Alaska GeoSummit 2025 Workshop

Preparing for NSRS Modernization in Alaska : Tools, Products, and Services

Dena'ina Civic and Convention Center, Anchorage, AK

April 11, 2025

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Nate Murry, NOAA CO-OPS Vdatum Technical Coordinator

Jeff Jalbrzikowski, NOAA NGS Appalachian Regional Geodetic Advisor

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Gwen Gervelis, Alaska DNR Chief, Survey Section, NOAA NGS State Coordinator

Joel Cusick, Alaska Region National Park Service GIS Specialist

2025 Geosummit Workshop Agenda

1:30 -1:45 Intro : Preparation in the Alaska Region for NSRS Modernization

1:45 -3:45 NOAA's VDatum 4.7 : Training with NOAA/NGS Team

3:45-4:00 Break

4:00 -5:00 Alaska Partner Presentations, Demonstrations, and Discussion

Jeff Jalbrzikowski, NOAA NGS Appalachian Regional Geodetic Advisor

VDatum Demonstration

Frequently Asked Questions

https://vdatum.noaa.gov/docs/faqs.html

Information available on VDatum's Site

On This Page

Download VDatum

Prerequisite: Java Runtime Environment (JRE)

NEW!

*Running VDatum requires that Java Runtime Environment (JRE) 1.8.0 or newer version be installed on the user's computer. Since the big change from Oracle Java-11, please check JRE or JDK version and settings on your local environment before you run VDatum application.

The OpenJDK-11.0.2_Windows-x64 is bundled with this download package. Also you can modify settings to run VDatum application by using your local JRE or JDK

For more information about how to set up Java Home for VDatum app, click on this link
About Java Home

For OpenJDK release information, click on this link:
https://jdk.java.net/archive/

For Oracle Java release information, click on this link:
https://www.oracle.com/technetwork/java/index.html

Download the latest Full Package

	Size (Mb)
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On This Page

- Interpolation Overview
- GTX Overview
- ASCII GTX File Format
- Binary GTX File Format

VDatum Transformation Grid Formats

Interpolation Overview

As you traverse various paths along the VDatum roadmap, both parameter transformations and grid based interpolation might be utilized for transforms. 3-D datums provide the foundation for accurate determination of ellipsoidal heights and employ parameter transforms contained within HTDP. Orthometric datums are those that employ the Earth's gravity field as their datum and Tidal datums are those based on tidally-derived surfaces of high or low water and both of these employ grids for the transform. In order to provide transformation values at any point within the gridded area, it is necessary to interpolate between grid-defined points. The following interpolation methods are utilized in VDatum.

Bilinear interpolation: Bilinear interpolation is the use of quadratic functions in two dimensions, to interpolate a value at any location, from some given grid of values. In order to provide a unique solution therefore, bilinear interpolation relies upon the nearest 2 × 2 set of grid points to the point of interpolation (POI). Inverse distance weighted interpolation method is used when there is more than one Null point.

Biquadratic Interpolation: As its name implies, biquadratic interpolation is the use of quadratic functions in two dimensions, to interpolate a value at any location, from some given grid of values. In order to provide a unique solution therefore, biquadratic interpolation relies upon the nearest 3 × 3 set of grid points to the point of interpolation (POI).

Type of Transformation	Interpolation
Tidal Transform	Bilinear

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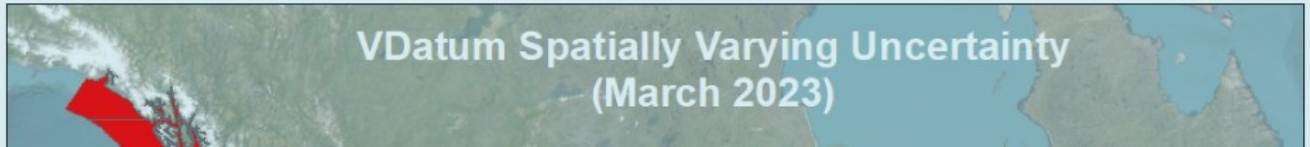
VDatum Transformation Grid Formats

Estimation of Vertical Uncertainties in VDatum

Created in: March 2009. Revised: May 2016

- Accuracy of Transformation
- Accuracy of the Source Data
- Other Considerations
- Accuracy of Transformation Between NAVD 88 - NGVD 29
- Topography of the Sea Surface Accuracy
- Tidal Transformation Accuracy
- Tidal Datum Accuracy
- References

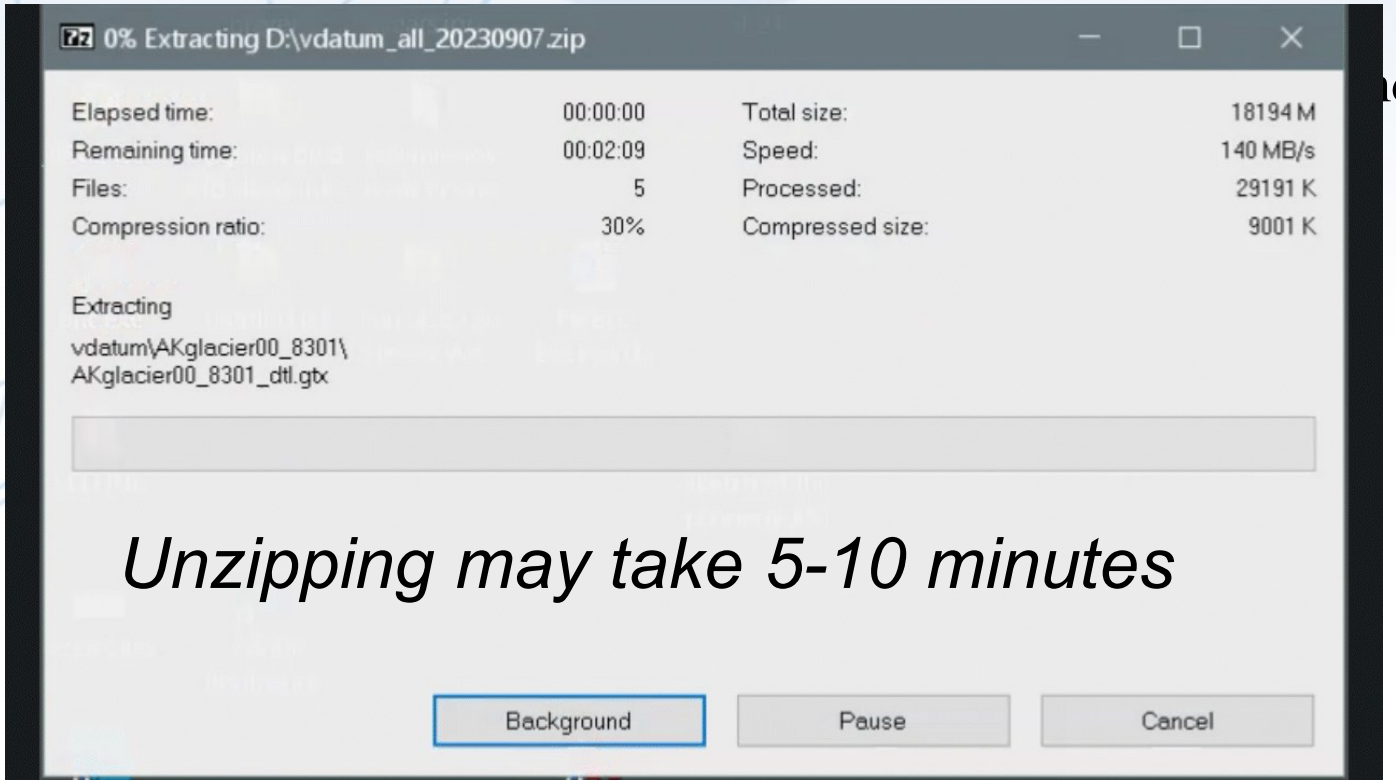


IT Environment Questions

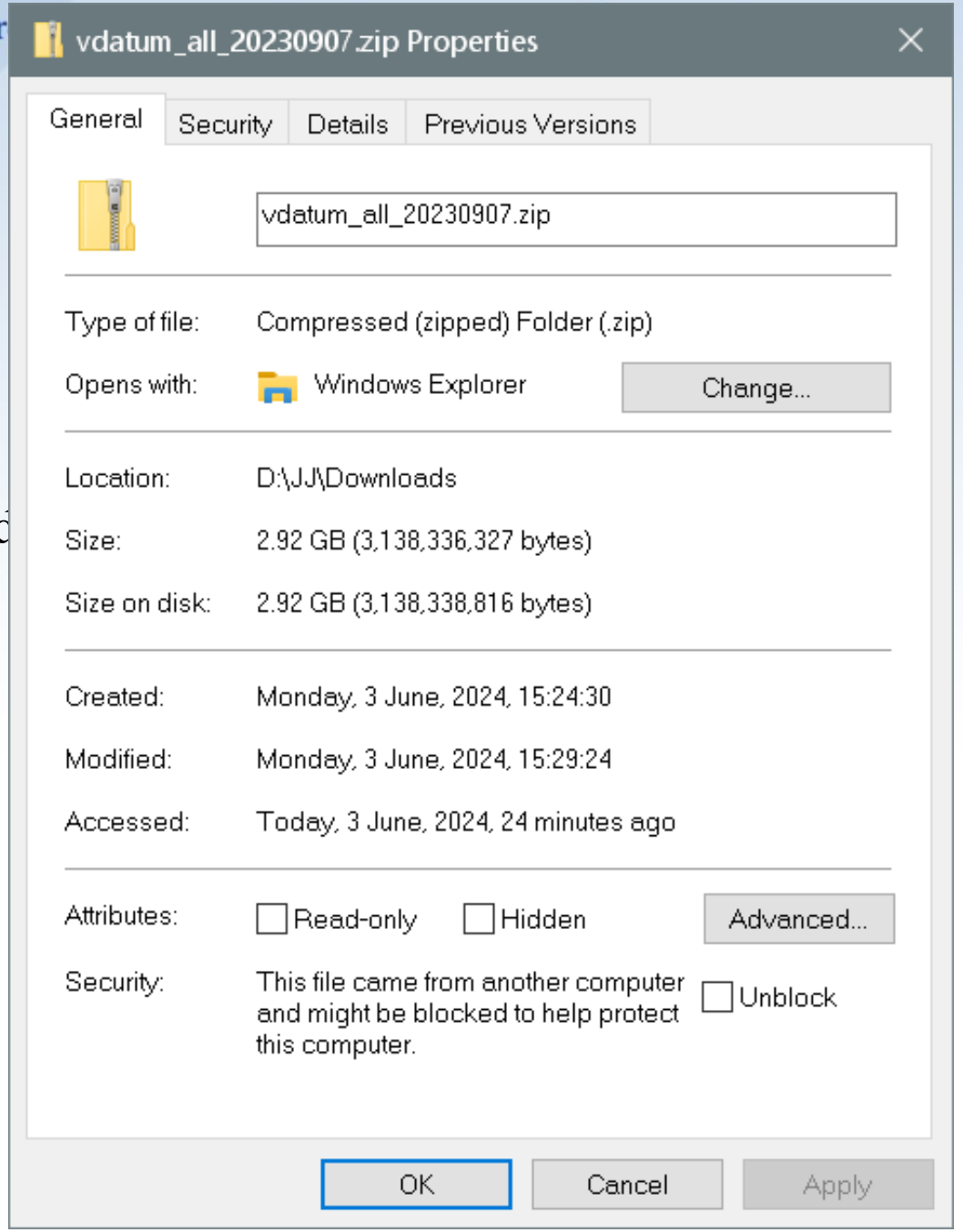
https://vdatum.noaa.gov/docs/faqs.html

IT Environment Questions

- **Installation**



Unzipping may take 5-10 minutes



IT Environment Questions

- **Installation**
- **Difference between downloadable executable software and online service**
- Access to the API

IT Environment Questions

- **Installation**
- **Difference between downloadable executable software and online service**
- Access to the API

- **Which OS does VDatum run on?**
- **I have the latest Java, however when I double click vdatum.bat, the command prompt window flashes for a split second and the application does not launch.**
- **Running "java -jar vdatum.jar" at the command prompt window gives me "java is not recognized as an internal or external command, operable program or batch file".**

IT Environment Questions

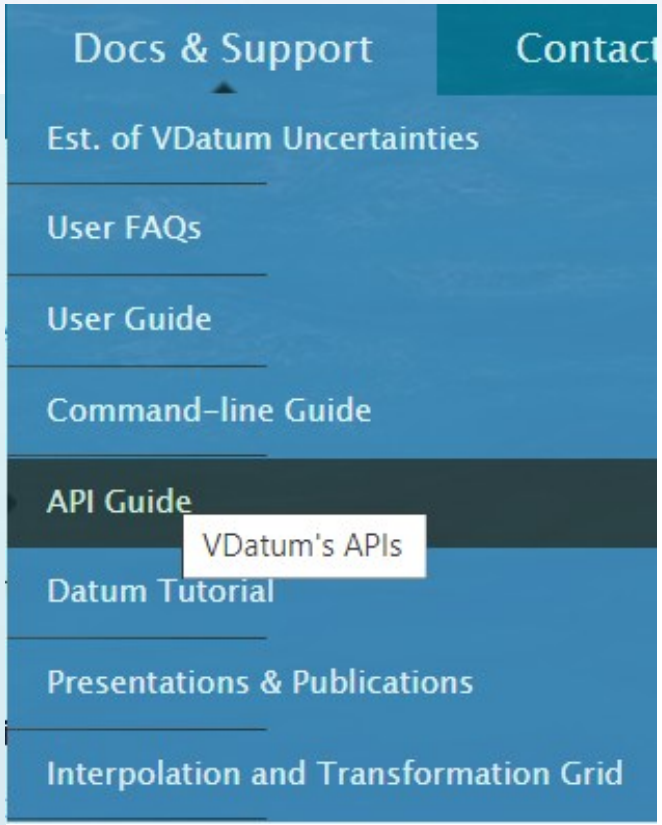
- Installation
- Difference between downloadable executable software and online service
- **Access to the API**

VDatum API Documentation

VDatum API Documentation describes how to use the APIs and includes code samples.

JSON - VDatum Full API

- VDatum Full API Diagram
- Response Elements
- Request URL
- Request parameters
- Regions List
- Horizontal Reference Frames List
- Vertical Reference Frames List
- Sample URL requests and responses



Working with the Datum Transformation Grid (.GTX)

- VDatum Transformation Grid Format
- Coverage
  - Boundary polygons and VDatum/Tidal Transformation Grids
  - Tidal datum coverage beyond the shoreline
  - No-data-value (-999999.0) output
- Working in GIS environments

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https://vdatum.noaa.gov/docs/gtx_info.html

VERTICAL DATUM TRANSFORMATION

INTEGRATING AMERICA'S ELEVATION DATA

On This Page

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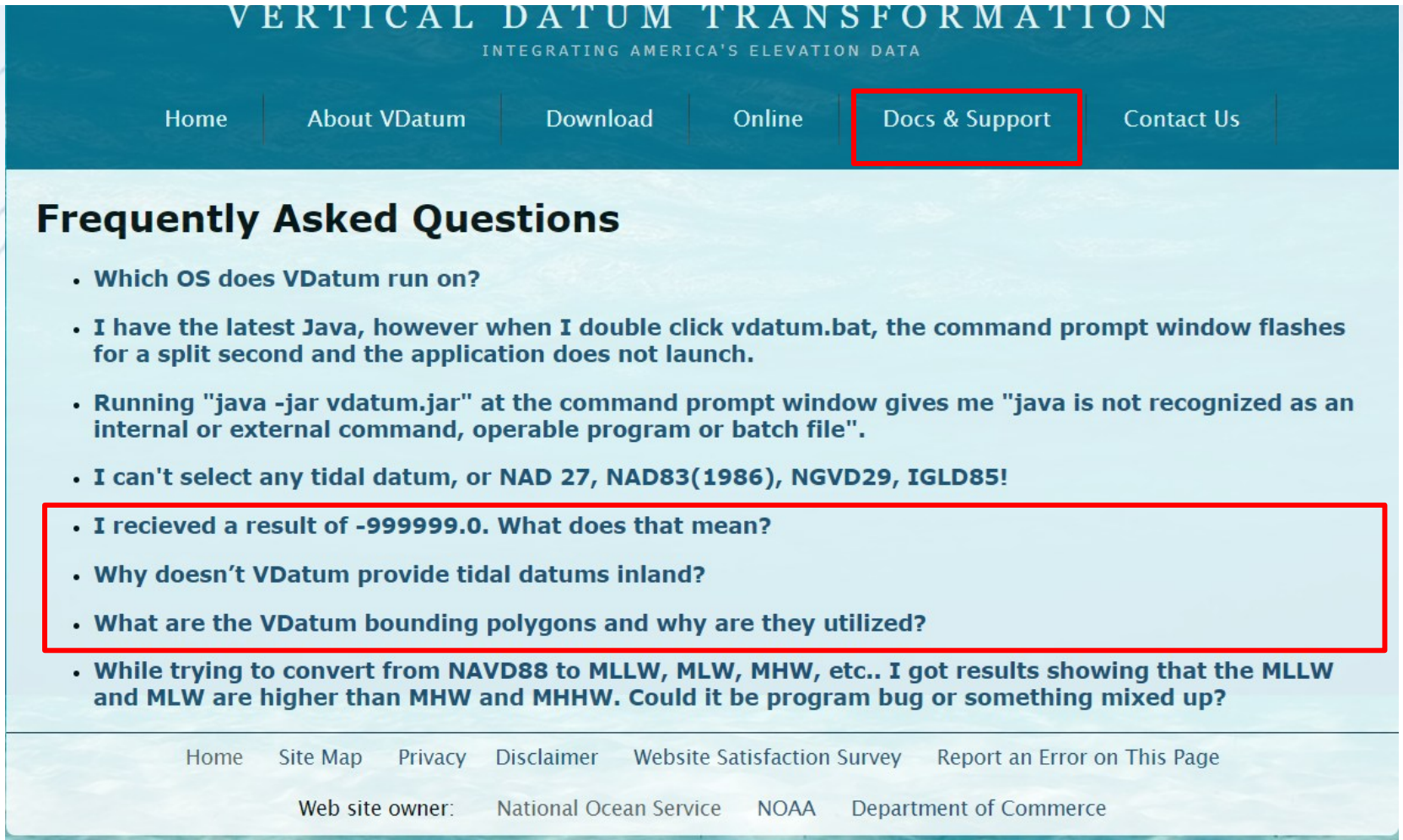
Updating VDatum's Frequently Asked Questions

https://vdatum.noaa.gov/docs/faqs.html



Boundary polygons and Transformation Grids

As mentioned earlier, the **VDatum Transformation Grids** provide:

- Parameter transformations
- Grid based interpolation might be utilized for transforms..

The boundary Polygons supplement the **VDatum Transformation Grids**, specifically the **Tidal Transformation Grids**. In order to define the area of valid transformations.

Bounding polygons provide the user with the correct vertical datum transformation values, including

- Separation between areas with different tidal characteristics.
- Delineation of borders between adjacent VDatum regions.
- Exclusion of regions based on their coastal morphological.

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Tidal datum coverage beyond the shoreline

Current coverage of the Tidal Datum transformations is about 500m from the shoreline (https://nsde.ngs.noaa.gov/). This is typically 1 to 2 km.

- **Why doesn't VDatum provide tidal datums inland?**

  Tidal datum transformations in VDatum extend only slightly inland of the mean high water (MHW) shoreline (1 or 2 km), but many applications seek to reference elevations to tidal datums further inland. The main reason that VDatum doesn't provide tidal datums inland is the fact that tidal datums have no physical meaning inland (until or unless that inland location becomes inundated by tides).

No-Data-Value (-999999.0)

When a location outside the Boundary polygons of the Transformation Grids is selected you will receive a No-Date-Value (-999999.0):

- **I recieved a result of -999999.0. What does that mean?**

  The -999999.0 is the no-data-value in our program. It occurs in areas where the transformations are invalid. In the tidal transformations, this -999999.0 value could mean that your elevation data are either out of the boundaries of our tidal transformation grids, or in the masked-out areas, i.e. inland or where are not covered by the tidal models.

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Working with GTX files in GIS environments

Drag and drop -

- The binary VDatum Transformation Grids can be read by ArcGIS, ArcPro, and QGIS.

Processing data in VDatum and analyzing the results

- Can't select a tidal datum, geometric or geopotential reference systems
- I see a difference in the orthometric heights/TSS values between the current VDatum and the previous version
- The VDatum tidal observations do not align with my local water level observations
- While trying to convert from NAVD88 to a tidal datum, I got results showing that the MLLW and MLW are higher than MHW and MHHW.

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Can't select a layer for a transformation

If you are using a downloadable executable, there might be an installation issue. As such, please follow the guidance located at: https://vdatum.noaa.gov/download.php

This issue may also be related to the work environment that you are trying to install the software.

Running VDatum requires that **Java Runtime Environment (JRE) 1.8.0 or newer version** be installed on the user's computer. There was a major change JRE since the Oracle Java-11. **Please check JRE or Java Development Kit (JDK) version** and settings on your local environment before you run VDatum application.

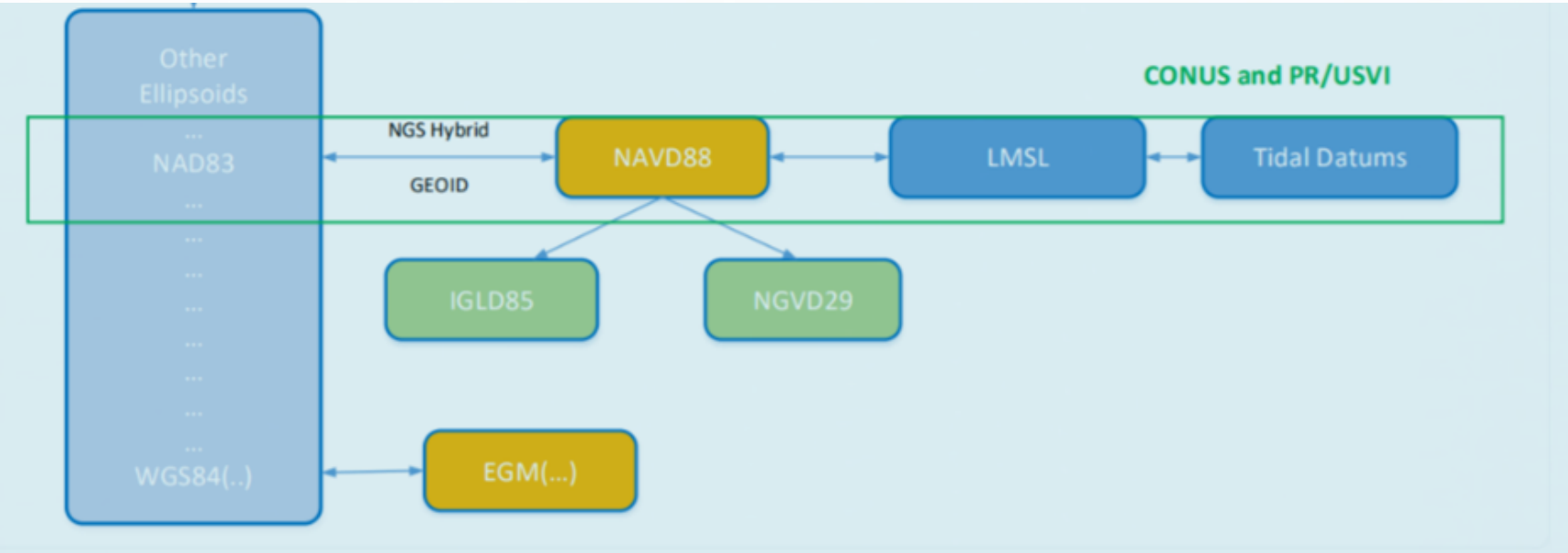
*The OpenJDK-11.0.2_Windows-x64 is bundled with this download package. Also you can modify settings to run VDatum application by using your local JRE or JDK.

Can't select a layer for a transformation

Another reason for not being able to select a transformation layer is that a transformation path does not exist.A good starting point is to use following link as reference:

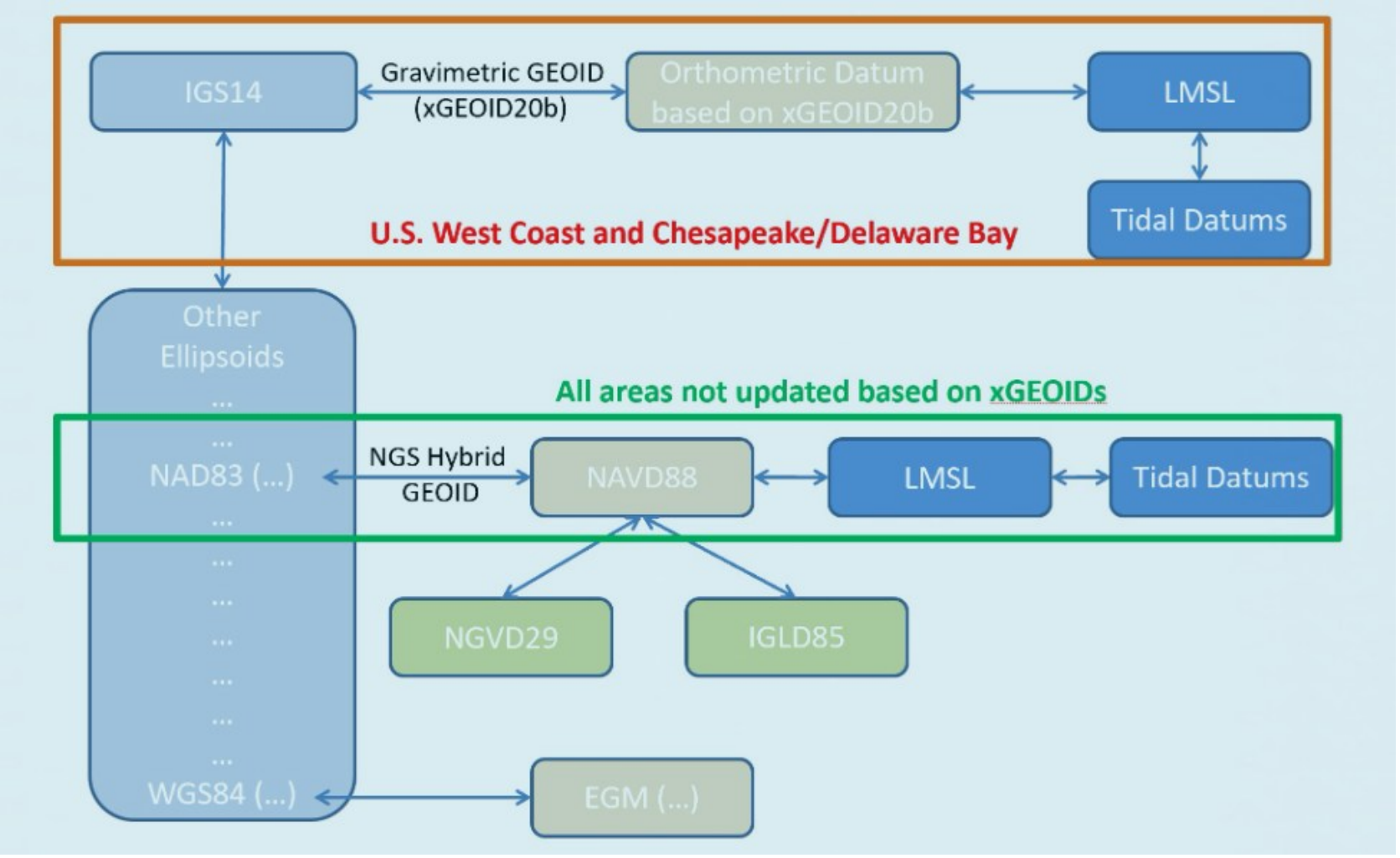
User Guide - https://vdatum.noaa.gov/docs/userguide.html

Although the lower 48 provide many transformation options, this options might not be available for specific geographic locations due coverage or accuracy of the transformation



Can't select a layer for a transformation

Similarly for **US West Coast, Peurto Rico /US Virgin Islands** and **Chesapeake/Delaware Bay**



Can't select a layer for a transformation

When transforming in a coastal regional model and traversing to Local Mean Sea Level (LMSL) or other Tidal Datums, it is important to understand the transformation roadmap differs from that of other currently supported VDatum regional models:

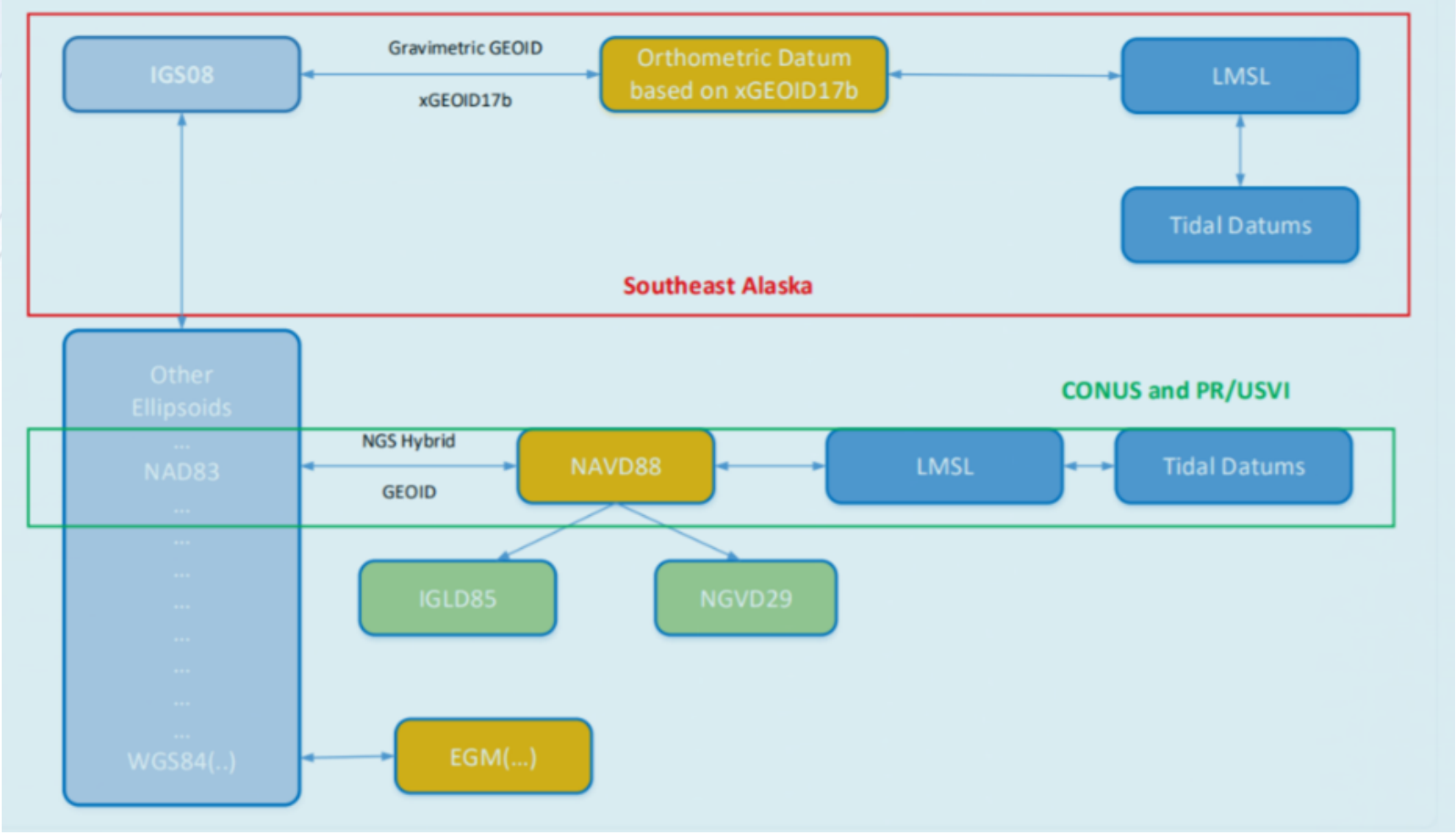
- **Chesapeake**
- **US West Coast**
- **Puerto Rico and US Virgin Islands**

The Target Horizontal reference frame automatically changes to **IGS14** when selecting LMSL or a Tidal Datum as the source or target vertical datum. The reason for this is that our roadmap traverses through **IGS14**, then utilizes **xGEOID20B**, and then into LMSL with the Topography of the Sea Surface (TSS) and then to tidal datums.

All other VDatum regional models traverse through **NAD83** and then to **NAVD88** utilizing a **NGS Hybrid GEOID**. The use of **xGEOID's** is to assist in preparation for transitioning to the modernized **National Spatial Reference System (NSRS)**.

Can't select a layer for a transformation

For example, **SE Alaska** does not have a EGM08 option



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I see a difference in the orthometric heights/TSS values between the current VDatum and the previous version

In the Columbia River, there is a significant change in the TSS/LMSL transformation grid values going from VDatum 4.3 to 4.4/4.5. What is the cause for this change?

In March, 2022 VDatum 4.4 had an updated layer for the West coast.

In October, 2022 VDatum added a Columbia River layer.

VDatum 4.5 is released!

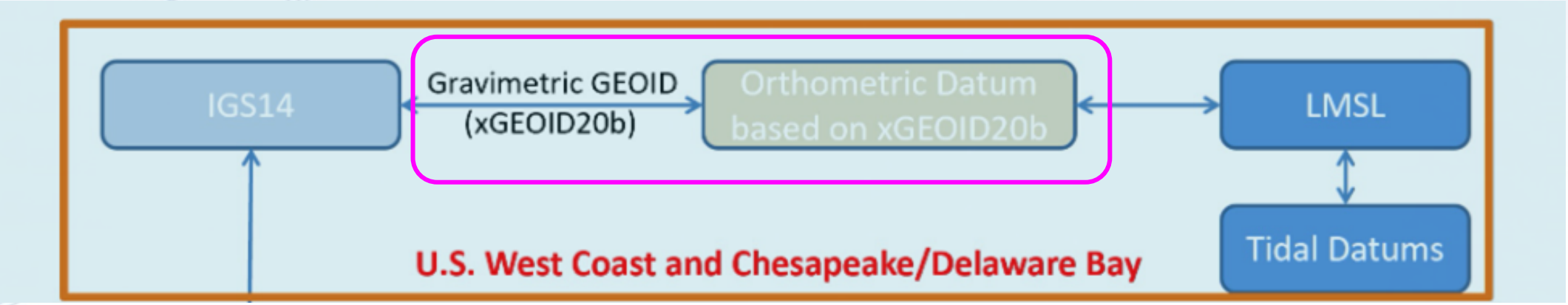
- Added - Columbia River, Version 1.0

VDatum 4.4 is released!

- Updated the WEST coastal Regional Model, that includes Spatially Varying Uncertainty
  - Updated Washington - Coastal to Version 1
  - Updated Washington - Strait of Juan de Fuca Inland to Version 1
  - Updated Washington - Strait of Juan de Fuca to Version 4
  - Updated Washington - Puget Sound to Version 3
  - Updated Washington/Oregon/California - Offshore to Version 1
  - Updated Oregon - Coastal Inland to Version 3
  - Updated Oregon - Coastal to Version 1
  - Updated California - Monterey Bay to Morro Bay to Version 3
  - Updated California/Oregon - Coastal to Version 1
  - Updated California - San Francisco Bay Vicinity to Version 3
  - Updated California - San Francisco Bay Inland to Version 1
  - Updated California - Southern California Inland to Version 1
  - Updated California - Southern California to Version 1
- Updated the Tidal layer into the online map
- Updated Spatially Varying Uncertainty Availability layer into the online map

I see a difference in the orthometric heights/TSS values between the current VDatum and the previous version

The major change between VDatum 4.3 and the newer version is the Geoid that is used in the transformation.



The new geoid (**xGeoid20b**) was updated with new gravity observations for the West Coast. As such, the height difference between the new orthometric heights in the newer VDatum (especially inland, like Columbia River) can be up to 1.5 m compared to the orthometric heights produced in VDatum 4.3

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The VDatum tidal observations do not align with my local water level observations

Please share this issue with the VDatum Team

(**vdatum.info@noaa.gov**)!

Comments like these provide the VDatum team local/regional feedback that is crucial for the VDatum performance.

The VDatum tidal observations do not align with my local water level observations

There might be several reasons for this issue. The most likely reasons may be related to -

1. Lacks of water level observations to constraint the marine grids in the specific area of interest.
2. The geodetic control of the water level observations used for generating the VDatum marine grids (either the survey or the benchmark information) needs to be re-evaluated.

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No, it isn't a program bug, nor a mix up.

Let's consider the diagram on the right, assuming a point (at the lightning bolt) has following elevation values (height values):

- NAVD88: 1.72m
- MLW: 0.6557m
- MHW: -3.6847m

where the original elevation value is relative to NAVD88 (1.72m). Using VDatum to get elevation values referenced in MLW (0.6557m), and in MHW is (-3.6847m). Since the origin of MHW is above the origin of MLW, the elevation result of MHW will be less than that of MLW.