



Testimony on VT S.154 VT State Plane Coordinate System

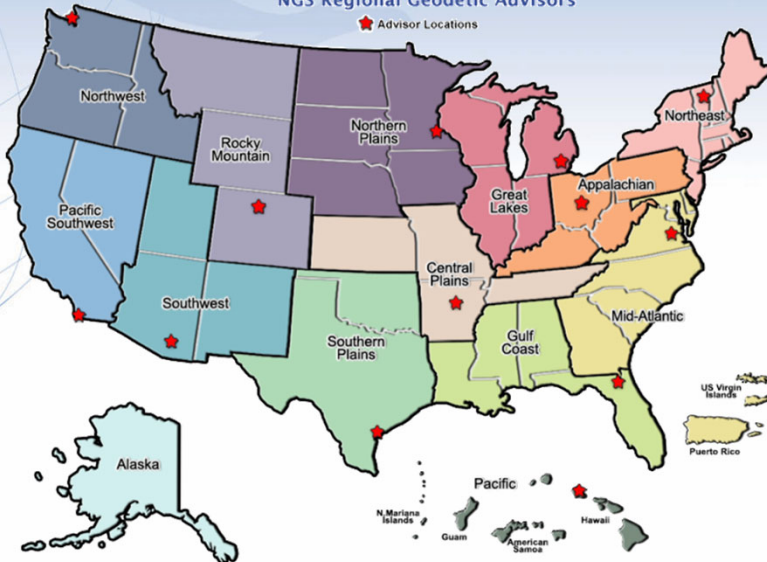


House Committee on Government Operations and Military Affairs
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NGS Regional Geodetic Advisors

★ Advisor Locations



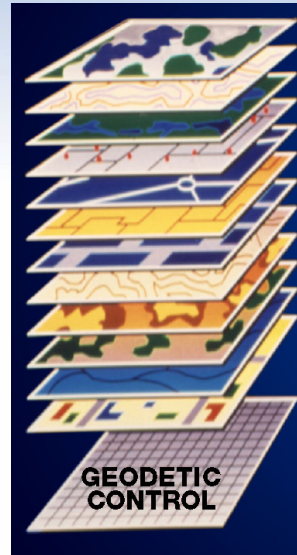
National Spatial Reference System (NSRS)

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

Consistent National Coordinate System

- Latitude/Northing
- Longitude/Easting
- Height
- Scale
- Gravity
- Orientation

& how these values change with time



The National Spatial Reference System supports



Nautical charts, among many other geospatial applications
National Oceanic and Atmospheric Administration



Emergency Response Imagery, Flood zones for the National Flood Insurance Program
Federal Emergency Management Agency



Levee Safety Program to determine levee heights & positions
United States Army Corps of Engineers



Topographic Maps and interior water data for the nation
United States Geological Survey



NSRS gravity data for the geospatial mission of NGA
National Geospatial-Intelligence Agency

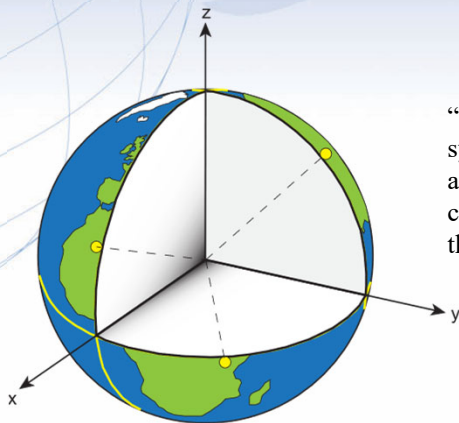


Aeronautical Data Quality Assurance
Federal Aviation Administration

National Spatial Reference System (NSRS) Improvements over time

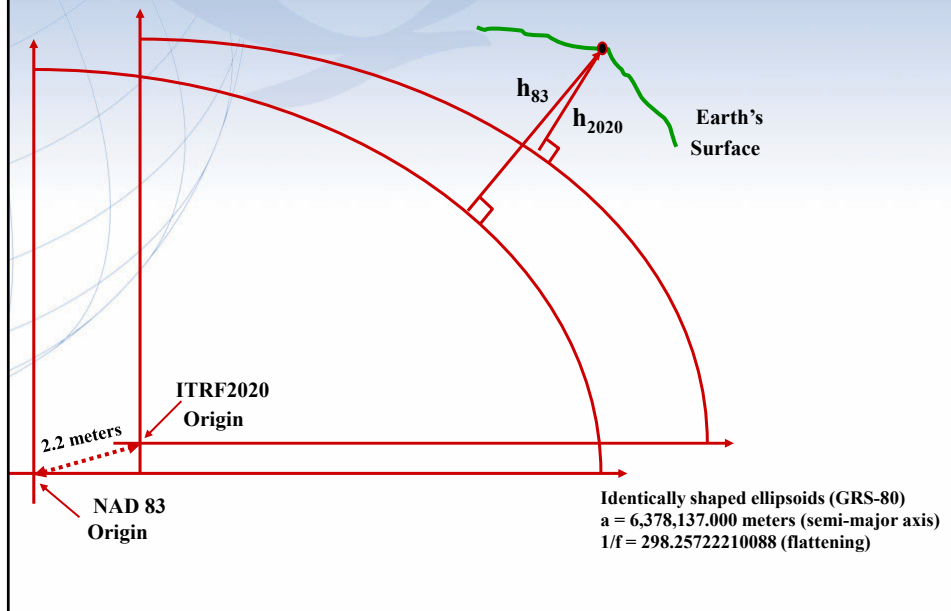
| NETWORK | TIME SPAN | NETWORK ACCURACY | LOCAL ACCURACY | SHIFT |
|---|-----------|------------------|----------------|----------|
| North American Datum of 27 NAD 27 | 1927-1986 | 10 meters | (1:100,000) | |
| North American Datum of 83 NAD83(86) | 1986-1990 | 1 meter | (1:100,000) | 10-200 m |
| North American Terrestrial Reference Frame of 2022 NATRF2022 | 2025- | 0.01 meter | 0.01 meter | ≈ 1.30 m |

International Terrestrial Reference Frame (ITRF)



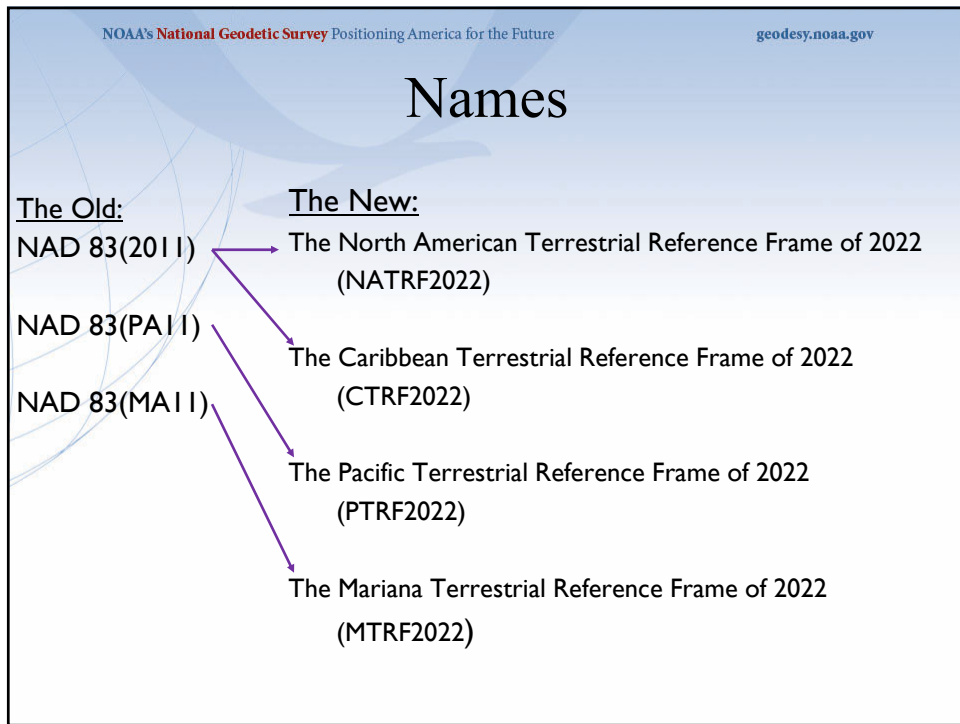
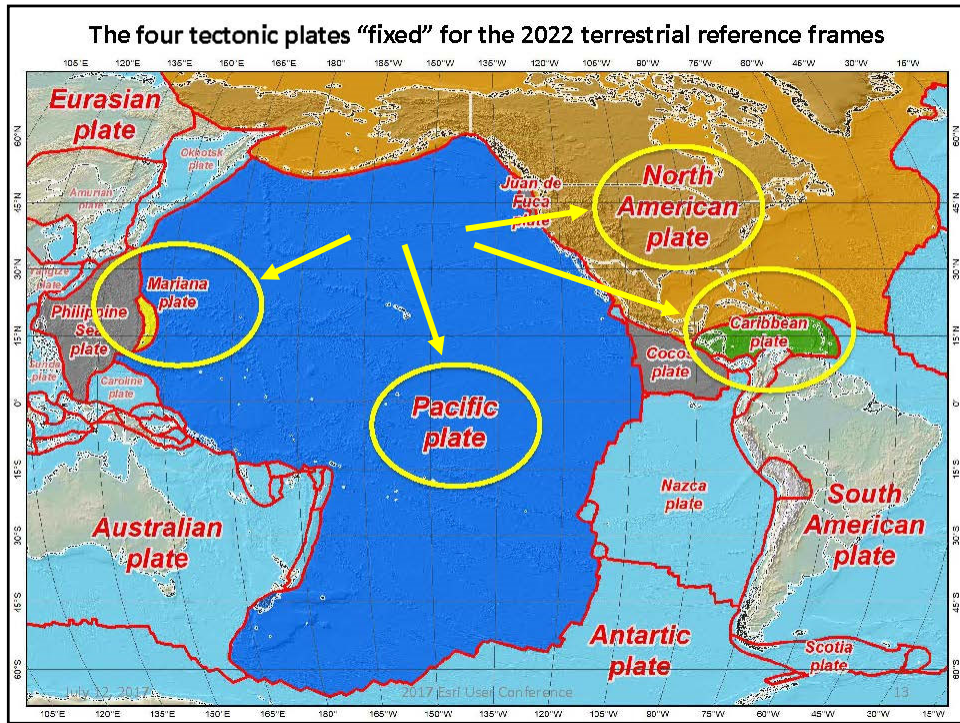
“Realization” of the idealized reference system occurs when coordinates are assigned to physical points in a self-consistent manner that honors the rules of the reference system.

Simplified Concept of NAD 83 vs. ITRF2020



Why Replace NAD 83?

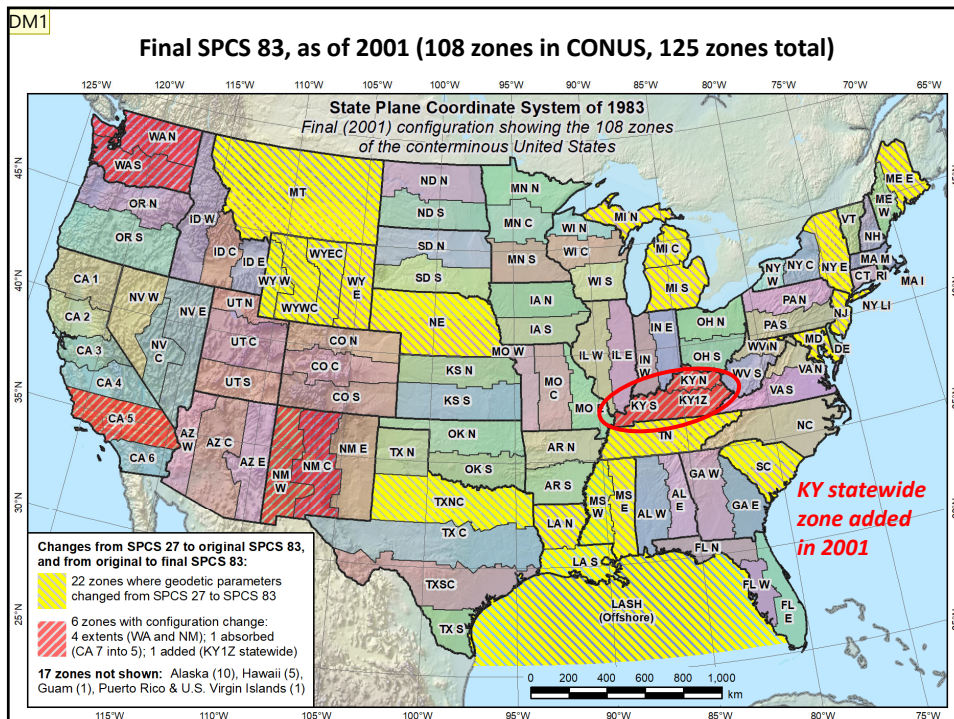
- **NAD 83** is not as geocentric as it could be (approx. 2 m)
- **NAD 83** is not well defined with positional velocities
 - Earthquakes, landslides, intra-plate motions (horizontal)
 - Post Glacial Isostatic Adjustment (uplift in some places subsidence in others)
 - Subsurface fluid withdrawal (subsidence)
 - Sediment loading (subsidence)



NOAA's National Geodetic Survey Positioning America for the Future geodesy.noaa.gov

What is the State Plane Coordinate System (SPCS)?

- SPCS is a system of large-scale conformal map projections originally created in the 1930s to support surveying, engineering, and mapping activities throughout the U.S. and its territories. A map projection is a mathematical transformation of latitudes and longitudes on the surface of a sphere or ellipsoid representing the Earth to grid coordinates (*northing, easting* or *y, x* values) on a plane.
- Since its inception, SPCS has served as a practical means for NGS customers to access to the National Spatial Reference System (NSRS).



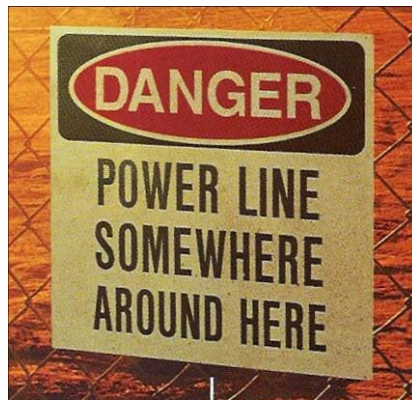
Slide 12

DM1

Dan Martin, 12/14/2018

Why does all this “stuff” matter?

- Geospatial data is everywhere
- Usefulness diminished if “stuff” doesn’t line up



Courtesy of Michael Dennis

Who is affected by this change?

- Anyone creating or using or updating surveys, maps, or other products tied to the NSRS.
 - Surveyors, Engineers, GIS Professionals, etc...
 - Many/most Federal Agencies who produce mapping products.
 - Many State Agencies including VTrans, ANR, Digital Services (VCGI)
 - Town Governments (Tax Maps, Municipal mapping of infrastructure)
 - Construction (layout and machine control)
 - Agriculture (Precision Farming)

Questions?

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Extra Slides

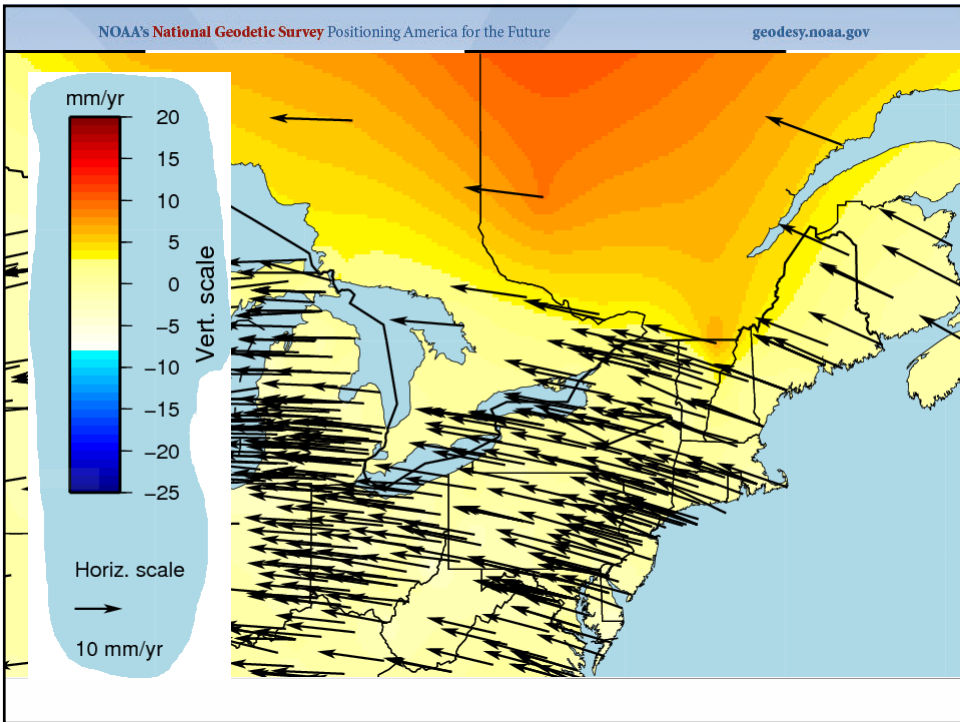
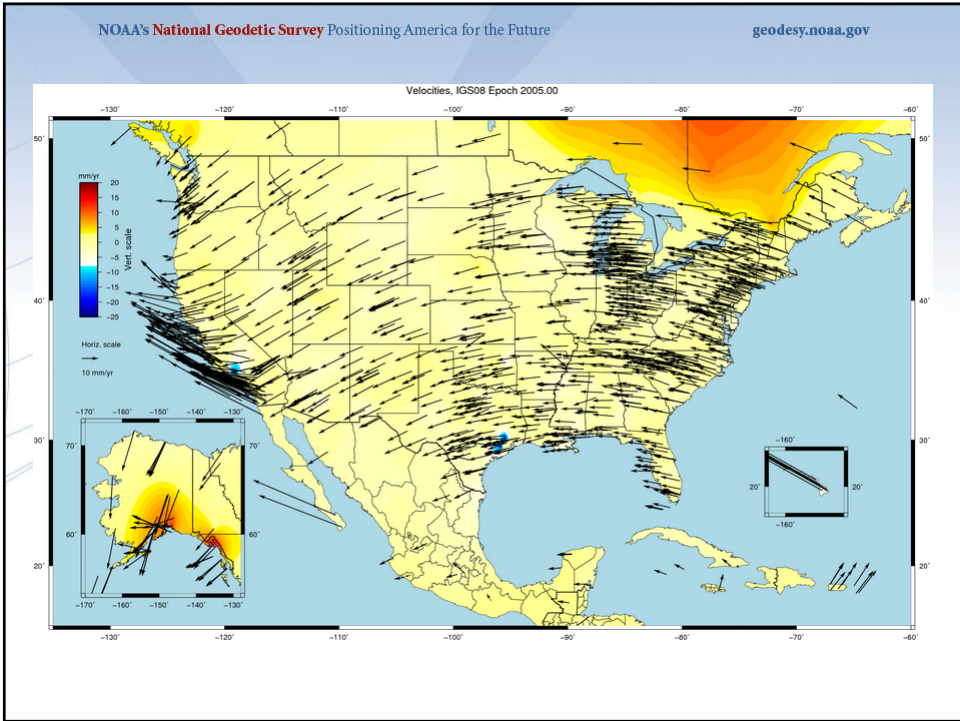
What is a Datum? What is it's purpose?

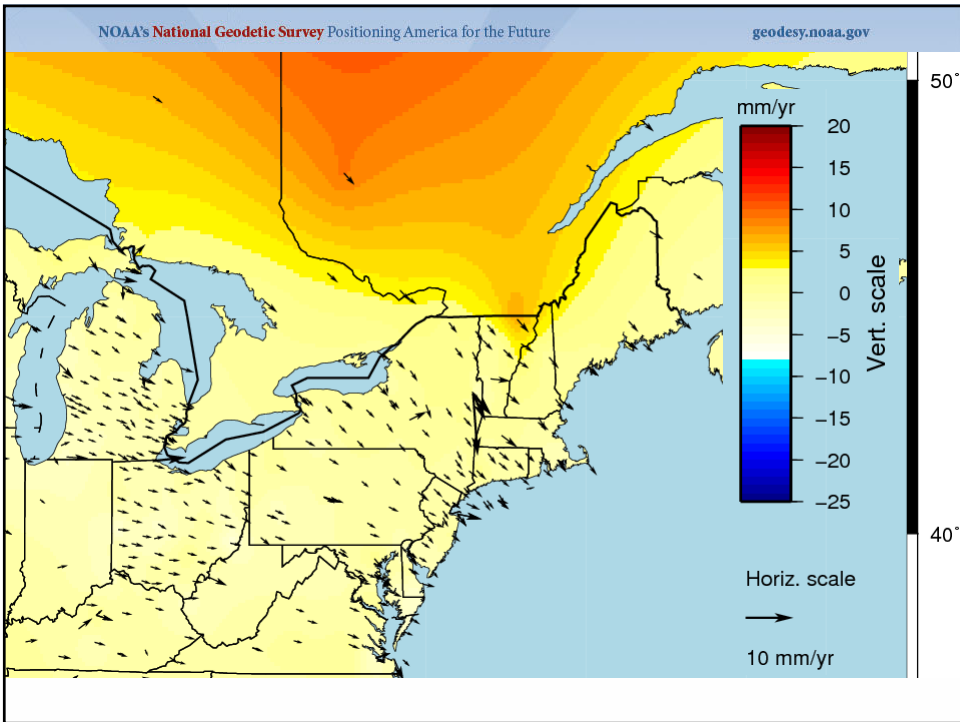
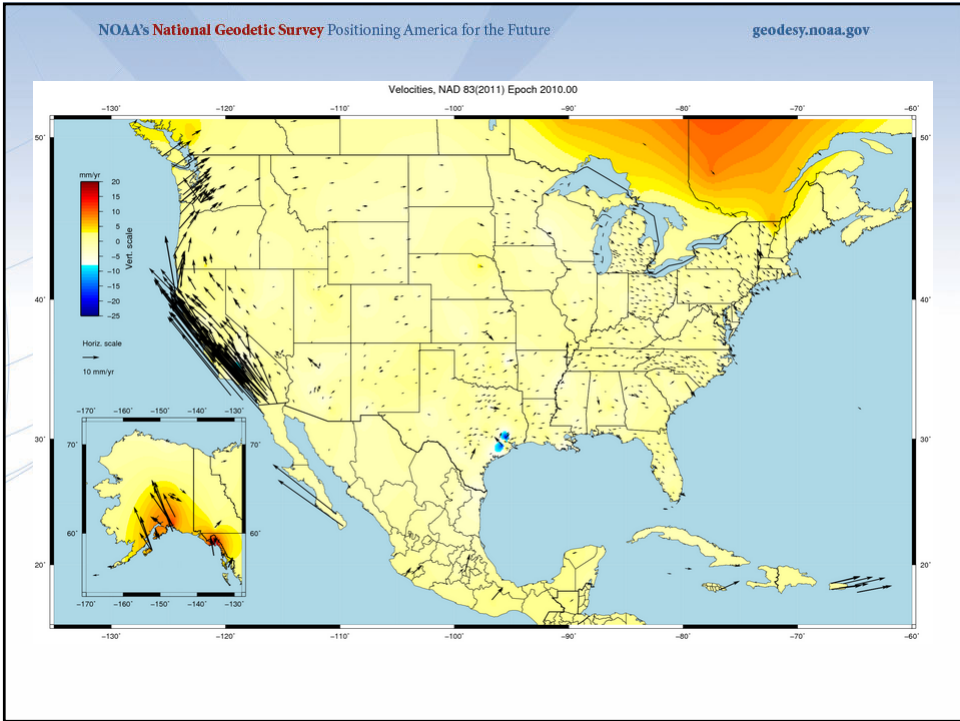
- "A set of constants specifying the coordinate system used for geodetic control, i.e., for calculating the coordinates of points on the Earth."
- Geodesists and surveyors use datums to create starting or reference points for floodplain maps, highway surveys, property boundaries, construction surveys, levee design, or other work requiring accurate coordinates that are consistent with one another.

Traditional horizontal geodetic datums

North American Datum of 1927 (NAD27)



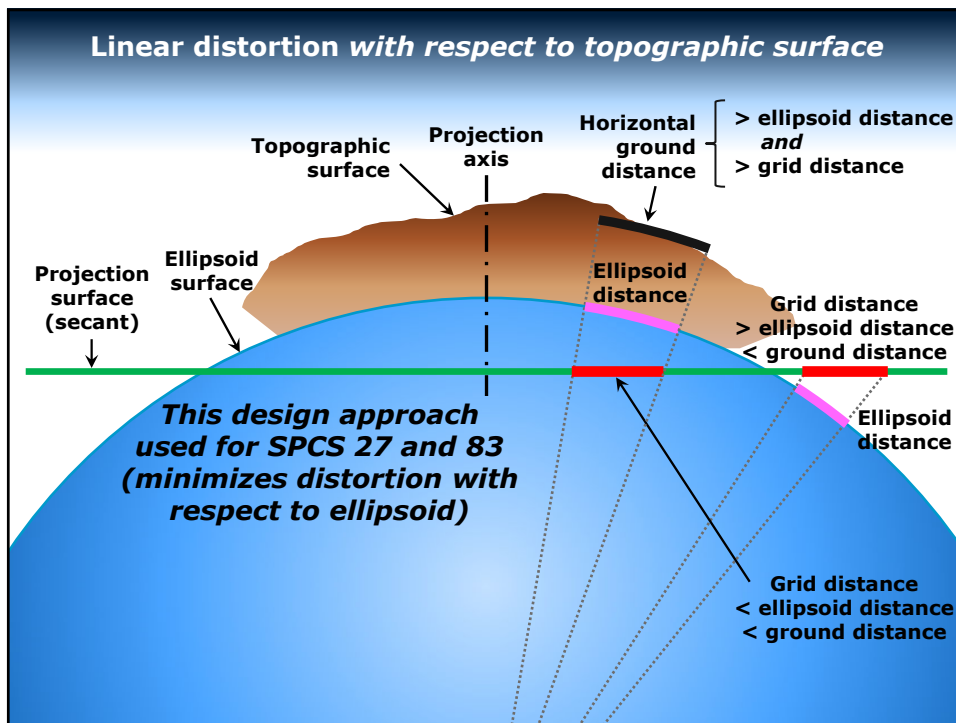
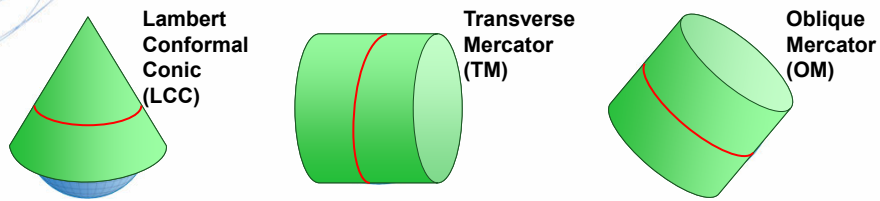


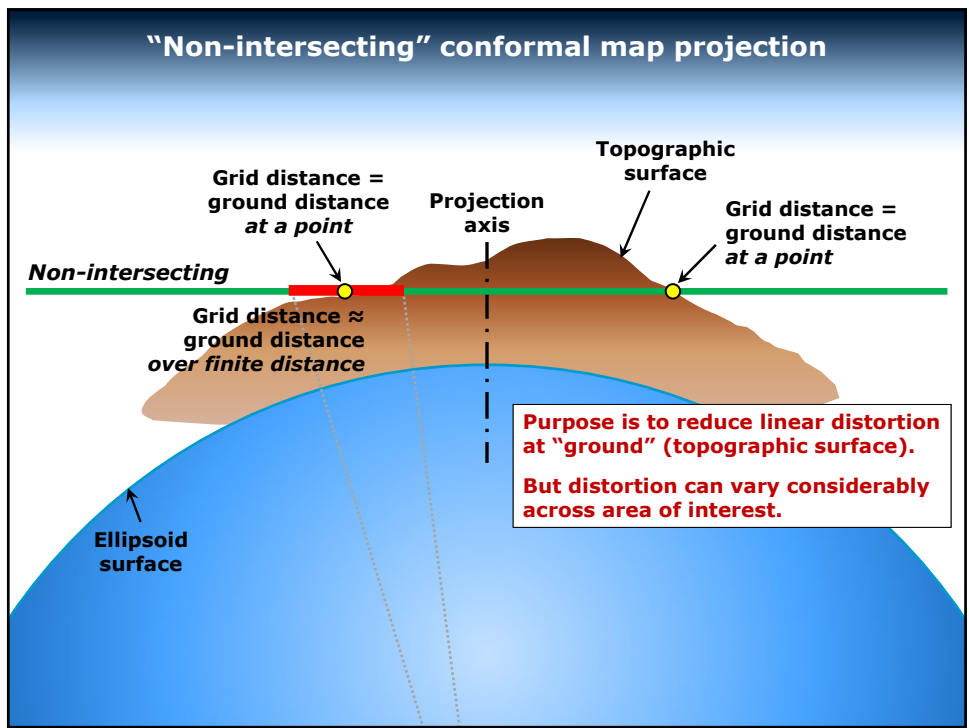
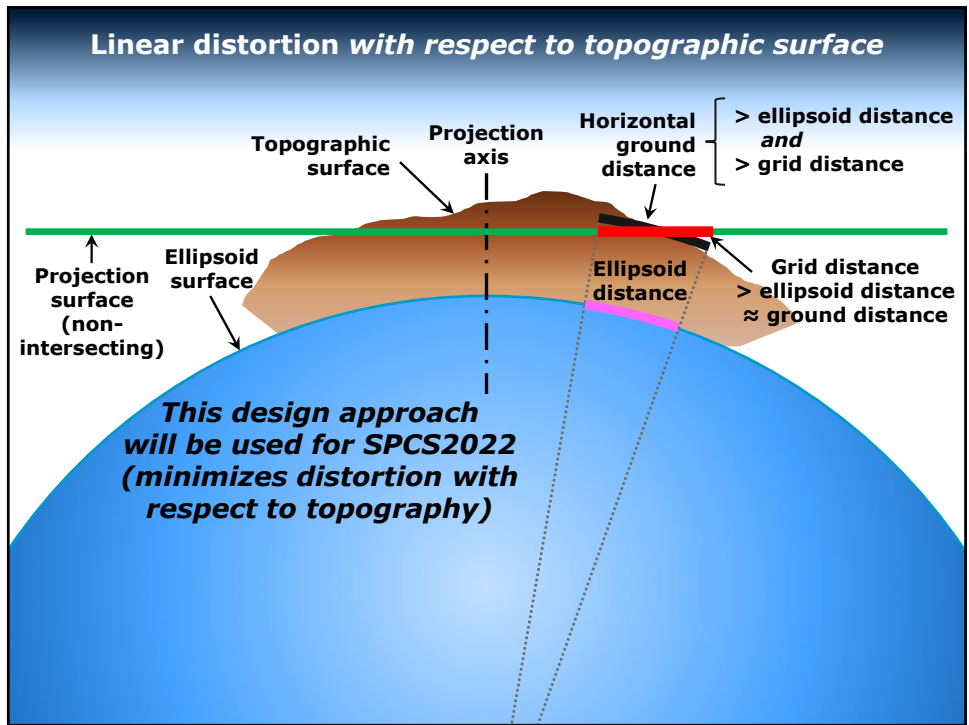


A New State Plane Coordinate System

- **State Plane Coordinate System of 2022 (SPCS2022)**

- Referenced to 2022 Terrestrial Reference Frames (TRFs)
- Based on same reference ellipsoid as SPCS 83 (GRS 80)
- Same 3 *conformal* projection types as SPCS 83 and 27:





Changing projection axis to reduce distortion variation

