



FIG Working Week 2024

19-24 May

Accra, Ghana

Your World, Our World:
Resilient Environment
and Sustainable
Resource Management
for All

Trimble's support for modernized datums in Africa

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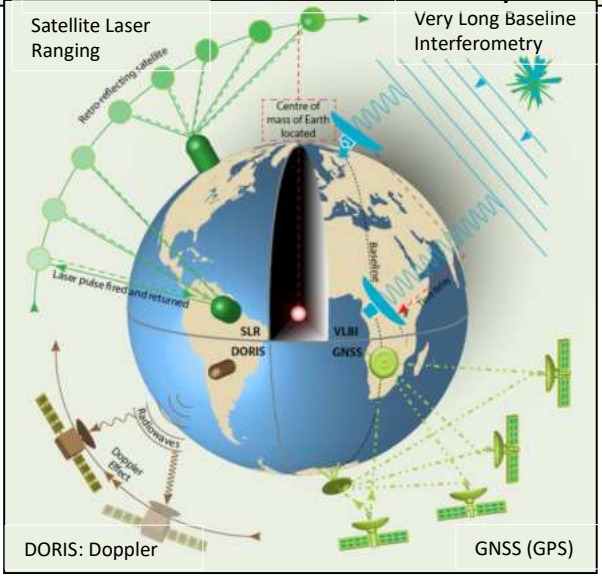
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ITRF Measurement Techniques



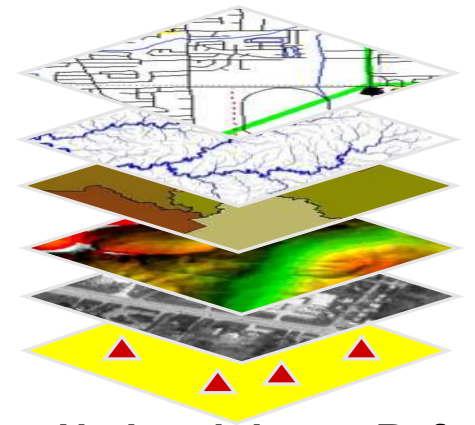
ITRF eom

Semi dynamic datum

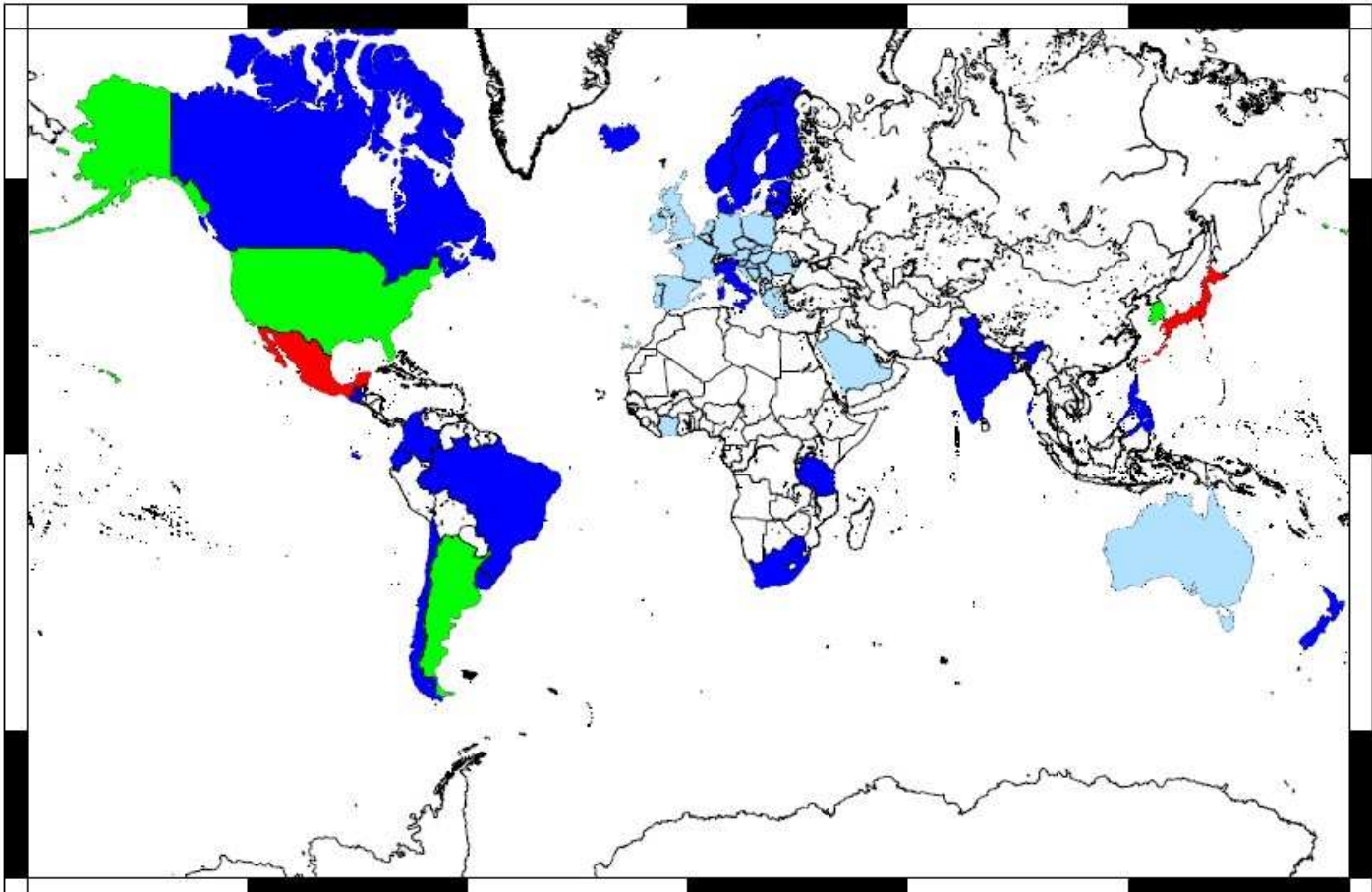
Datum transformation 14 param



Deformation model

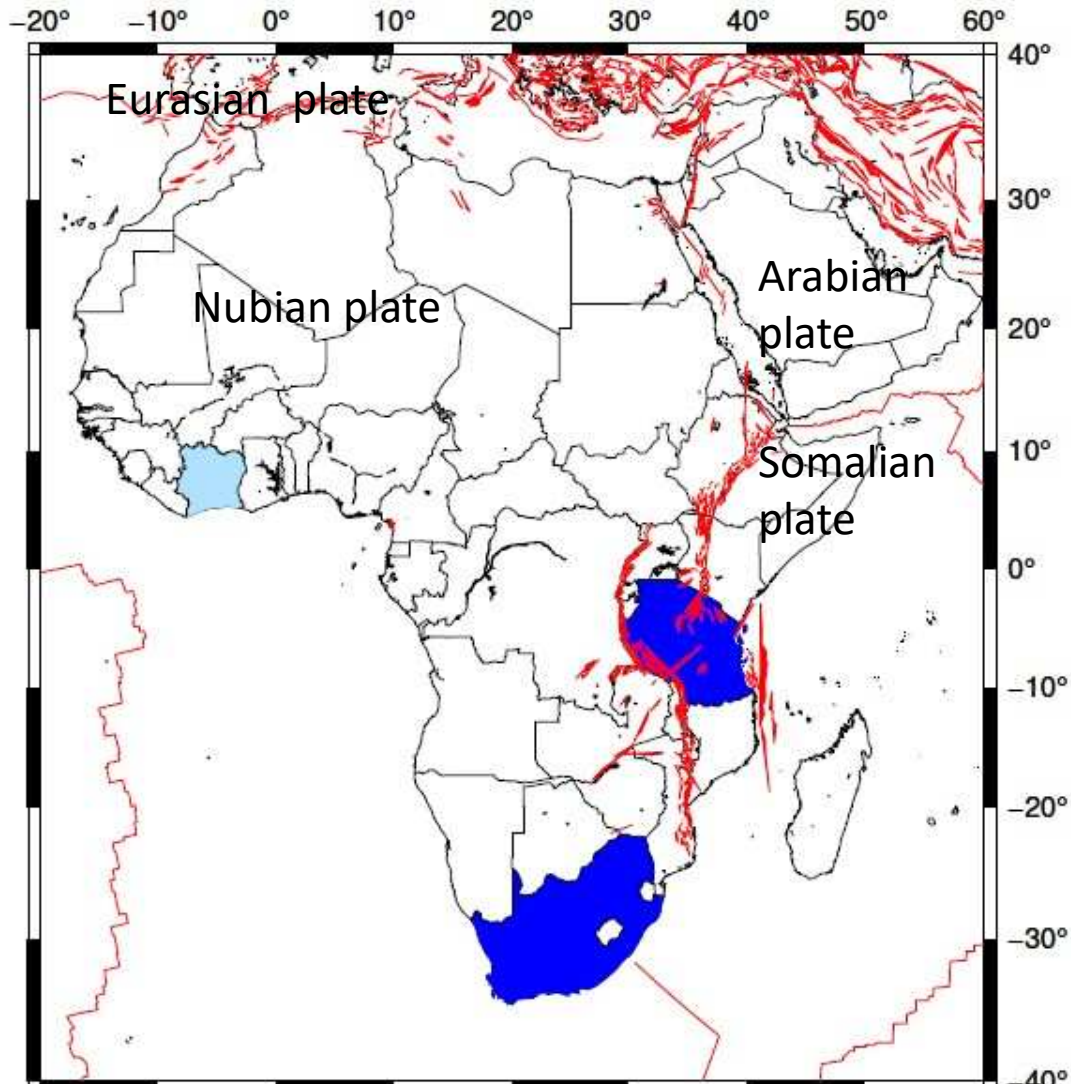


National datum Reference epoch



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

Three examples

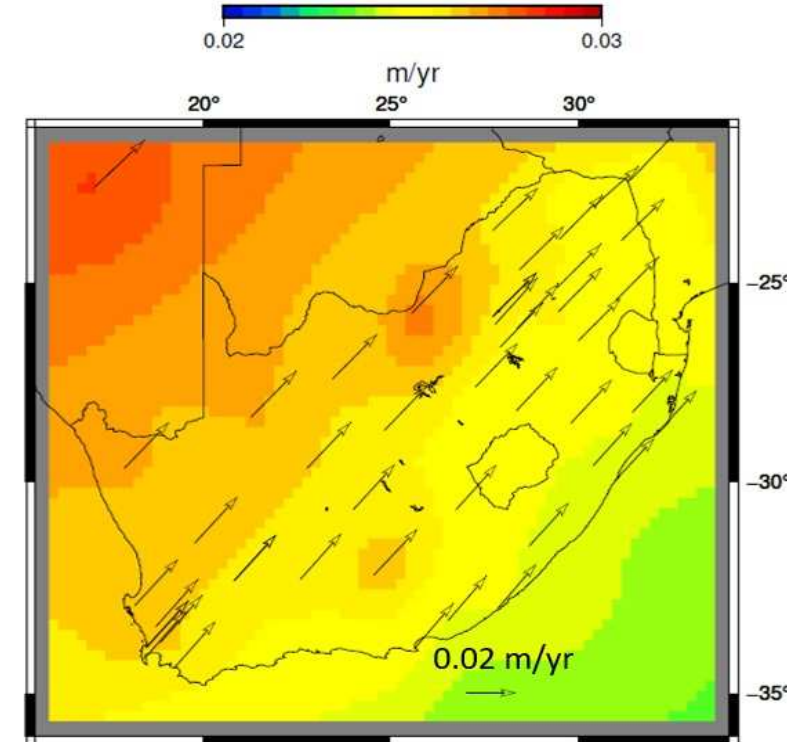
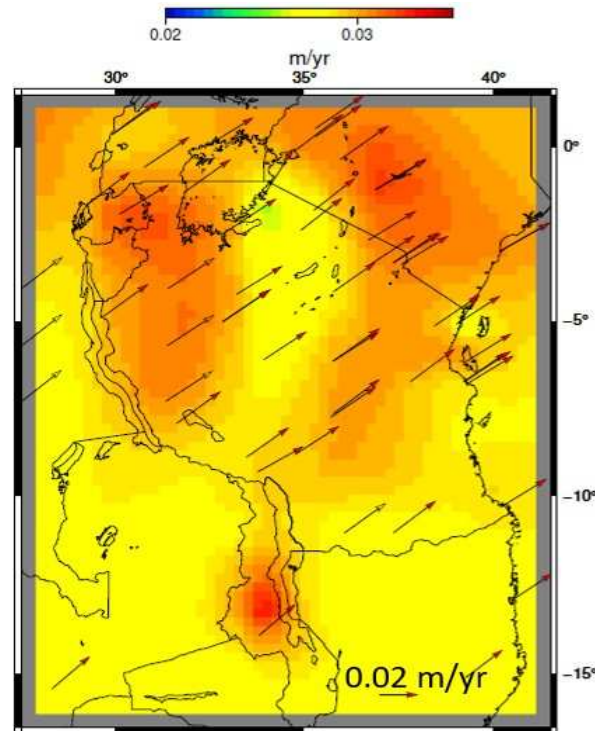
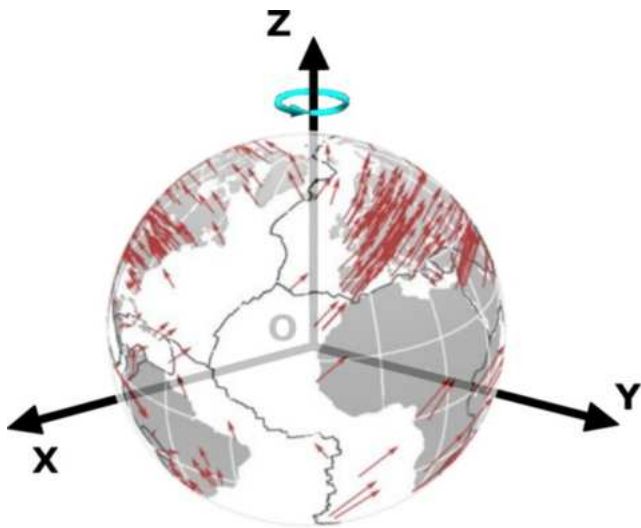


- Ivory Coast located in the stable Nubian plate. The motion here can be modelled by the Nubia EP
- Tanzania encompassing the Nubian-Somalian plate boundary zone and including most of the Victoria plate and part of the Rovuma Plate
- South Africa lies close to the Nubian-Somalian plate boundary zone and may be undergoing some tectonic deformation

Summary of test results

- Ivory Coast
- Tanzania
- South Africa

	RMS	e m	n m	u m
	ITRF2020 @ eom 2 RGCI 2022	0.006	0.008	0.006
	ITRF2020 @ eom 2 TANREF11	0.007	0.008	0.020
	ITRF2020 @ eom 2 ITRF2014 @ 2018.18	0.004	0.005	0.014
	ITRF2014 @ 2018.12 2 HART94	0.014	0.016	NA



Integration in Trimble Software

The image displays two overlapping software windows. The left window, titled "Change Coordinate System", shows a search for "Hart94" and a list of coordinate system options. The right window, titled "Project Settings", shows the "Coordinate System" section with a summary table and "EPSG IDs" section.

Change Coordinate System - Search Results

Coordinate System Group	Zone	Datum Transformation	Geoid Model	EPSG ID
South Africa/Hart94 (Grid)	Lo 17	Hart94 (Grid)	South Africa Geoid 2010	2047
South Africa/Hart94 (Grid)	Lo 19	Hart94 (Grid)	South Africa Geoid 2010	2048
South Africa/Hart94 (Grid)	Lo 21	Hart94 (Grid)	South Africa Geoid 2010	2049
South Africa/Hart94 (Grid)	Lo 23	Hart94 (Grid)	South Africa Geoid 2010	2050
South Africa/Hart94 (Grid)	Lo 25	Hart94 (Grid)	South Africa Geoid 2010	2051
South Africa/Hart94 (Grid)	Lo 27	Hart94 (Grid)	South Africa Geoid 2010	2052
South Africa/Hart94 (Grid)	Lo 29	Hart94 (Grid)	South Africa Geoid 2010	2053
South Africa/Hart94 (Grid)	Lo 31	Hart94 (Grid)	South Africa Geoid 2010	2054
South Africa/Hart94 (Grid)	Lo 33	Hart94 (Grid)	South Africa Geoid 2010	2055

Project Settings - Summary

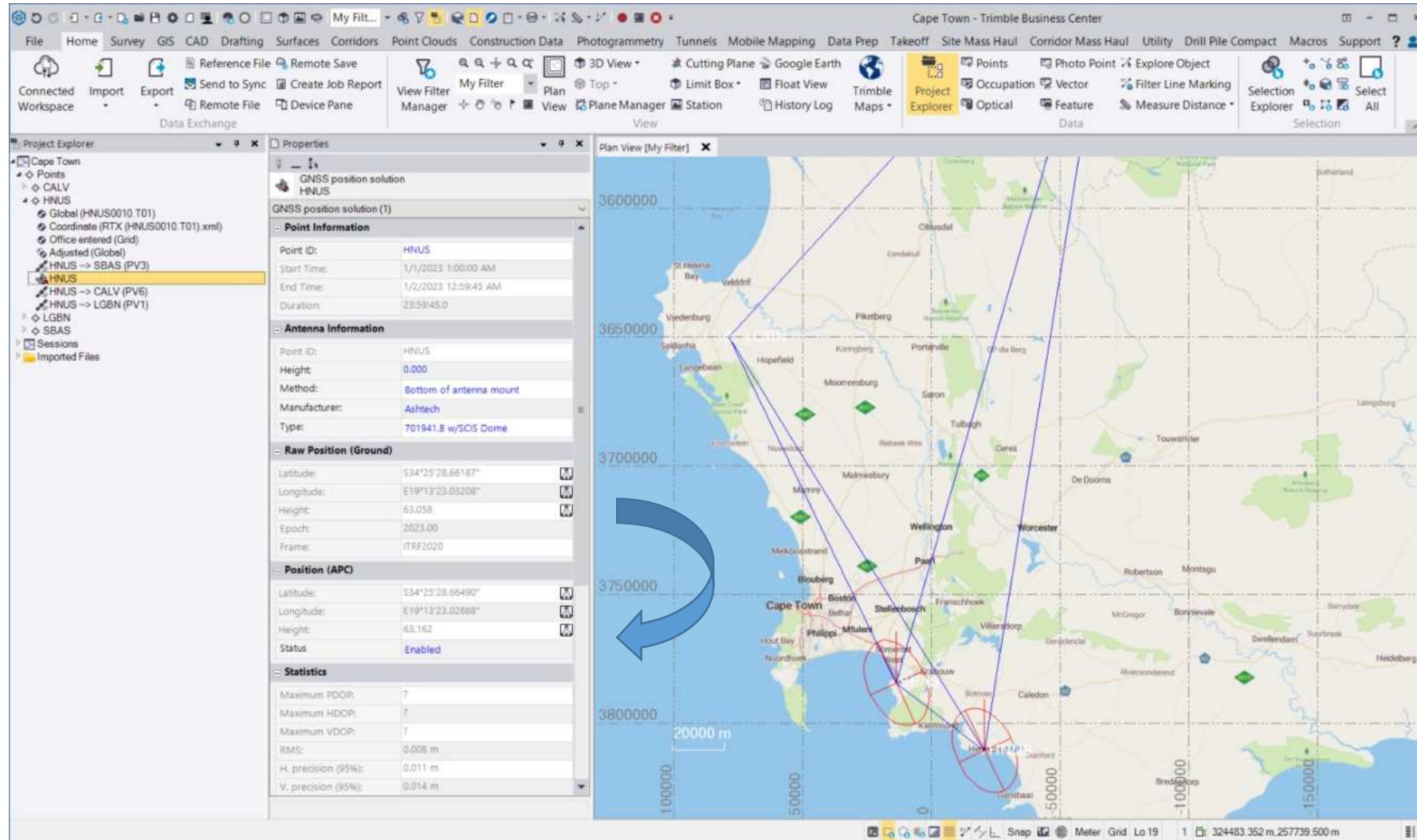
Coordinate system group:	South Africa/Hart94 (Grid)
Zone:	Lo 19
Datum transformation:	Hart94 (Grid) (Grid Definition)
Global reference datum:	ITRF2014-TRIGNET
Global reference epoch:	2016.18
Displacement model:	South_Africa_NDM_2013
Geoid model:	South Africa Geoid 2010

Project Settings - EPSG IDs

Projected CRS ID (2D):	2048
Local Geographic CRS ID (2D):	4148
Local datum ID:	6148
Local ellipsoid ID:	7030

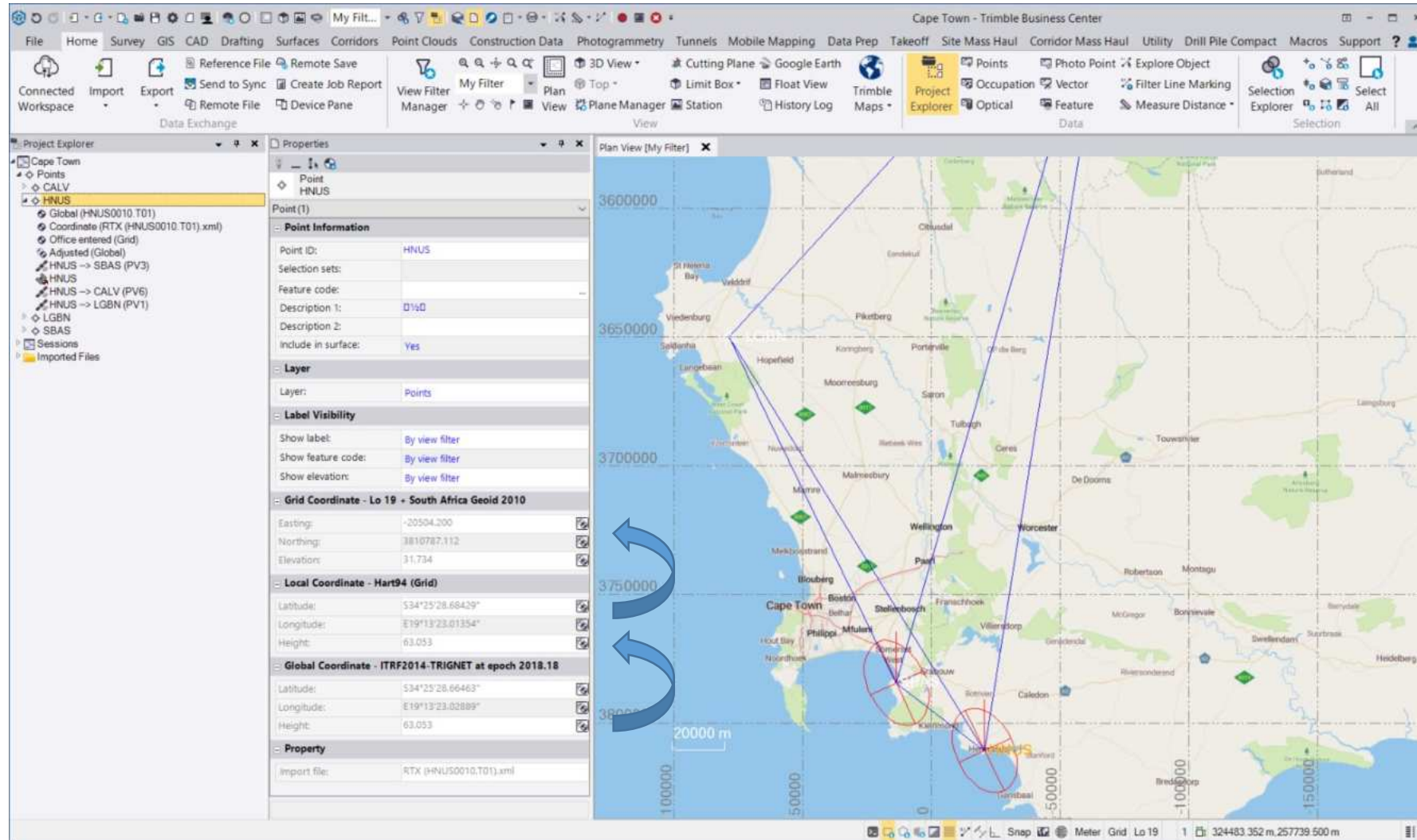
Select default Coordinate Reference System used in Cape Town South Africa

Time-dependent transformations



ITRF2020@eom to ITRF2014@2018.18

Static transformations



ITRF2014@2018.18 to HART94 + Standard Projection & Geoid Model

Resulting coordinates

Point Derivations

C:/Users/SVielli/AppData/Local/Temp/TBCTemporal/kv34tbzp.wem/Rpt6f51522b.html

Project File Data		Coordinate System	
Name:	C:\Users\SVielli\Documents\Trimble Business Center\Cape Town.vce	Name:	South Africa/Hart94 (Grid)
Size:	82 KB	Zone:	Lo 19
Modified:	5/6/2024 3:26:24 PM (UTC:2)	Datum:	Hart94 (Grid)
Time zone:	Romance Standard Time	Global reference datum:	ITRF2014-TRIGNET
Reference number:		Global reference epoch:	2018.18
Description:		Geoid:	South Africa Geoid 2010
Comment 1:		Vertical datum:	
Comment 2:		Calibrated site:	
Comment 3:			

Point Derivations

Resultant Coordinates for point: [HNUS](#)

Easting	Northing	Elevation	Height
-20504.200 m	3810787.112 m	31.734 m	63.053 m

Data	Used to calc.	Status	ΔEast (Meter)	ΔNorth (Meter)	Distance (Horiz) (Meter)	ΔElevation (Meter)	ΔHeight (Meter)
Adjusted (Global)	NEeh	Enabled	0.000 m	0.000 m	0.000 m	0.000 m	0.000 m
SBAS → HNUS		Enabled	0.000 m	0.000 m	0.000 m	-0.002 m	-0.002 m
CALV → HNUS		Enabled	-0.002 m	0.001 m	0.003 m	-0.006 m	-0.006 m
LGBN → HNUS		Enabled	0.000 m	0.000 m	0.000 m	0.003 m	0.003 m
Coordinate (RTX (HNUS0010_T01).xml)		Enabled	0.000 m	-0.008 m	0.008 m	-0.002 m	-0.002 m
Office entered (Grid)		Enabled	0.000 m	-0.008 m	0.008 m	-0.006 m	-0.006 m



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Conclusions

Support for datums for Tanzania, South Africa and Ivory Coast have recently been added to Trimble software:

Our support for Ivory Coast is based on the ITRF2014 Numbia Euler Pole

Tanzania lies in a very complex zone of deformation associated with the East Africa Rift so here we used an average velocity grid based on published measurements

South Africa lies adjacent to the southern end of the East Africa Rift so we used an average velocity grid here also. We also developed a datum grid to support the HART94 datum

In all three areas, testing invokes the ITRF2020 eom to national datum transformation is accurate to better than 1 cm.

TGL is generally in line with the ISO, RTCM & OGC's standard for deformation models and we encourage national agencies to support this standard.

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Commission 5

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