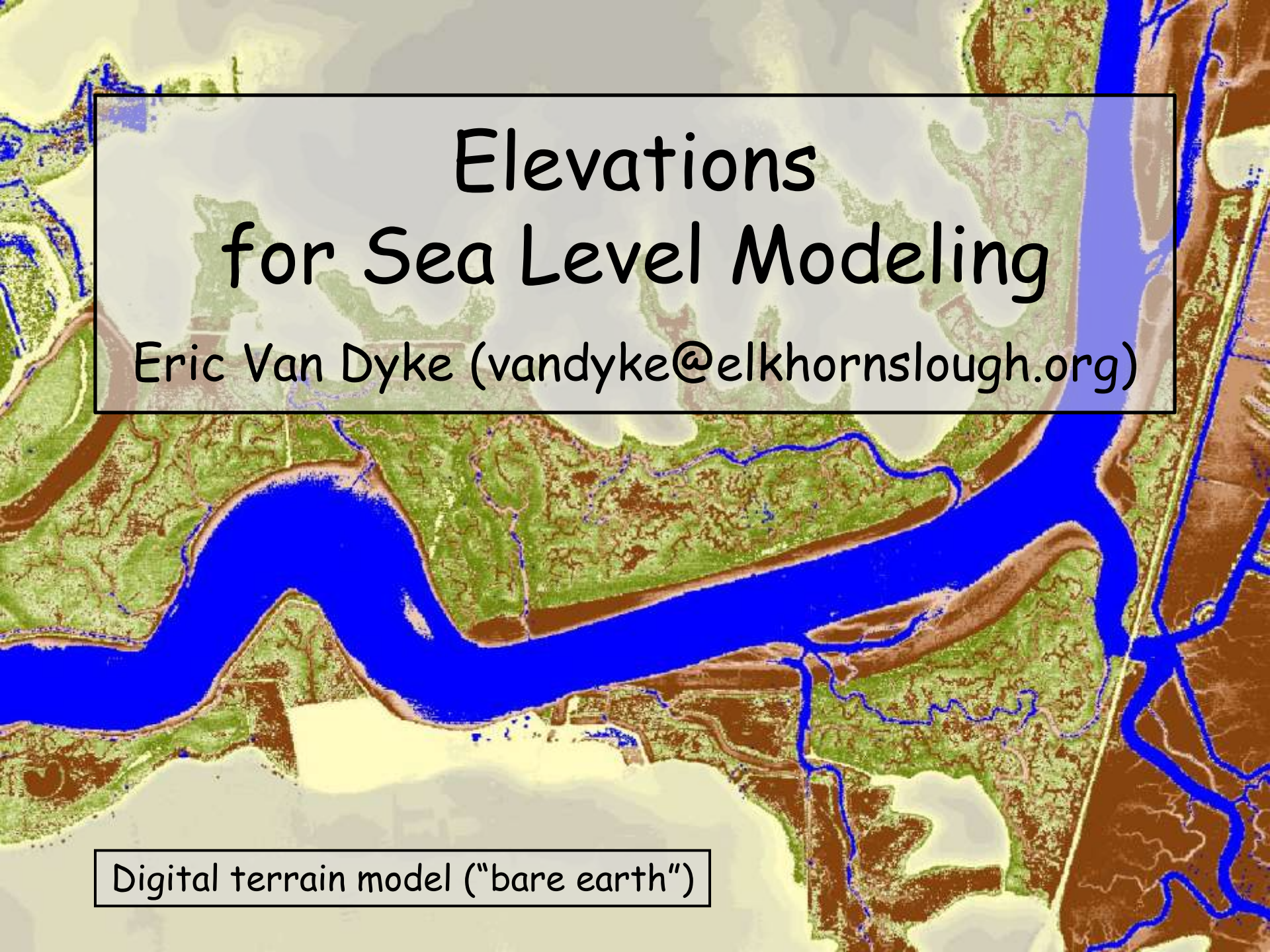
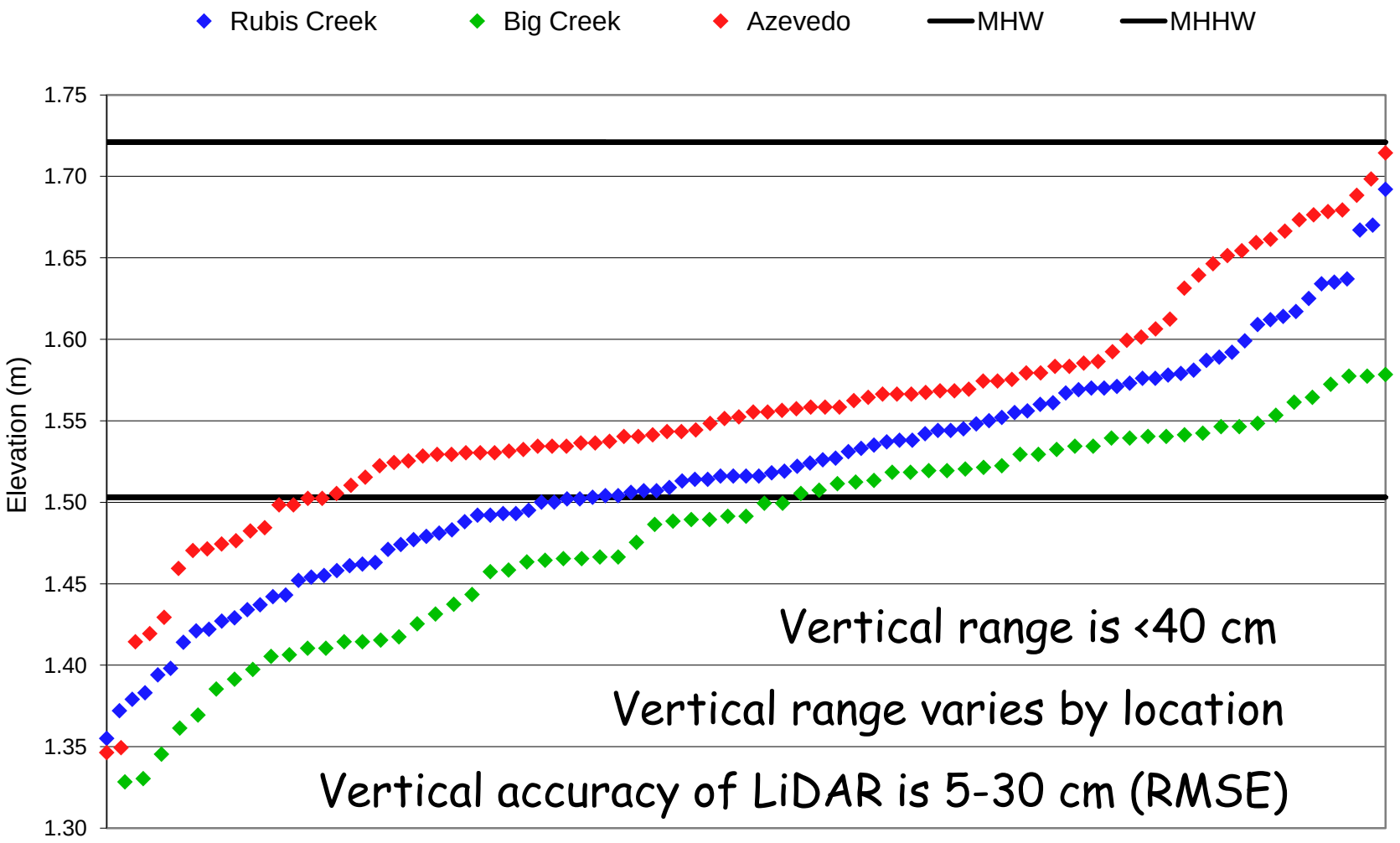
Elevations for Sea Level Modeling

Eric Van Dyke (vandyke@elkhornslough.org)

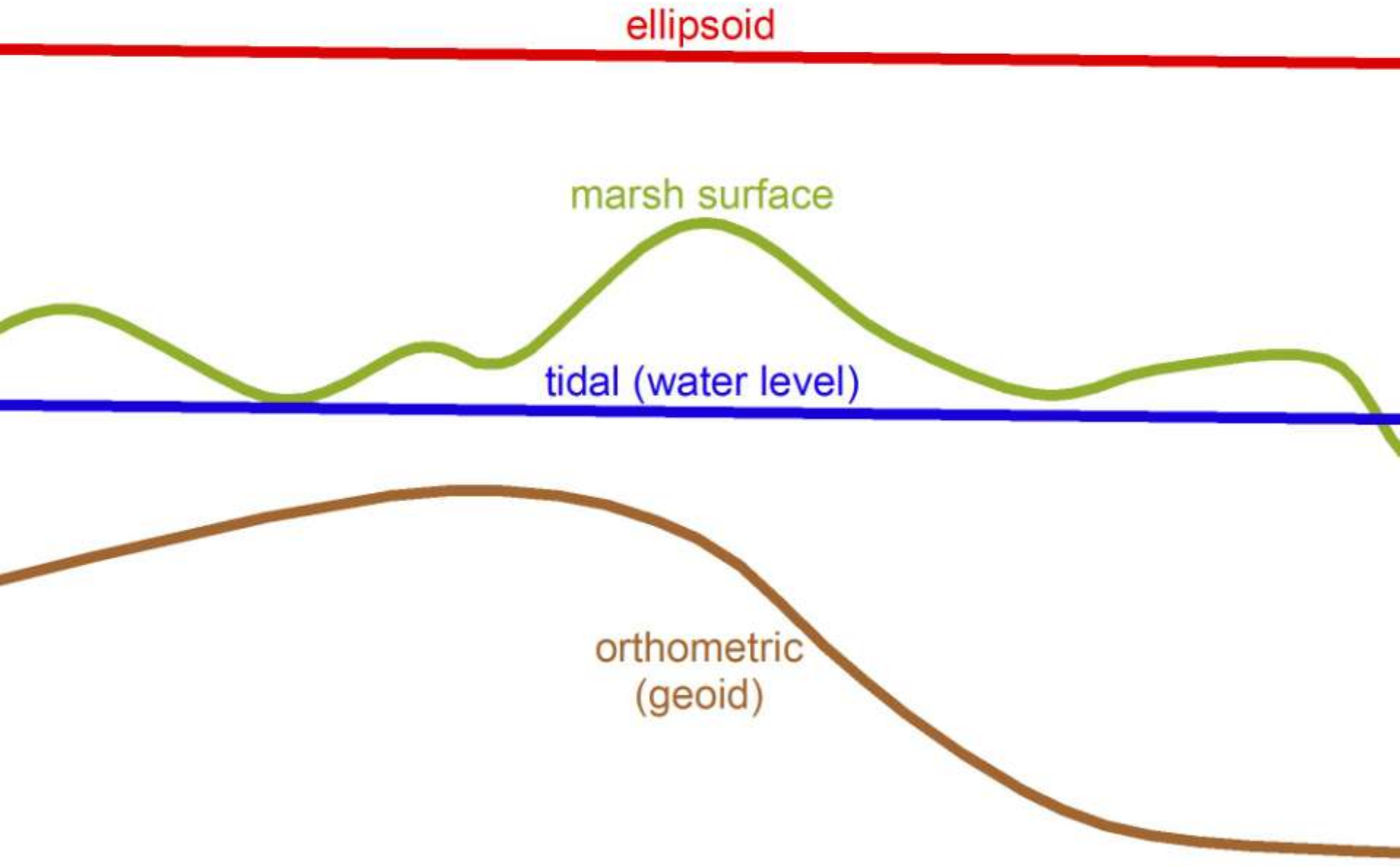


Digital terrain model ("bare earth")

Sorted marsh elevations (surveyed)



Vertical datums: orthometric, tidal, ellipsoid



Station: 9413651
Name: Kirby Park, Elkhorn Slough, CA
Status: Accepted (Mar 25 2009)

tidesandcurrents.noaa.gov

Epoch: 1983-2001
Datum: STND

Datum	Value	Description
MHHW	4.252	Mean Higher-High Water
MHW	4.034	Mean High Water
MSL	3.473	Mean Sea Level
MTL	3.468	Mean Tide Level
DTL	3.412	Mean Diurnal Tide Level
MLW	2.902	Mean Low Water
MLLW	2.572	Mean Lower-Low Water
NAVD88	2.531	North American Vertical Datum of 1988
STND	0.000	Station Datum
GT	1.680	Great Diurnal Range
MN	1.131	Mean Range of Tide
DHQ	0.219	Mean Diurnal High Water Inequality
DLQ	0.330	Mean Diurnal Low Water Inequality
HWI	6.86	Greenwich High Water Interval (in Hours)
LWI	12.35	Greenwich Low Water Interval (in Hours)
HAT	4.781	Highest Astronomical Tide
HAT Date	19861231	Highest Astronomical Tide Date
HAT Time	10:00	Highest Astronomical Tide Time
LAT	2.027	Lowest Astronomical Tide
LAT Date	19861231	Lowest Astronomical Tide Date
LAT Time	17:24	Lowest Astronomical Tide Time

Vertical Datum Transformation

vdatum.noaa.gov

Integrating America's Elevation Data

Home | About | Download | Education | Development | Contact Us

- What's New?
- VDatum Features
- **Est. of Vertical Uncertainties**
- **Download VDatum now**
- **Online User Guide**
- Troubleshooting / FAQs

Welcome to VDatum!

Update of the Gulf of Mexico coast from St. Joseph Bay, FL to Mobile Bay, AL and the eastern half of Louisiana/Mississippi coasts (08/10/2011)! NEW!

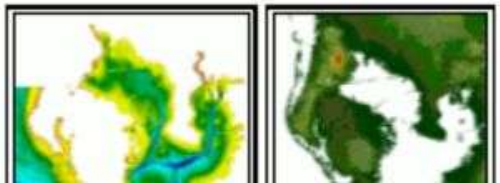
VDatum is a free software tool being developed jointly by NOAA's National Geodetic Survey (NGS), Office of Coast Survey (OCS), and Center for Operational Oceanographic Products and Services (CO-OPS). VDatum is designed to vertically transform geospatial data among a variety of tidal, orthometric and ellipsoidal vertical datums - allowing users to convert their data from different horizontal/vertical references into a common system and enabling the fusion of diverse geospatial data in desired reference levels.

Where available and uncertainties are established, VDatum converts the following:

- **Horizontal datums**: from NAD 27 or NAD 83(1986) to NAD 83(HARN) and other ellisoidal datums such as WGS 84 and ITRF
- **Vertical datums**: among three vertical groups: tidal datums, orthometric datums and ellipsoidal datums (i.e. three-dimension or 3-D datums), in which:
  - Tidal datums are available along the coastlines from Rhode Islands to Texas and from Washington to California. (Why doesn't VDatum provide tidal conversions inland?)
  - Transforms among ellipsoidal and orthometric datums are available throughout the United States;
  - Conversions between the NAD 83 ellipsoidal datum and the NAVD 88 orthometric datum are calculated base on the current GEOID model of 2009. Previous NGS's GEOID models are also supported, including GEOID 99,

The VDatum Demonstration Project in Tampa Bay, Florida

NOAA Bathymetry | USGS Topography



Convert LiDAR DTM to connected water surface

NOAA CO-OPS website (tidal datums and benchmarks)
http://tidesandcurrents.noaa.gov

NOAA Digital Coast website (coastal inundation modeling)
http://www.csc.noaa.gov/digitalcoast

Coastal Inundation Mapping Guidebook (2009)
http://www.csc.noaa.gov/digitalcoast/inundation/_pdf/guidebook.pdf

Detailed inundation methods document (for ArcGIS + Spatial Analyst)
http://www.csc.noaa.gov/slr/viewer/assets/pdfs/Inundation_Methods.pdf

NOAA VDatum website (vertical datum transformations)
http://vdatum.noaa.gov

www.ngs.noaa.gov

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GU3199 ***********************************************************
GU3199  TIDAL BM     -  This is a Tidal Bench Mark.
GU3199  DESIGNATION  -  941 3651 B TIDAL
GU3199  PID          -  GU3199
GU3199  STATE/COUNTY-  CA/MONTEREY
GU3199  USGS QUAD    -  PRUNEDALE (1993)
GU3199
GU3199                        *CURRENT SURVEY CONTROL
GU3199 ______________________________________________________________
GU3199* NAD 83(1986)-  36 50 32.      (N)    121 44 48.      (W)      SCALED
GU3199* NAVD 88      -         2.121  (meters)       6.96   (feet)   READJUSTED
GU3199 ______________________________________________________________
GU3199  GEOID HEIGHT-          -33.59 (meters)                       GEOID09
GU3199  DYNAMIC HT  -           2.120 (meters)       6.96   (feet)   COMP
GU3199  MODELED GRAV-      979,874.7  (mgal)                         NAVD 88
GU3199
GU3199  VERT ORDER   -  ?
GU3199
GU3199.The horizontal coordinates were scaled from a topographic map and have
GU3199.an estimated accuracy of +/- 6 seconds.
GU3199
GU3199.The orthometric height was determined by differential leveling
GU3199.and adjusted in March 1993.
GU3199.The height was derived from older observations constrained to new
GU3199.heights in a crustal motion area.  The height is approximate in
GU3199.relation to other heights in its vicinity.
GU3199
GU3199.This Tidal Bench Mark is designated as VM 11895
GU3199.by the CENTER FOR OPERATIONAL OCEANOGRAPHIC PRODUCTS AND SERVICES.
GU3199
GU3199.The geoid height was determined by GEOID09.
```

www.ngs.noaa.gov/GEOID

The NGS Geoid Page

National Geodetic Survey

Geoid Quick Links

- NGS Geoid Home Page
- NGS Geoid models
- Publications
- NGS Geoid Research Page
- Geophysics of the Geoid
- Geoid Slope Validation Survey of 2011

Have a geoid question?

- Contact the Geoid Team

The National Geodetic Survey has released updated models for transforming heights between ellipsoidal coordinates and physical height systems that relate to water flow. These models cover regions including the conterminous United States (CONUS), Alaska, Hawaii, Guam and the Commonwealth of the Northern Mariana Islands, and American Samoa. Models for Puerto Rico and the U.S. Virgin Islands are being held back pending release of final control data for the USVI but will likely be released later this Fall. GEOID09 transforms to NAVD 88 in CONUS and Alaska and to the respective datums for all the other regions (each having its own datum point). Models for the Deflection of the Vertical have also been released for these same regions mainly for aid in navigation systems.

Latest models

Hybrid Geoids
Converts heights from NAD 83 to regional Vertical datums
(e.g., NAVD 88)

- GEOID09
- GEOID03 UPDATED - model g200307.bin (southern Louisiana)
- GEOID06
- GEOID99
- GEOID96

Gravimetric Geoids
Converts heights from ITRFxx to the NGS geoid surface
(not NAVD 88 or other Vertical datums)

Update LiDAR DTM geoid model

NOAA NGS website (benchmark datasheets)
http://www.ngs.noaa.gov

NOAA NGS geoid website (geoid models)
http://www.ngs.noaa.gov/GEOID

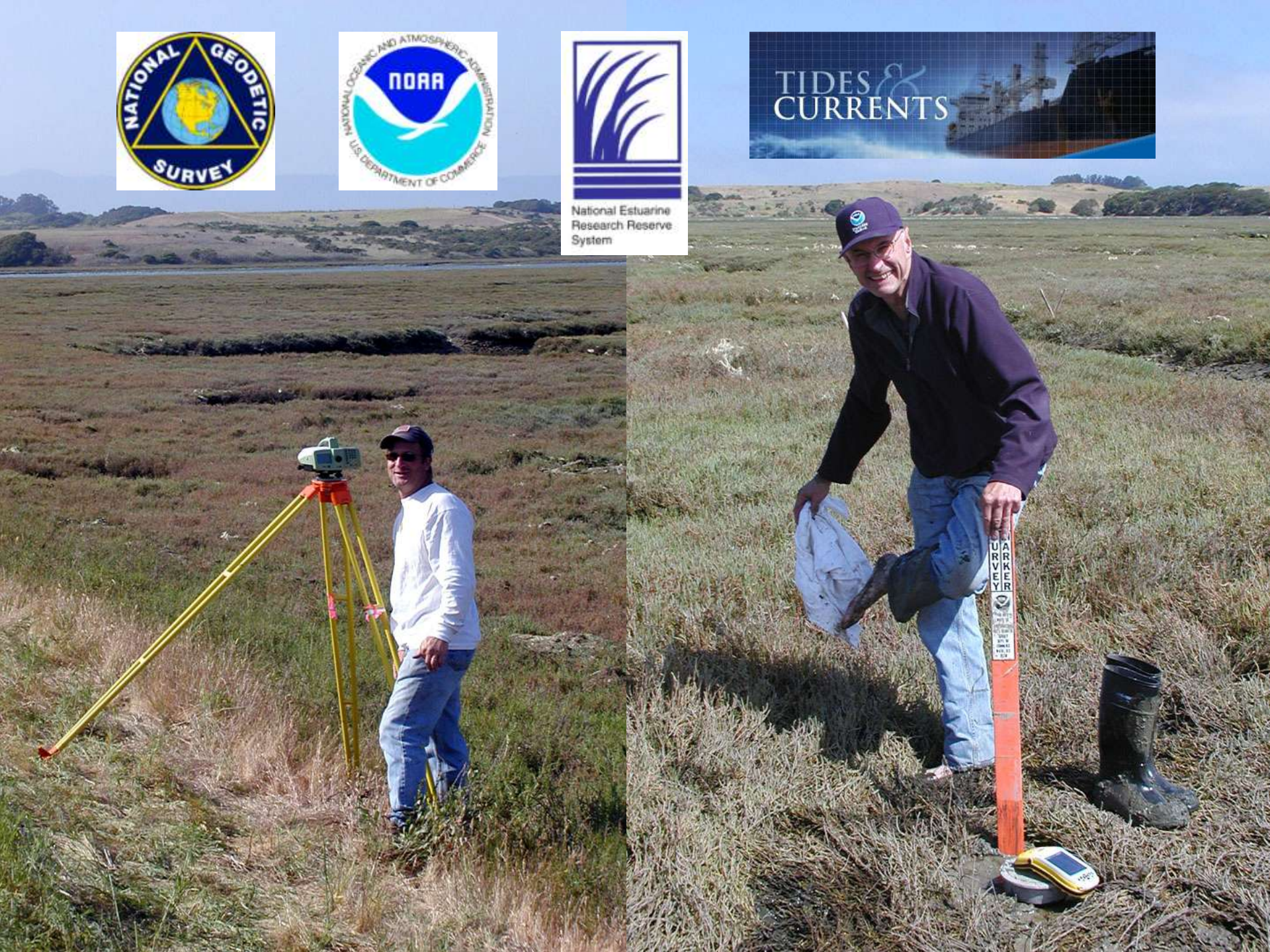
Sea level rise and geospatial data

Technical Considerations for Use of Geospatial Data in Sea Level Change Mapping and Assessment (2010)
http://tidesandcurrents.noaa.gov/publications/tech_rpt_57.pdf

Lidar Data Collected in Marshes: Its Error and Application for Sea Level Rise Modeling (2010)
http://www.csc.noaa.gov/digitalcoast/data/coastallidar/_pdf/Lidar_marshes_slamm_CSC.pdf

Summary

- Use LiDAR elevations
  Vertical accuracy of IfSAR and most NED is >1m (RMSE)
- Update to GEOID09 (if necessary)
- Convert DSM to DTM (challenging in marsh!)
  Compensate for uplift/subsidence?
  Compensate for marsh vegetation bias?
- Enforce tidal connectivity (bridges, culverts)
- Convert DTM to water surface (VDatum)


NATIONAL GEODETIC SURVEY
NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE
National Estuarine Research Reserve System
TIDES & CURRENTS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PLEASE DO
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SURVEY MARKER
FOR INFO
WRITE TO
THE DIRECTOR
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SURVEY
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20230
1976
BENCH MARK


NATIONAL OCEAN SERVICE
FOR INFORMATION WRITE TO THE DIRECTOR WASHINGTON, D.C.
BENCH MARK


GEODETIC CONTROL
FOR INFORMATION OR TO REPORT DAMAGE WRITE TO
THE DIRECTOR NATIONAL GEODETIC SURVEY, WASHINGTON, D.C.