Current Status and the Future of the NOAA CORS Network

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Acknowledgements

To the CORS team: Fran Coloma, Will Freeman, Don Haw, Phillip McFarland, Jarir Saleh, Ira Sellars, Lijuan Sun, Kathleen Walls, and Mike Lucci.

To our contributors for volunteering their geodetic stations, networks, time and efforts in coordination with NGS to make a robust contribution towards the NSRS.

National Geodetic Survey's Mission

To define, maintain and provide access to the **National Spatial Reference System (NSRS)** to meet our Nation's economic, social, and environmental needs.

The National Spatial Reference System

- Official system of the US civilian government
  - Geodetic latitude, longitude, and height
  - Orthometric height
  - Geopotential
  - Acceleration of gravity, and deflection of the vertical

- Contains information about
  - Orientation and scale relative to international reference frames
  - Precise orbits of GPS satellites
  - Information derived from the continuously operating GPS/GNSS reference stations aka CORS
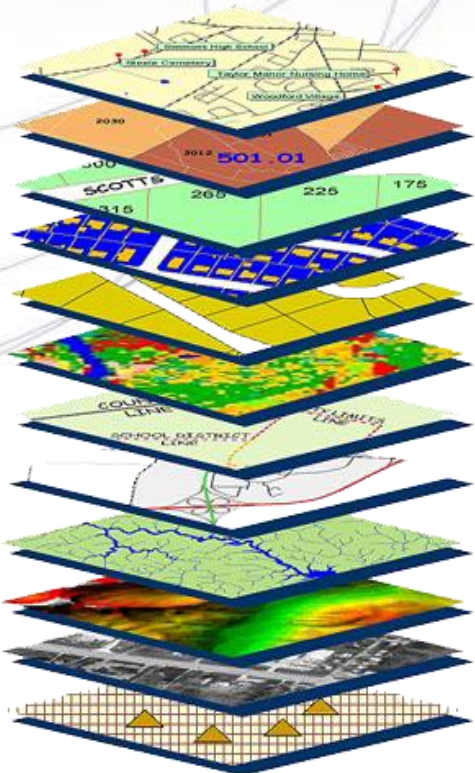
Guiding Principles for
Continuously Operating Reference Stations (CORS)

- CORS a major component of NSRS.
- The International Earth Rotation and Reference Systems Service (IERS) International Terrestrial Reference System (ITRF) will continue to be the worldwide standard reference system.
- NGS will continue to support the ITRF through International GNSS Service (IGS) reference sites with the Foundation CORS network
- The NSRS will continue to be defined in relation to the ITRF.

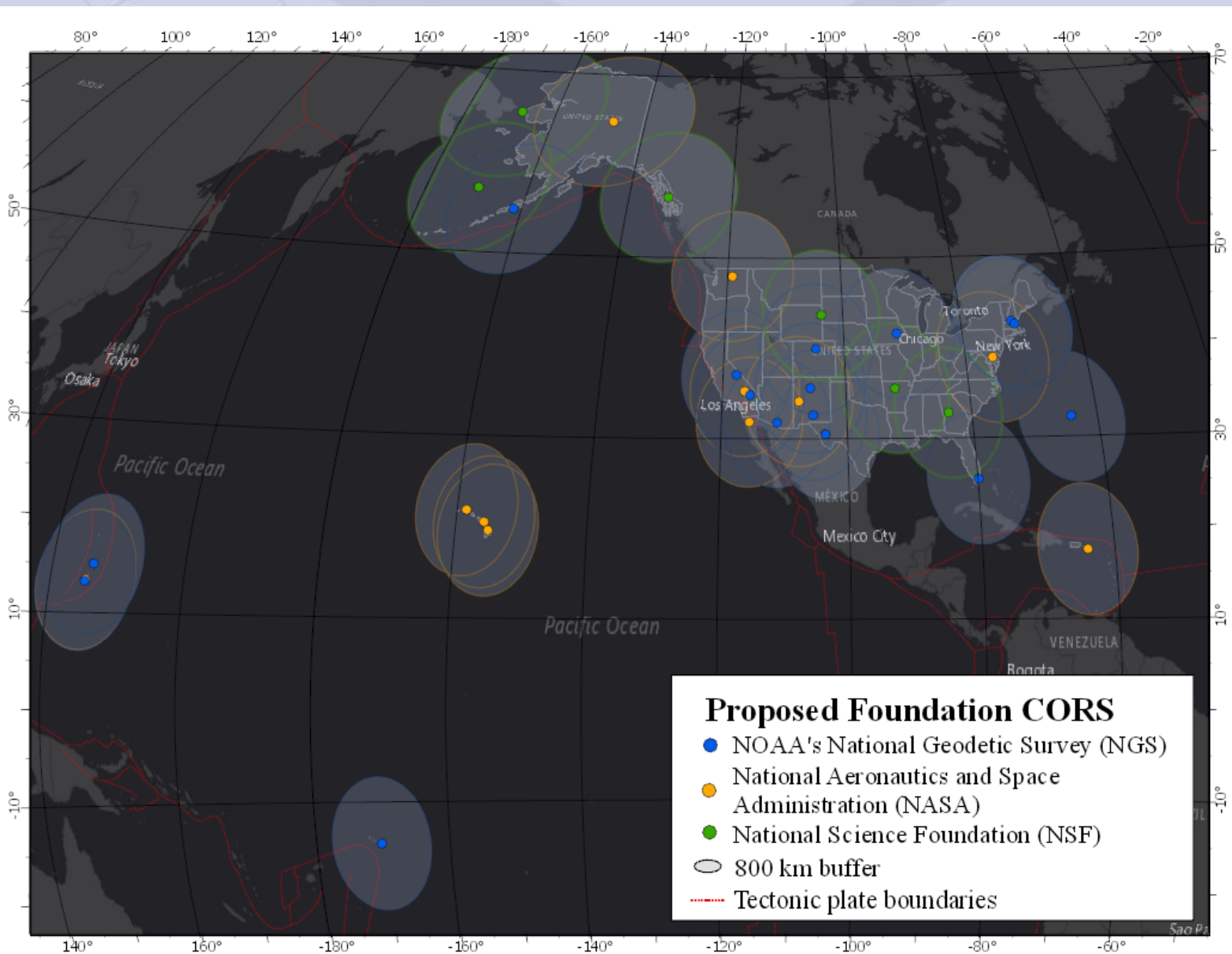# The NOAA CORS Network (NCN)

~1900 continuous stations **from more than 200 organizations** which provide GPS or GNSS data consisting of carrier phase and code range measurements in support of three dimensional positioning down to millimeters
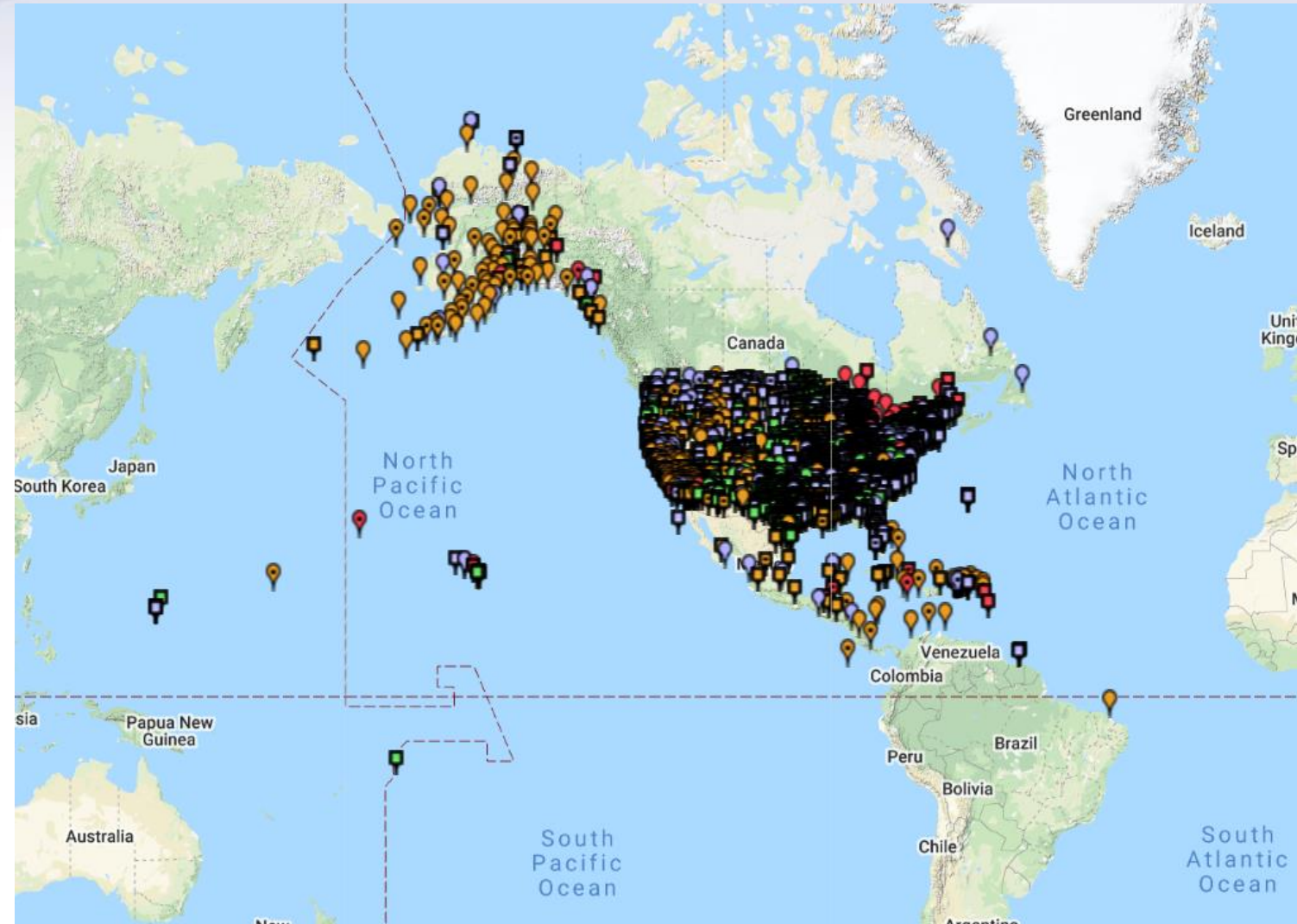
The NOAA Foundation CORS Network (FCN)

Proposed Foundation CORS
- ● NOAA's National Geodetic Survey (NGS)
- ● National Aeronautics and Space Administration (NASA)
- ● National Science Foundation (NSF)
- ⬭ 800 km buffer
- ·-·-· Tectonic plate boundaries

U.S. Federal Partners	GNSS Site ID	Location	Existing IGS or ITRF Site
National Science Foundation (NSF) Existing Sites Program: Network of the Americas (NOTA)	AB09	Wales, AK	
	AB51	Petersburg, AK	
	ATQK	Atqasuk, AK	
	P043	New Castle, WY	
	P777	Dennard, AR	
	P804	The Rock, GA	
NSF Existing Sites Program: COCONet	CN11	Pedro Cay, Jamaica	
	SAN0	San Andres Island, Colombia	
National Aeronautics and Space Administration (NASA) Existing Sites Program: Global GNSS Network (GGN)	BREW	Brewster, WA	ITRF
	CRO1	St. Croix, VI	ITRF
	FAIR	Fairbanks, AK	IGS
	TBD	Greenbelt, MD	IGS/ITRF
	GUAM	Dededo, Guam	IGS
	HAL1	Haleakala, HI	IGS/ITRF
	KOKB	Kauai, HI	IGS/ITRF
	MDO1	McDonald Observatory, TX	ITRF
	MKEA	Mauna Kea, HI	IGS/ITRF
	MONP	Mount Laguna, CA	IGS/ITRF
	PIE1	Pie Town, NM	IGS/ITRF
NOAA- National Geodetic Survey (NGS) Existing and New Sites Program: NOAA CORS Network	ASPA	Pago Pago, American Samoa	IGS
	BRSG	St. George, Bermuda	
	CNMR	Saipan, Northern Mariana Islands	IGS
	CORB	Woodford, VA	
	FLF1	Richmond, FL	Proposed IGS/ITRF
	GUUG	Mangilao, Guam	IGS/ITRF
	TMG2	Boulder, CO	Proposed IGS
	WES2	Westford, MA	IGS/ITRF
	NEW	Apache Point, NM	ITRF
	NEW	Fort Davis, TX	ITRF
	NEW	Fort Irwin, CA	ITRF
	NEW	Hancock, NH	ITRF
	NEW	Los Alamos, NM	ITRF
	NEW	Kitt Peak, AZ	ITRF
	NEW	Owens Valley, CA	ITRF
	NEW	Cold Bay, AK	ITRF
	NEW	North Liberty, IA	ITRF

CORS Archive

Since 2004, at-sampling CORS RINEX data (where available) is directly available online.

NGS only keeps 30 days of at-sampling data, then decimates to 30-second sampling rate online.

Data is free, but you must register!

CORS online **archive** repository at NOAA's CLASS

Multi-Year CORS Solution 2 (MYCS2)

As of September, 2019: You now have access to more accurate NOAA CORS Network station coordinates and velocities in both the national (NAD83) and international (ITRF) reference frames

What:

Robust coordinates and velocities in ITRF2014 and NAD83(2011) epoch 2010.00 (a within-realization update) for all NCN stations installed before 2014.

Modeled coordinates and velocities available for stations installed between 2014 and present.

GPS orbits match with ITRF2014.

Updated OPUS online positioning software uses these coordinates and velocities, and GEOID18.

How:

Two years of detailed quality control on all data collected by the NCN over 22 years (1995-2017).

A full network adjustment of 3050 stations, 1100 weeks of data for all NCN stations installed before 2014 (active and decommissioned), IGS, and NGA stations.

New CORS (<3 yrs old) have approximate coordinates and velocities "modeled" with OPUS-Net and HTDP (lower accuracy than the network solution).

Notable Events in 2020

- Discontinuance of the USCG DGPS service

- Impact of COVID-19 on CORS upgrades, installation, maintenance and repair

- Another delay implementing the modernized NSRS targeted for 2022

  - See Dru Smith's August 27th 2020 webinar at:

  https://geodesy.noaa.gov/web/science_edu/webinar_series/2020-webinars.shtml

CORS Modernization Efforts

Blueprint for 2022 Part 3: Working in the Modernized NSRS

- Better access to the National Spatial Reference System

https://www.ngs.noaa.gov/PUBS_LIB/NOAA_TR_NOS_NGS_0067.pdf

NOAA CORS Network Comprehensive Plan (writing in progress)

- Redesign the CORS website
- Improve OPUS' selection of CORS
- Quickly "repair" out-of-tolerance CORS
- Provide an OPUS CORS tracking tool
- Increase communications to community
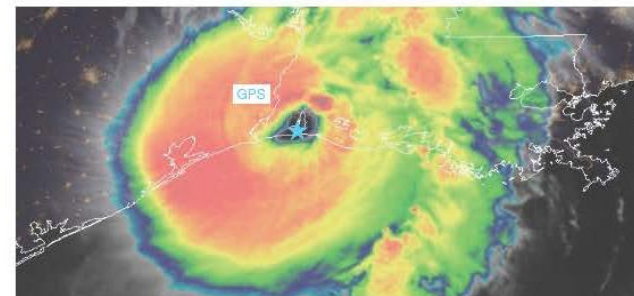- Better models of motion
- Automate

Cool and Fun Stuff

LSU-operated CORS "CALC"

NOAA CO-OPS "Sentinel" tide gauge and weather station platform
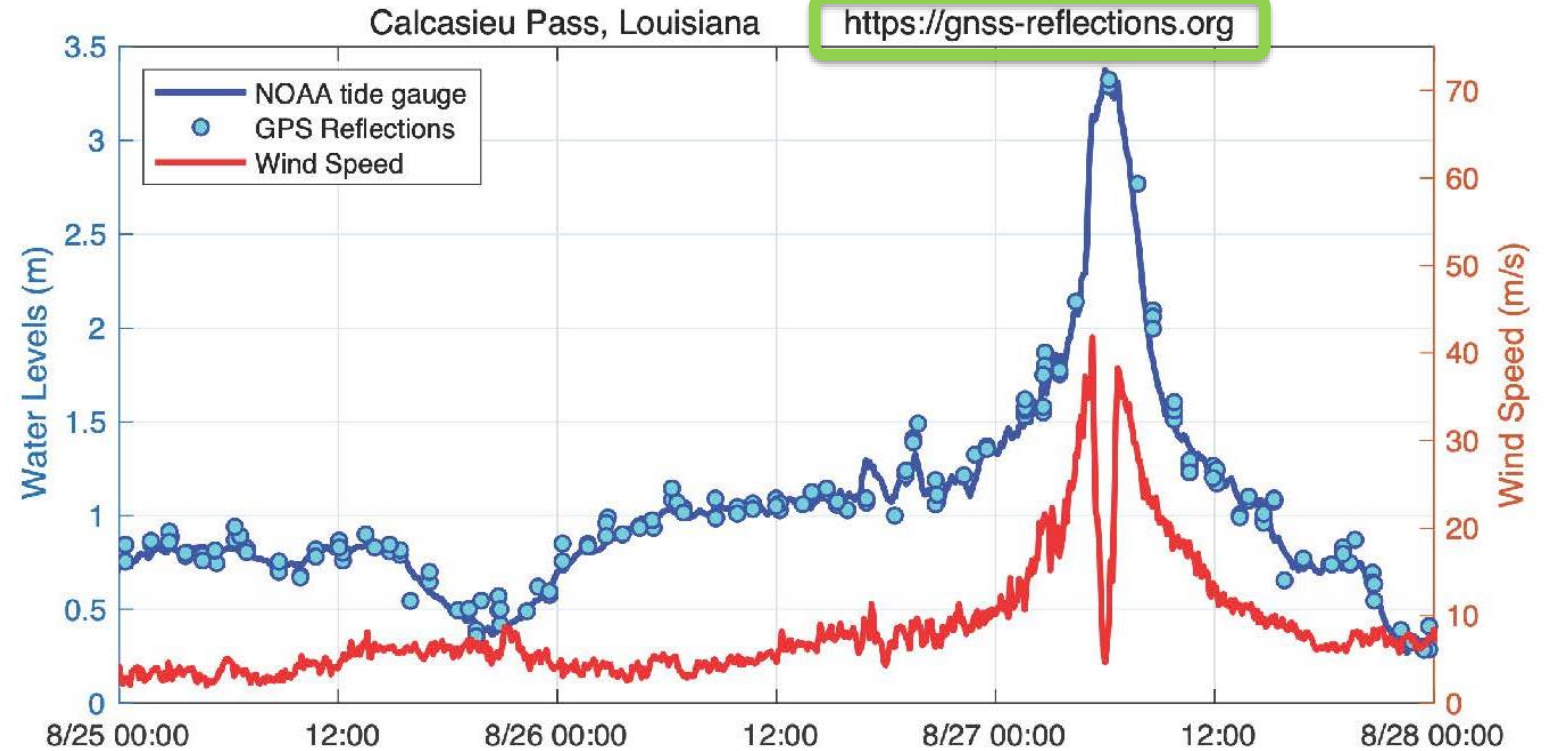
Water Levels Measured with Reflected GPS Signals During Hurricane Laura

https://kristinelarson.net

Thank you