



FIG WORKING WEEK 2023

28 May - 1 June 2023 Orlando Florida USA

Protecting
Our World,
Conquering
New Frontiers

Presented at the FIG Working Week 2023,
28 May - 1 June 2023 in Orlando, Florida, USA

Plans to support the modernized CSRS and NSRS datums in Trimble software

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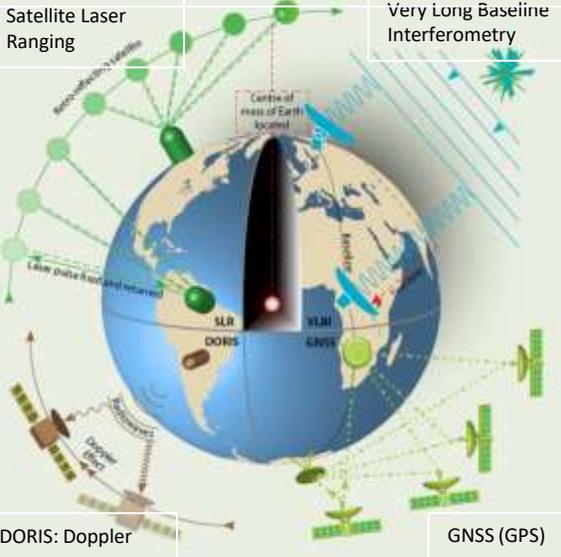
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ITRF Measurement Techniques



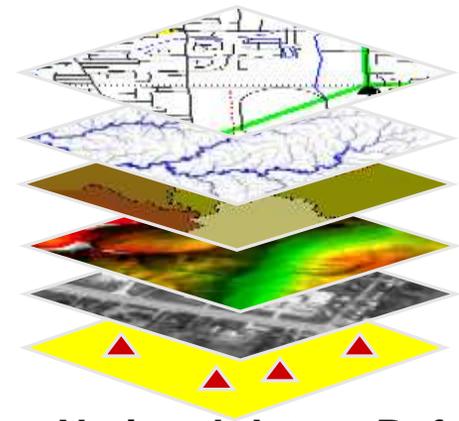
ITRF eom

Semi dynamic datum

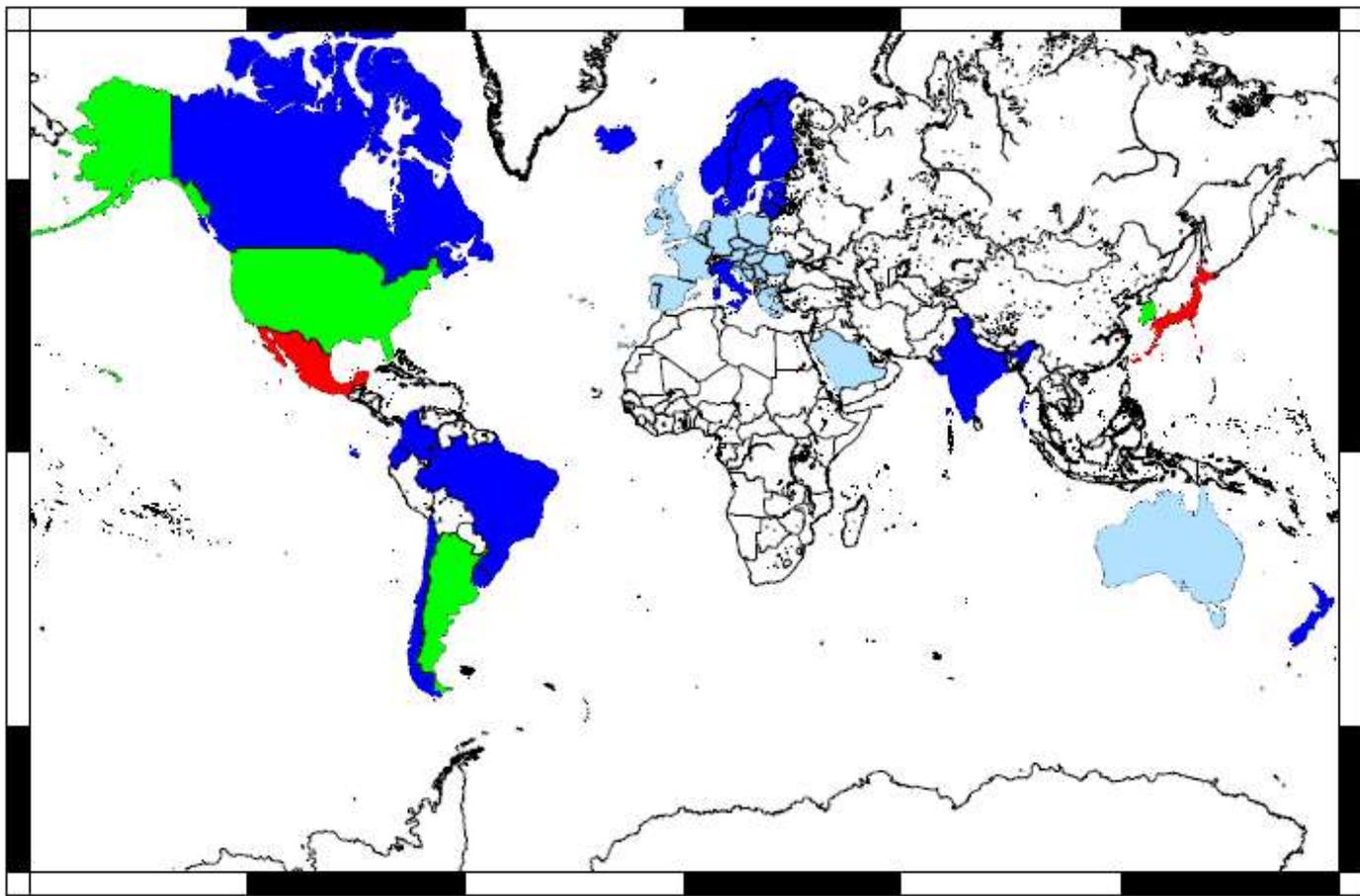
Datum transformation 14 param



Deformation model

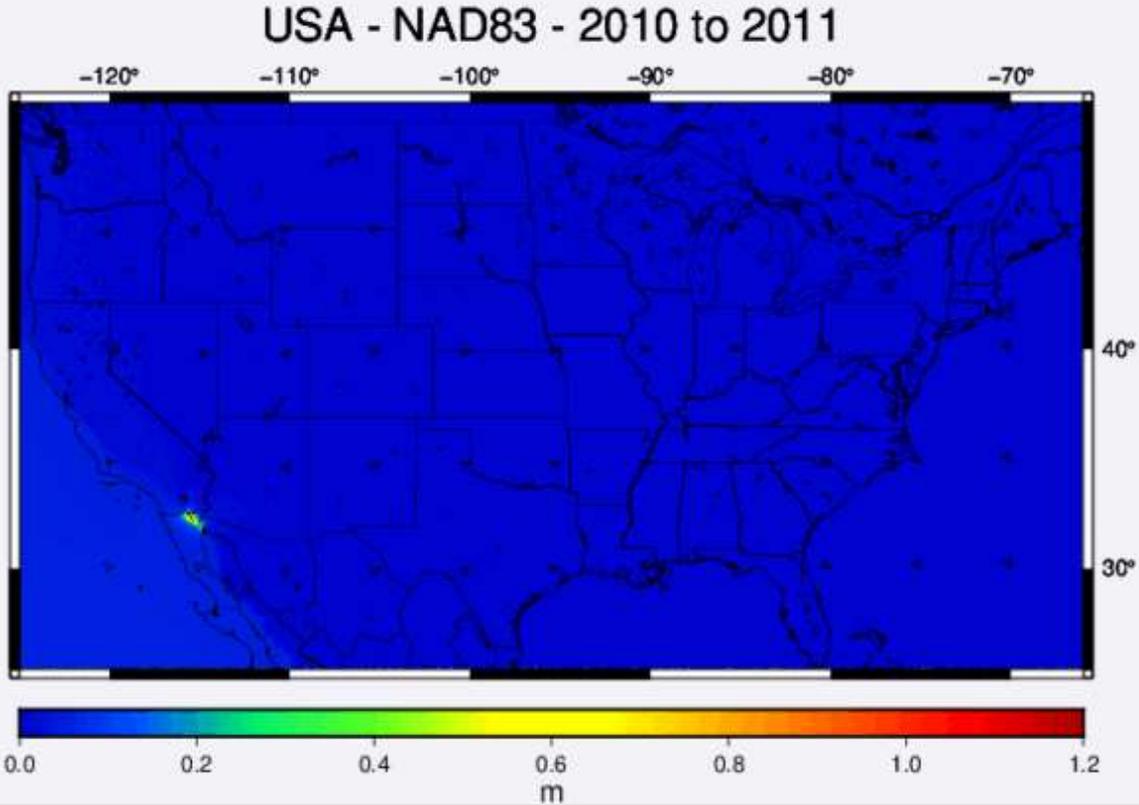
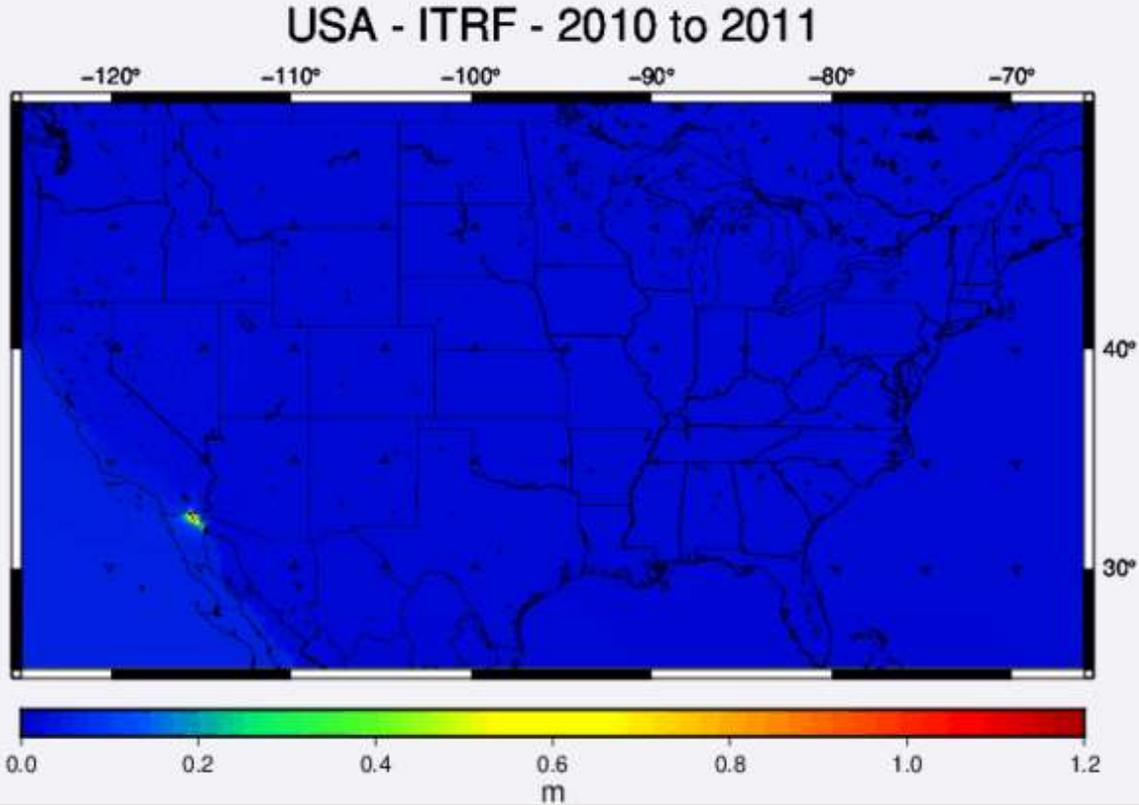


National datum Reference epoch



- Euler Poles
- Average Velocity only
- Velocity + EQ +PS
- Distortion grid: Displacement between t and reference epoch

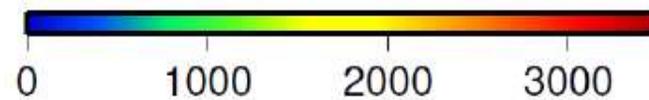
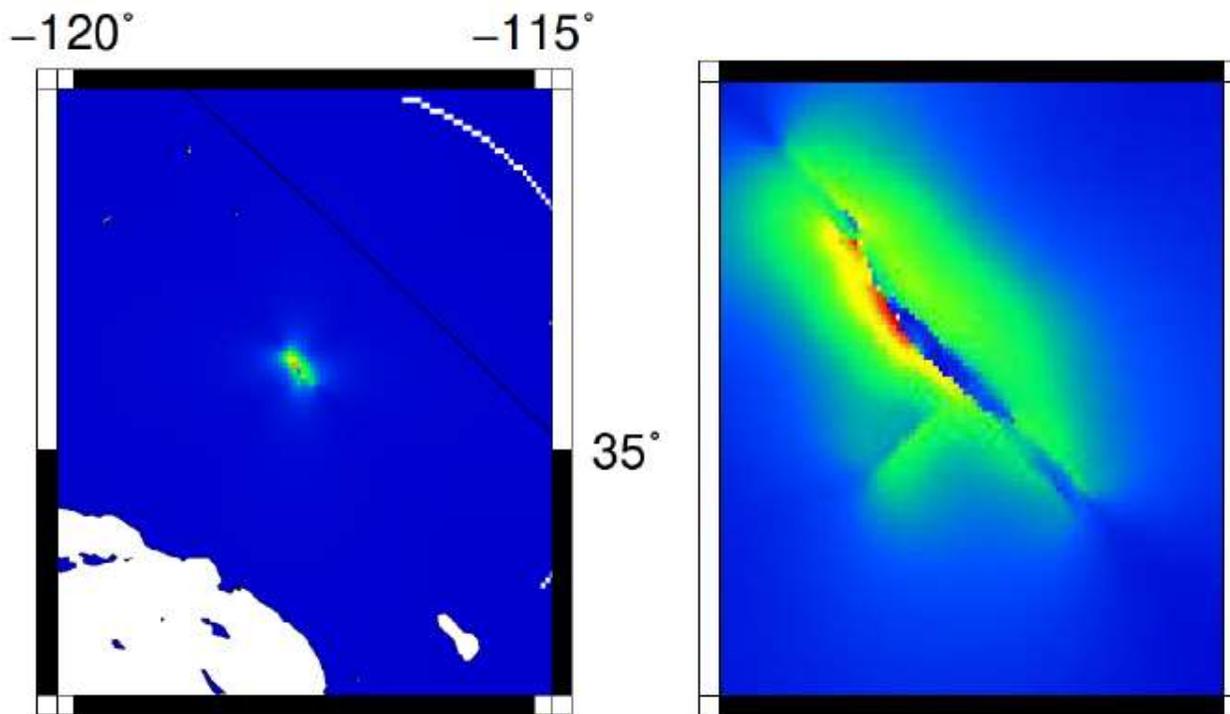
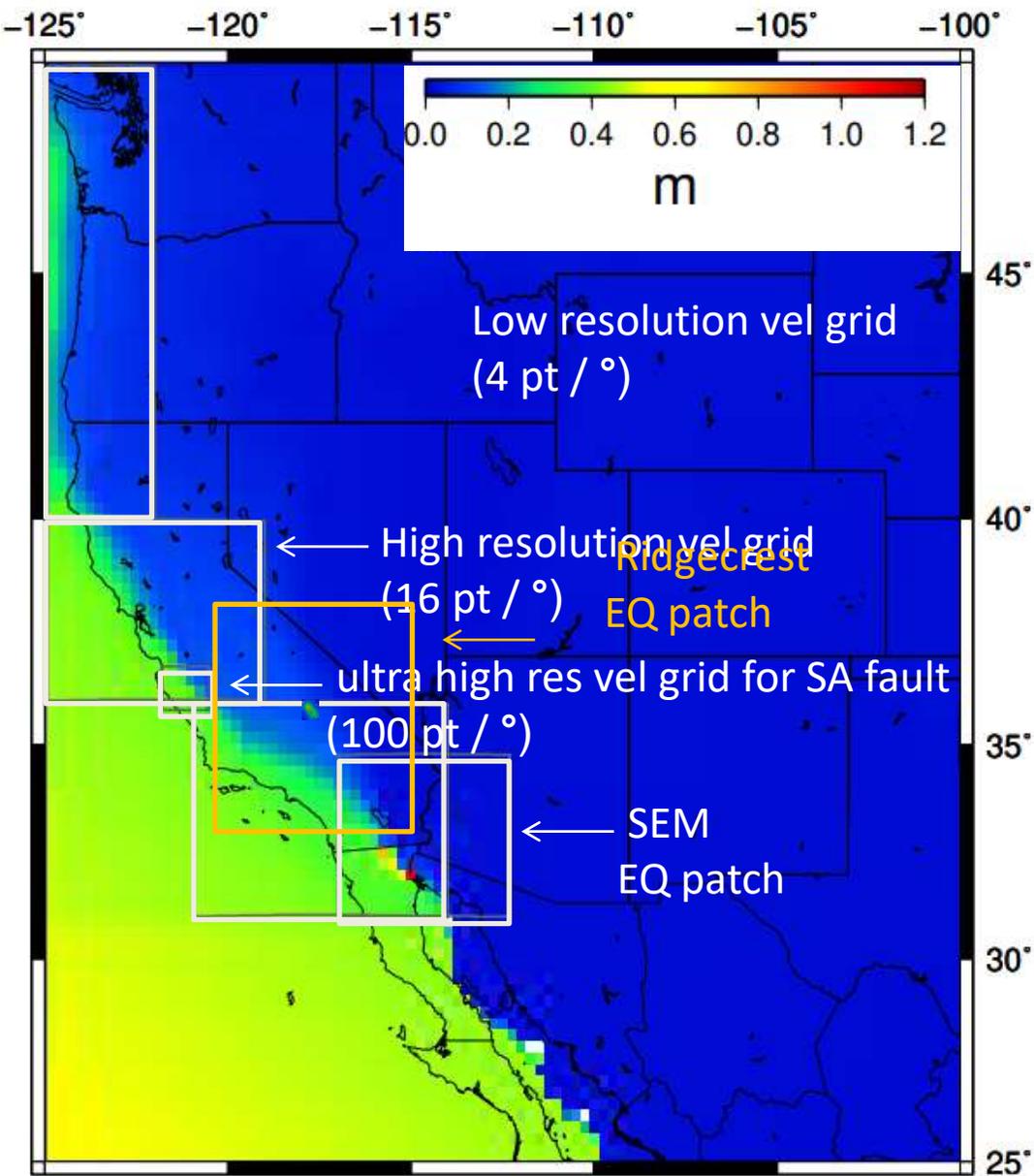
USA - NAD83(2011)



NAD83 (2011) CONUS

- Trimble Geodetic Libraries for support NAD83(2011)

- has the ability to support Euler Poles
- nested grids to model secular velocities and earthquakes
- Models of post seismic deformation.



mm

Trimble's support for modernized NSRS & CSRS

- Trimble's support for modernized NSRS & CSRS will be similar to NAD83(2011)
 - Along with ITRF2020 for the US there are 4 new Euler Poles (NATRF2022, PATRF2022, CATRF2022 and MATRF2022) and associated plate fixed frames while for Canada there is only NATRF2022
 - In the US we expect that the overwhelming majority of our users will use the appropriate plate fixed frame depending on their location with the exception of our users California will use the NATRF2022 frame even though the parts of the state are technically on the Pacific plate.
 - However there may be some limited use cases for PATRF2022 in these areas
- NGS also indicates support for survey epoch coordinates which may require support for user selected epochs in TGL

Deformation model

New velocity models for both the US and Canada

- Initially we expect that the US and Canada will have separate velocity models that are edge matched along the boarder
 - Both will be 3-d (including the vertical) and will have uncertainties
 - For the US we plan to store the velocities in ITRFR2020 and do an on-the-fly transformation to the users chosen plate fixed frame
- For the US, the earthquake catalogue will include all required earthquakes
 - This will probably expand the number of earthquakes Trimble support since we currently only support earthquakes since 2010
 - Canada will still be a velocity only model

SPCS2022

- New projections in SPCS2022 for the US will lead to a significant increase in the number of state plane coordinates from 120 to nearly 1000
- To help our users to efficiently select the appropriate zone for their project we have reorganized the projections in the US
- The provincial projection systems is not very different from current situation so we do not anticipate making any changes here.

NAPGD2022 and SGEOID2022

- New geopotential datum (NAPGD2022) will mean that GNSS users will be able to develop accurate coordinates without needing to connect to a benchmark
- The new geoid will include a static portion and dynamic portion that will compensate for geoid changes due to . At present we plan to support only the static geoid (SGEOID2022) not the dynamic portion (DGEOID2022)

Conclusions

- Along with the new deformation models for the US and Canada TGL will support:
 - 14 parameter transformations between ITRF2020 and NATRF2022, PATRF2022, CATRF2022 and MATRF2022
 - New projections in SPCS2022 for the US
 - New geopotential datum (NAPGD2022) and a new geoid. At present we plan to support only the static geoid (SGEOID2022) not the dynamic portion (DGEOID2022)
- TGL is generally in line with the OSG's proposed standard for deformation models
- We encourage national agencies to support this standard once it is approved.