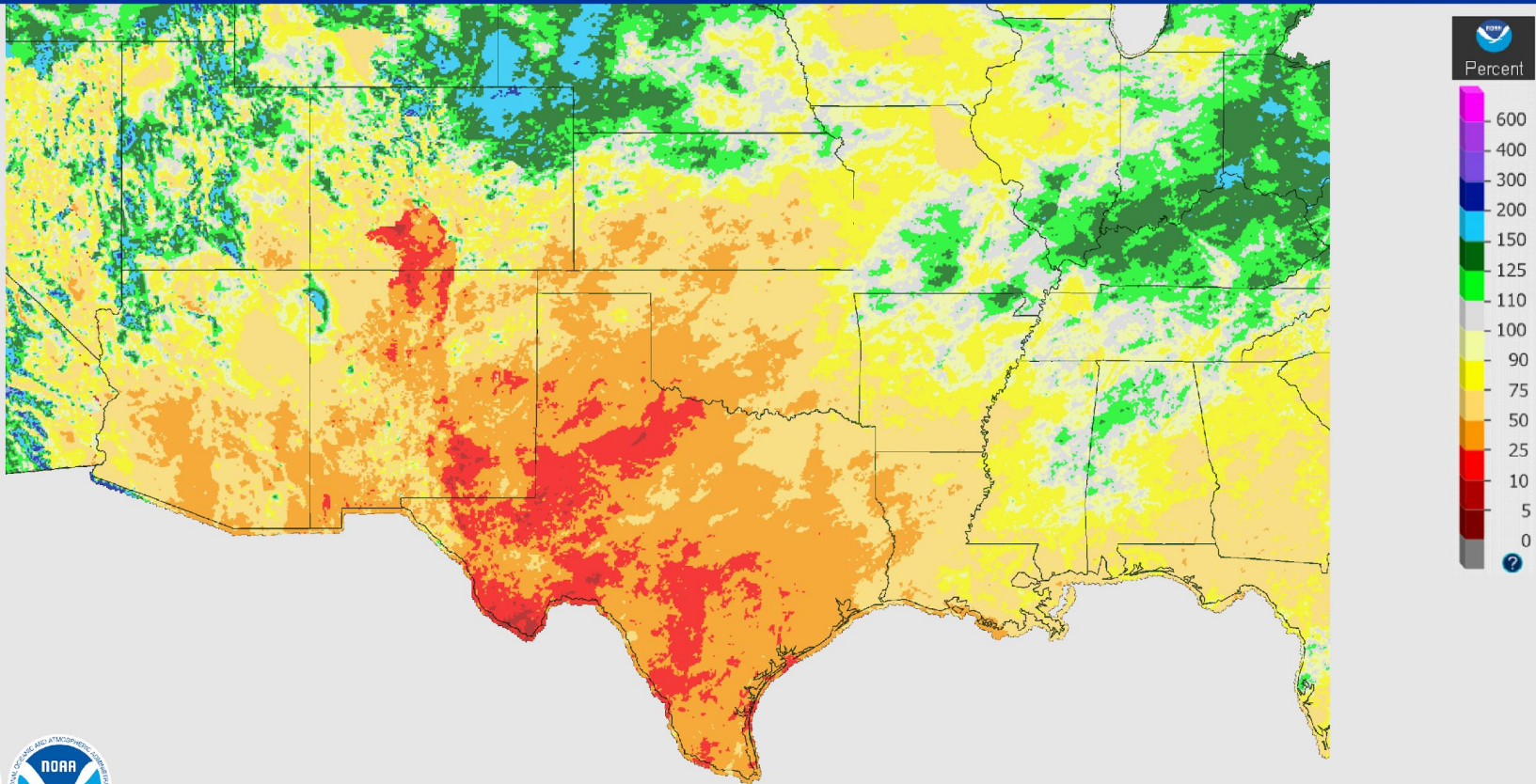
*“Texas is a land of perennial drought broken by the occasional devastating flood.”*  
- National Weather Service, 1927

# Drought in Texas: 2011

October 01, 2011 Water Year (Oct. 1) Percent Precipitation

Created on: June 26, 2018 - 12:41 UTC

Valid on: October 01, 2011 12:00 UTC



Source: <https://water.weather.gov/precip/>

# Flood in Texas: 2015 Memorial Day Flood

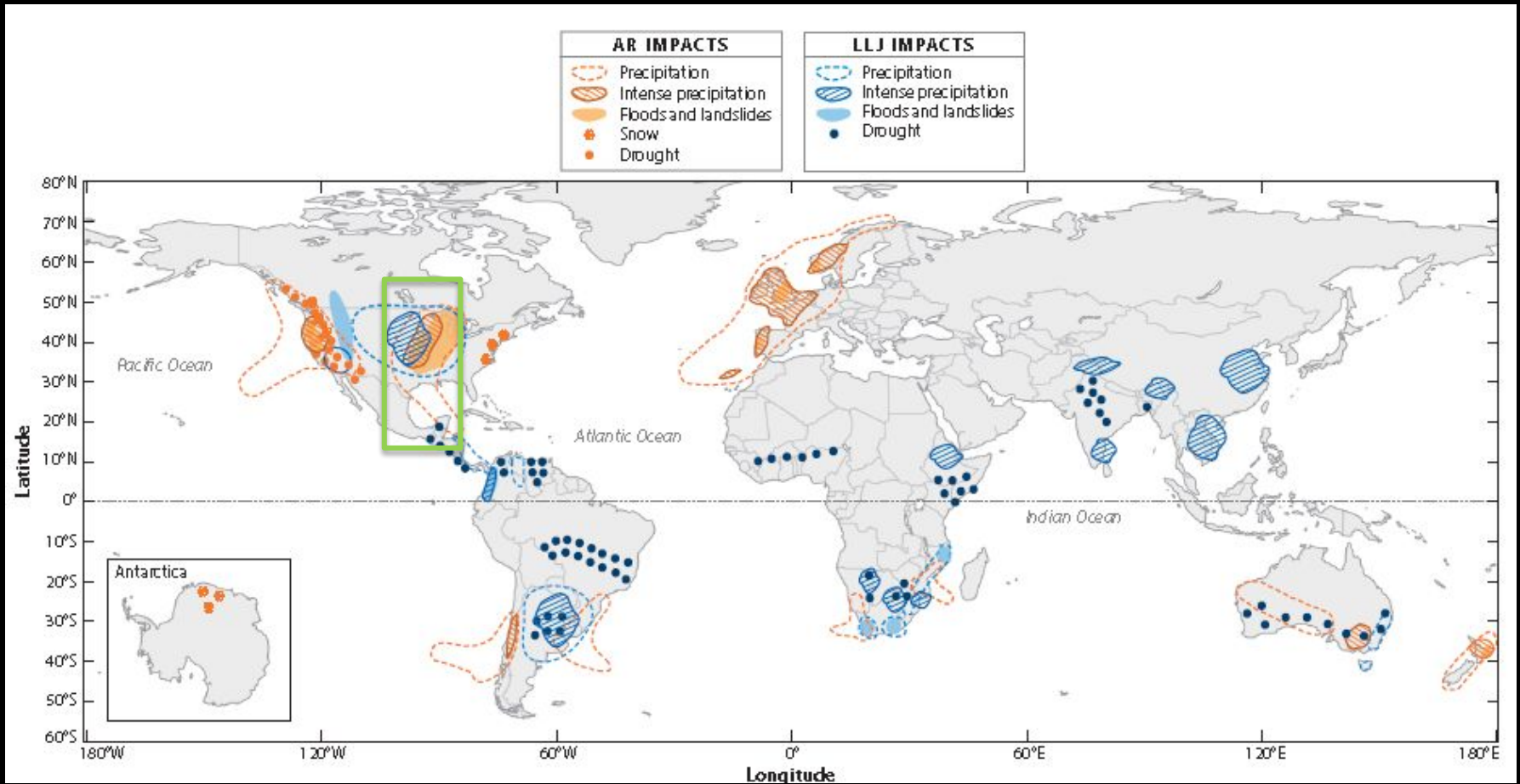


**Fischer Store Bridge  
Memorial Day flood of 2015**

Source:

<http://www.mysanantonio.com/news/local/article/TXDoT-Two-bridges-wrecked-in-the-Central-Texas-6294892.php#photo-8047612>

# Atmospheric Rivers vis-à-vis Texas



Source: Gimeno et al., 2016 (doi: 10.1146/annurev-environ-110615-085558)

# “Maya Express” Events from 2010

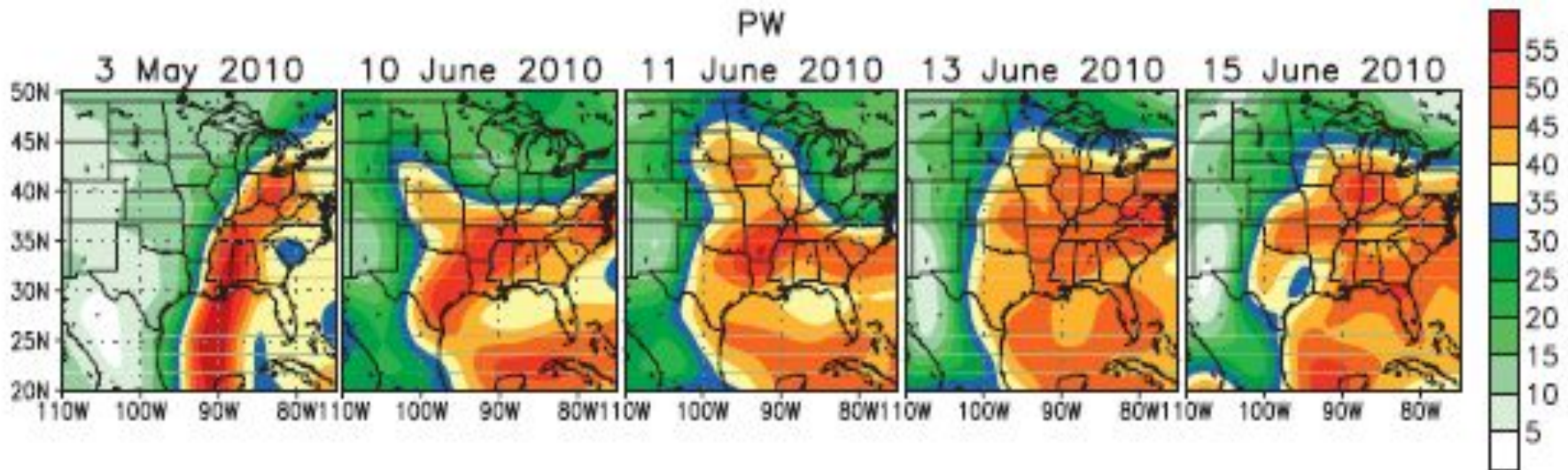
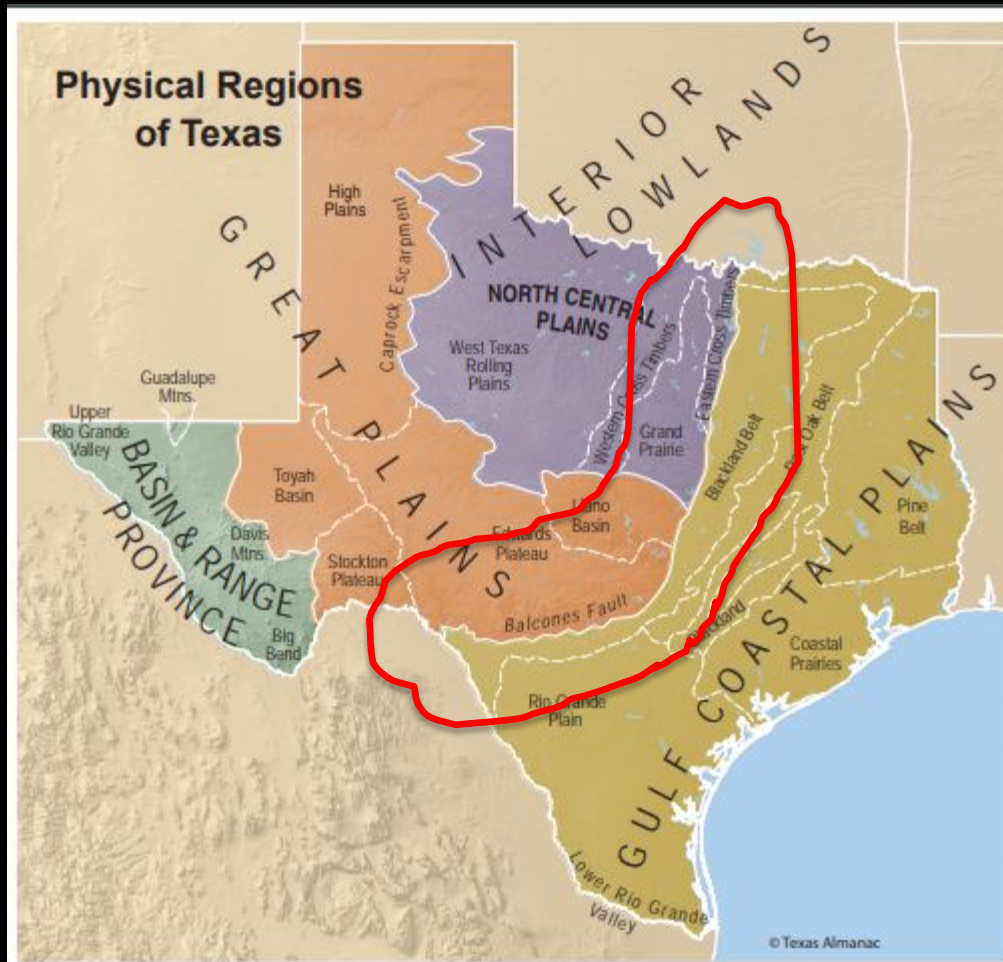


FIG. 5. Precipitable water (mm) for selected extreme events during May and June 2010. Dates of the extreme events are indicated across the top. Analyses are valid at 0000 UTC on the calendar dates indicated.

Source: Higgins et al., JHM, 2011 (*Journal of Hydrometeorology*, 12(5), 1056-1070. )

# Location and topography of Texas

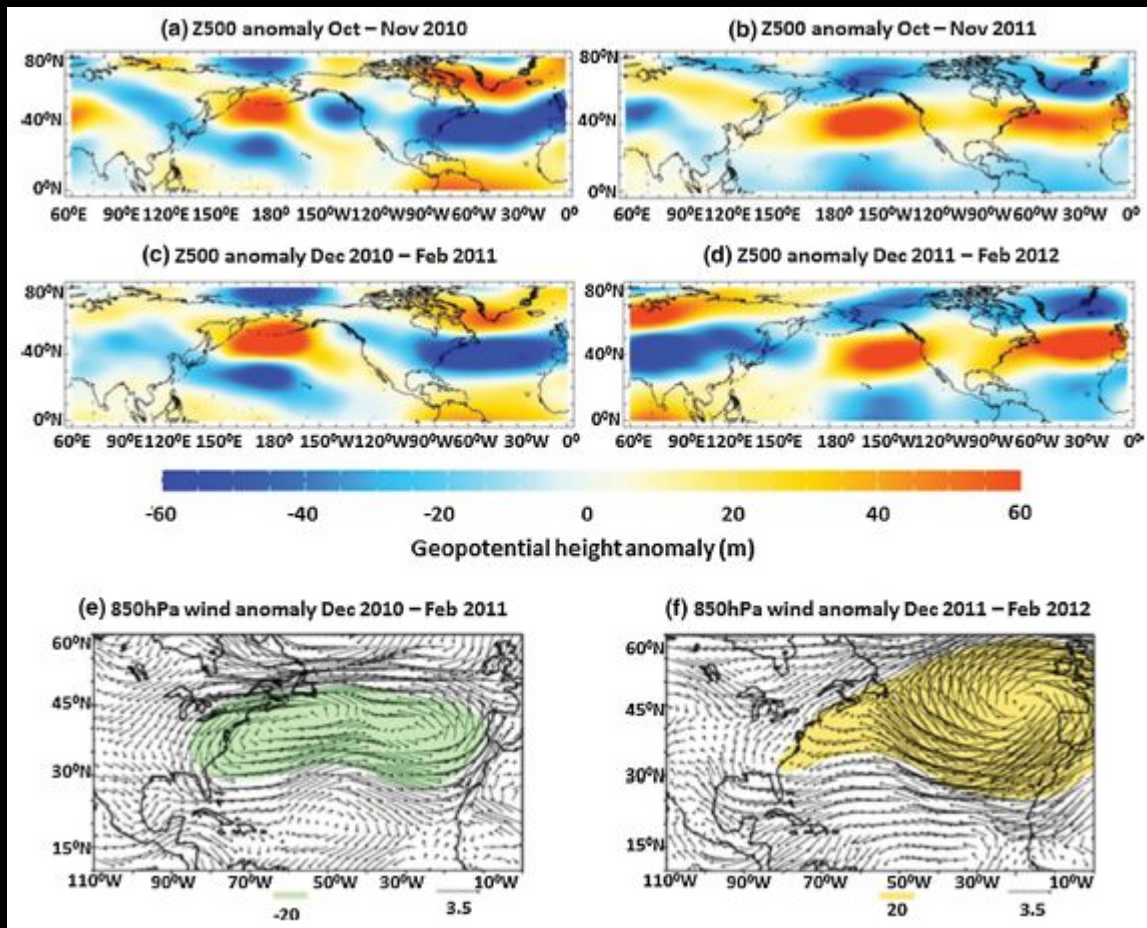


**1921 Thrall: 32" in 12 hours!**

**1935 D'Hanis: 22" in 2 hours 45 minutes!**

Source: <https://texasalmanac.com/sites/default/files/images/maps/PhysicalReg.pdf>

# Case 1: 2011 Drought (Winter Contrasts)

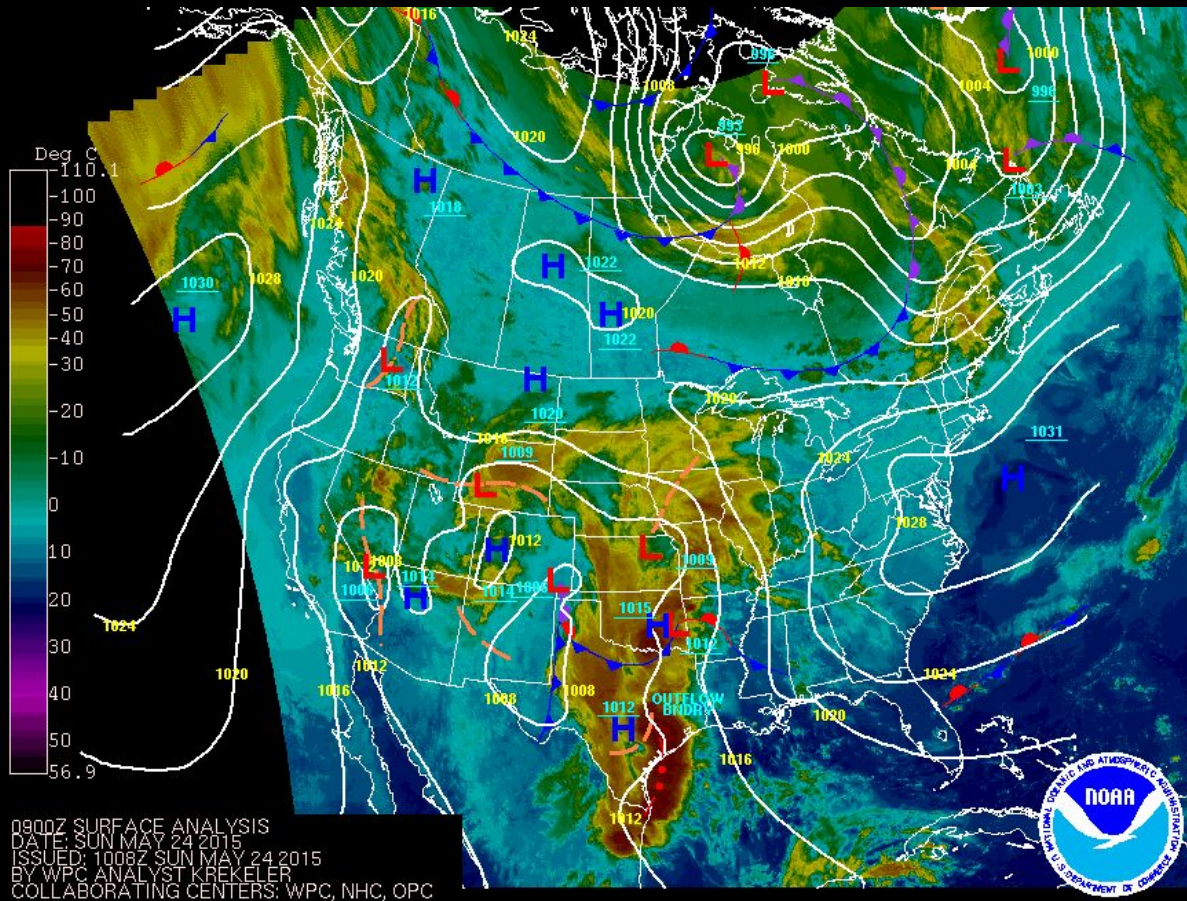


- **NAO interaction - 2010 vs. 2011**
- **Were storms steered away?**
- **GPLLJ intensification? (e.g. Barandarian et al., 2013)**

(Source: Fernando et al., 2016 (doi: 10.1007/s00382-016-3014-x))



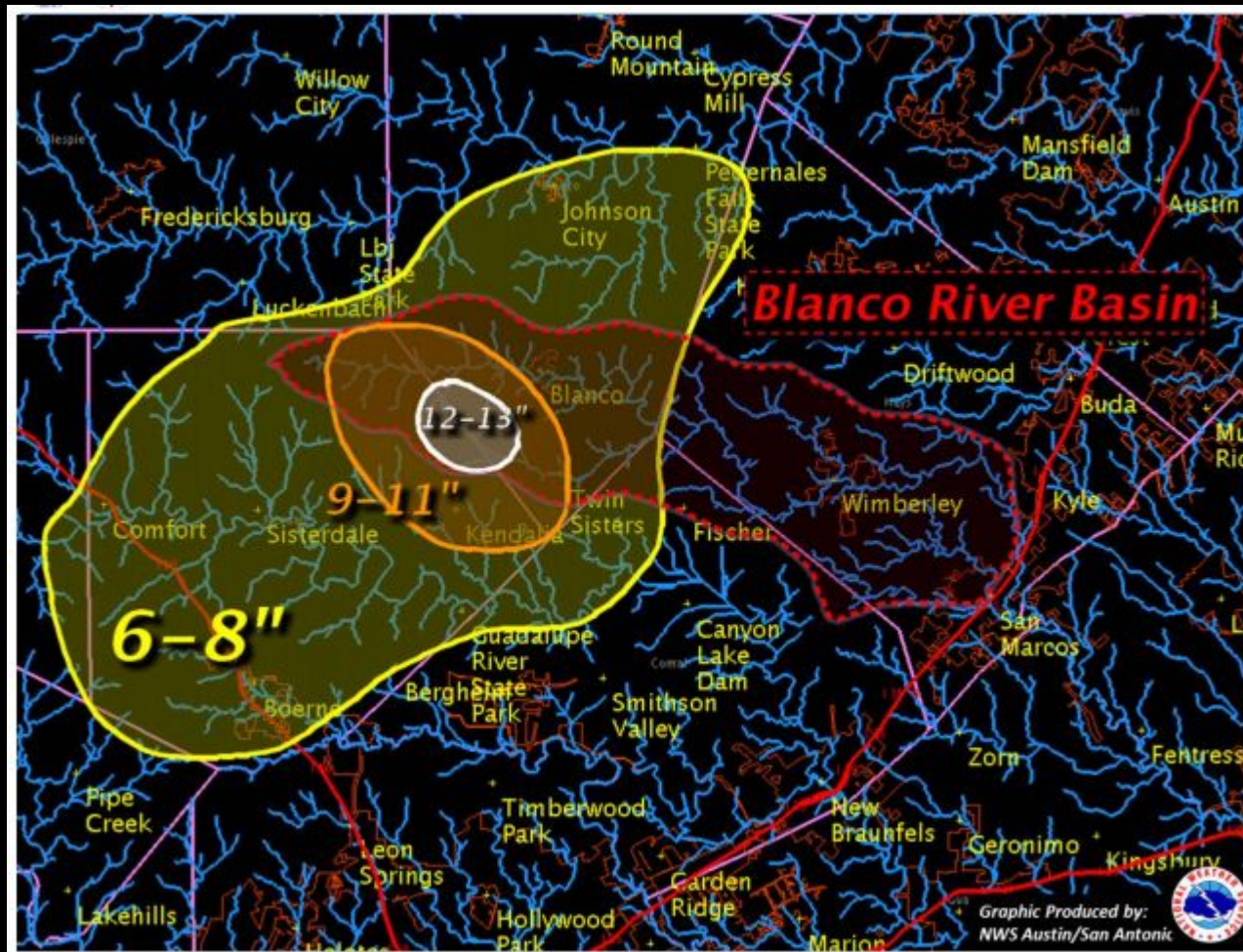
# Case 2: 2015 Memorial Day Flood



IR 20150524 0915Z GOES-E SAT IMAGE

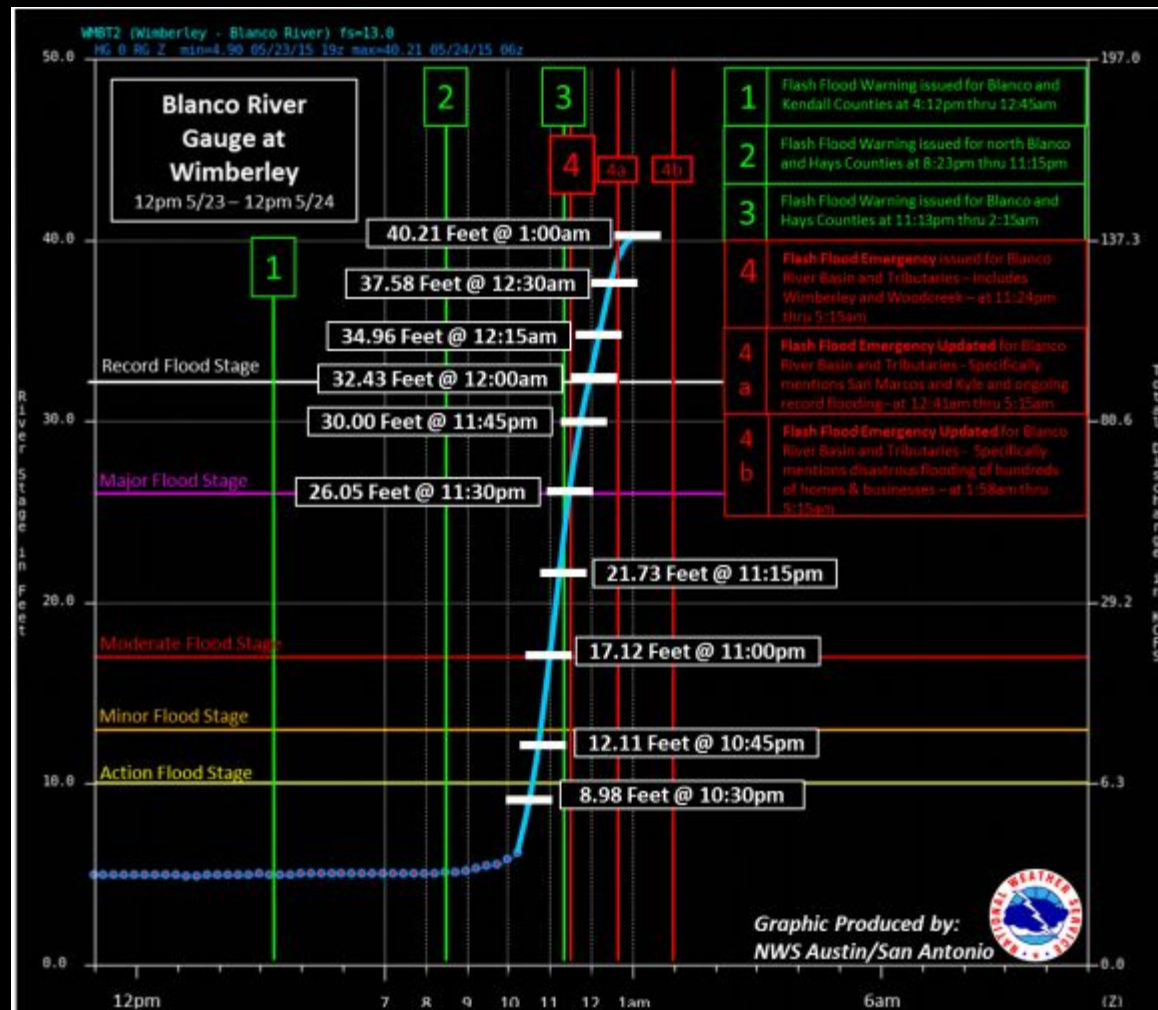
Source: [http://www.wpc.ncep.noaa.gov/archives/web\\_pages/sfc/sfc\\_archive\\_maps.php?arcdte=05/24/2015&selmap=2015052409&maptype=satsfcnp](http://www.wpc.ncep.noaa.gov/archives/web_pages/sfc/sfc_archive_maps.php?arcdte=05/24/2015&selmap=2015052409&maptype=satsfcnp)

# Blanco River Headwaters: May 23, 2015



Source: <https://www.weather.gov/media/ewx/wxevents/ewx-20150524.pdf>

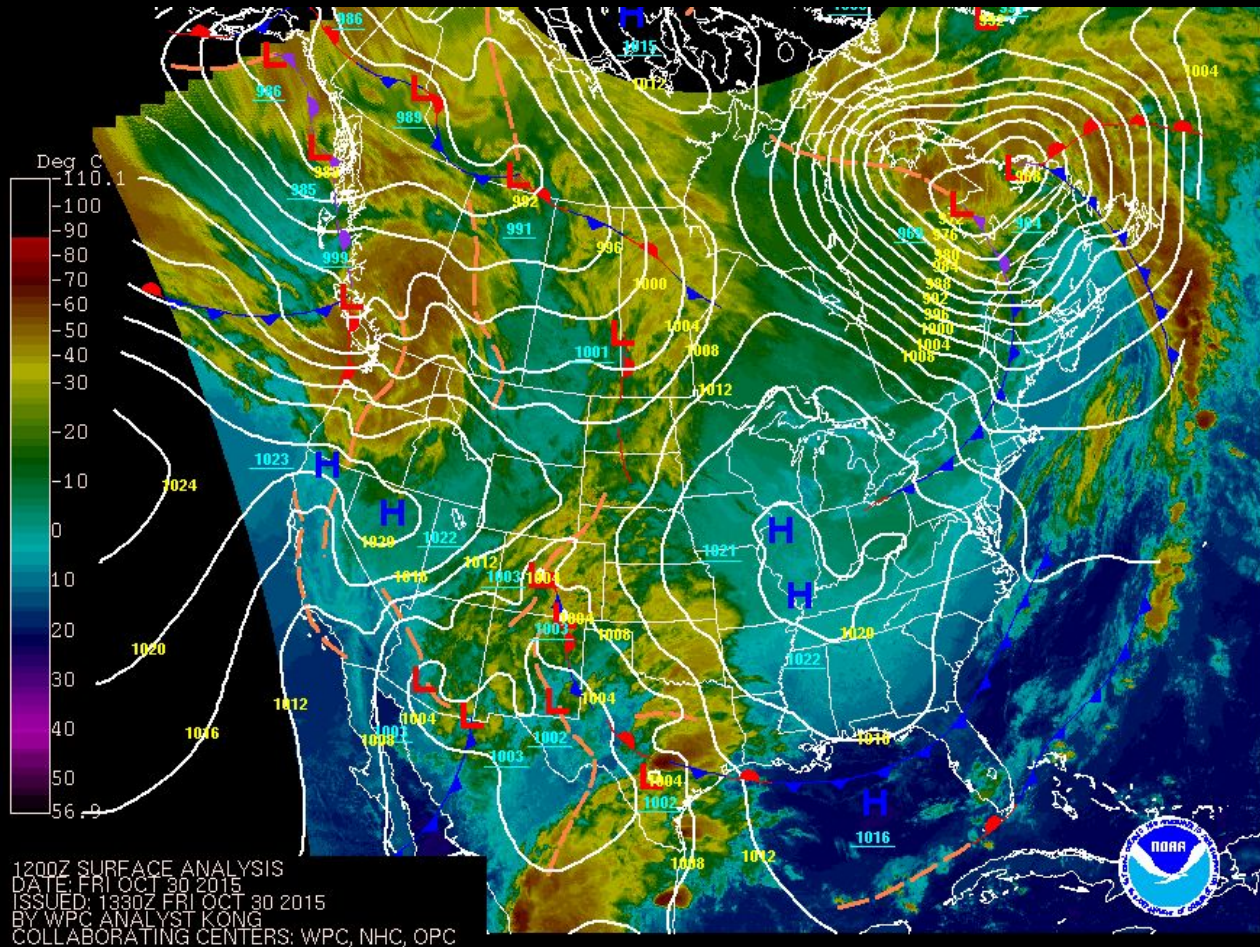
# Blanco River Gauge at Wimberley



Source: <https://www.weather.gov/media/ewx/wxevents/ewx-20150524.pdf>



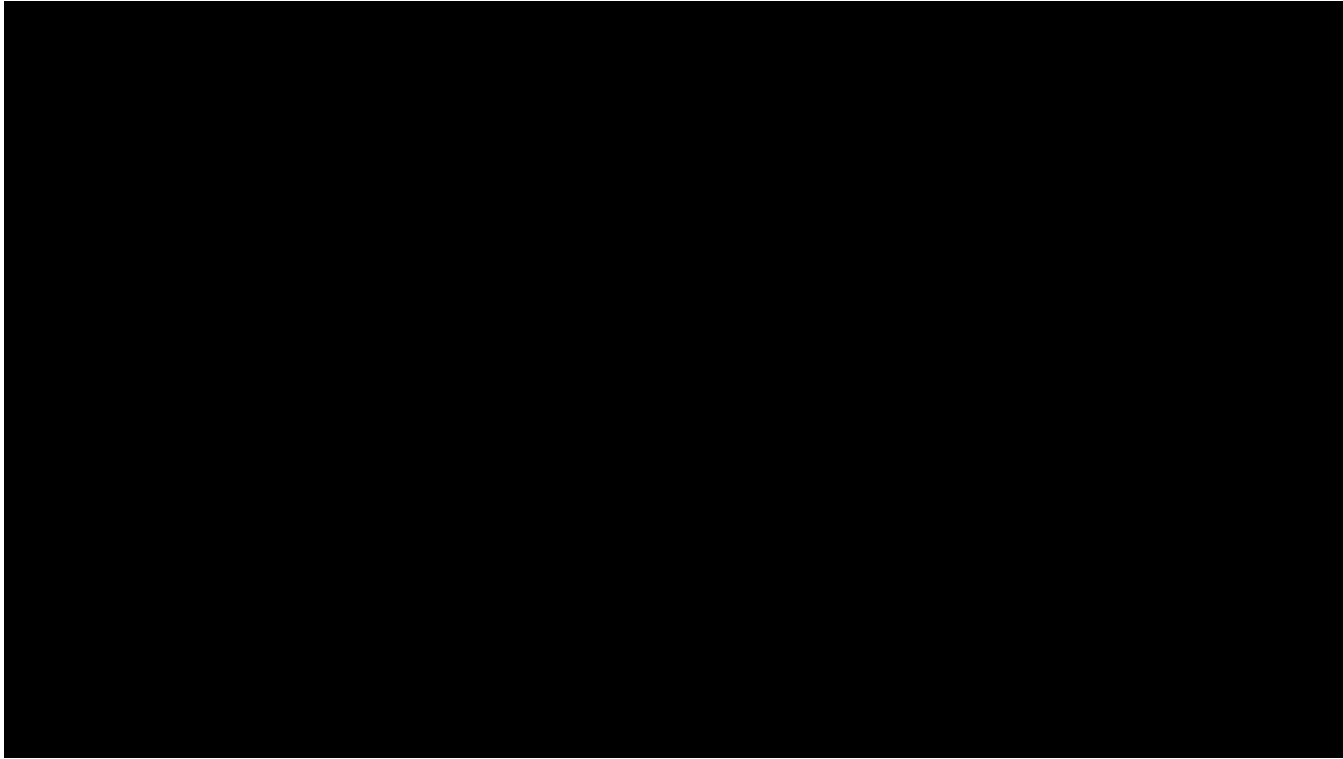
# Case 3: 2015 Halloween Flood



IR 20151030 1215Z GOES-E SAT IMAGE

Source: [http://www.wpc.ncep.noaa.gov/archives/web\\_pages/sfc/sfc\\_archive\\_maps.php?arcdate=10/30/2015&selmap=2015103012&maptype=satsfcnpns](http://www.wpc.ncep.noaa.gov/archives/web_pages/sfc/sfc_archive_maps.php?arcdate=10/30/2015&selmap=2015103012&maptype=satsfcnpns)

# Case 4: 2016 Sabine Flood



Source: <https://www.climate.gov/news-features/event-tracker/maya-express-behind-gulf-coast-soaking>

# Key Features for Flash Flooding

- Slow moving fronts or stalled cold fronts
- Divergence aloft
- Moisture air from the Gulf (southeast winds)
- Instability, modest shear, high values of precipitable water
  - Memorial day floods (2015)
- Upper level trough, plenty of moisture (warm front)
  - Halloween floods (2015)
- Upper level trough, plenty of moisture (cold front)
  - Oct. 24-25, 2015

# Who Benefits from Improved Forecasts of ARs?

- River Forecast Centers (e.g. WGRFC)
  - Set of signals to look for on the charts?
  - Improved flood forecasts
- Emergency managers
- Communities in flood plains, flashy valleys
- Reservoir operators, river authorities, forest service, utility companies (drought/ridging)

# How Can We (TWDB) Collaborate?

- Collaborate on proposals
- Applications of improved predictability
- Identify need for improved observations
- Seek resources to fund observational campaigns



# Questions?

## *Contact information*

*Nelun Fernando*

*Water Science and Conservation*

*Texas Water Development Board*

*Email: [nelun.fernando@twdb.texas.gov](mailto:nelun.fernando@twdb.texas.gov)*

*Phone: 512-475-0454*