



BLUE MARBLE
GEOGRAPHICS

WHERE GIS DATA CONVERSION SOLUTIONS ARE BORN

HIGH ACCURACY GPS: PITFALLS OF POST- PROCESSING

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- “If we’re going to race in the Tour de France, we might as well win.”
 - Johan Bruyneel, Team RadioShack Director



< 1 Meter

- Working at high precision levels requires care and persistence
- The work isn't done when the data has been collected
- There are:
 - Assumptions (to question)
 - Data Manipulations (to understand)
 - Limitations (to acknowledge)



+/- 1 Meter - Assumptions

EPSG Database states that:

WGS84 Transit, WGS84 (G730), WGS84 (G873),
WGS84 (G1150), NAD83, NAD83(NSRS2007),
NAD83 (CSRS), ITRF (all epochs), GDA94, RGF95,
JGD2000, IRENET95, ETRS89...

...About 60 datums in all, worldwide

Are coincident at the +/- 1 meter level

Because of this, many applications are
set up with that assumption.

Because of *this*, a lot of people are too.



GPS Post-Processing Data Lifecycle

- Transformations often take place multiple times in the life of a data set
 - GPS export, Post processing software, GIS tools, or that freeware app your intern found on the Internet...
- These might be done by you, or not

“Oh, we only work in NAD27. All data gets transformed when it comes in and before it goes back out.”



Transformations

Are you using the best possible datum transformation for your data?

Do you even know which one you're using?

Does everyone else that's going to handle your data know too?

Transformations – Example

NAD 27 to NAD 83

- NADCON (15cm)
- DMA Multiple Regression Eq. (1m)
- Canadian NTv2 (3m)
- 3 Parameter
 - Eastern US (13m)
 - Continental US (14.5m)



Local Engineering Grids

- Local Coordinates
 - To put them in a GIS, they must be transformed
 - Scale & Rotate (not good)
 - Affine Transformation (small areas)
 - Higher Order Polynomial Transformations
 - Hartsfield Jackson Airport, Atlanta, GA
 - » Sub 0.1 usft using 1st order polynomial
 - Limbaugh Mine, Montana
 - » 11mi wide area, sub 0.1 usft using 2nd order polynomial model

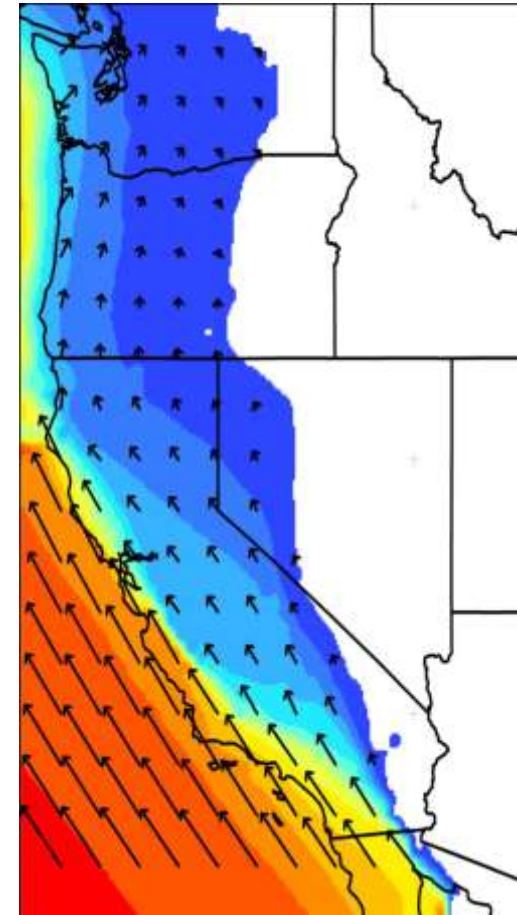


~~Where~~ When is your data?

If WGS 84 were a person, it would now be old enough to get cheap car insurance.

In the 27 years it's been around, the Earth hasn't stopped changing.

Your coordinates aren't where you left them.



Time Dependant Shifts

- Horizontal Time Dependant Positioning (HTDP) for North America
- AUSPOS for Australia
- 14 parameter transformations for other parts of the world
 - These can be shoehorned into existing software as fixed epoch transforms

Vertical Accuracy

“What’s your vertical reference?”

- “Feet.”



Geoids and Mean Sea Level

Geoid Models vs MSL

- NOT equal!
- Vertical models are *approximations* of MSL
- MSL is a moving target
 - For highest accuracy, local vertical deflections must be taken into account
 - The models are not all the same!



In Sum

- Sub meter accuracy is harder to maintain, than collect
- Knowing the details to maintain, is as important as maintaining them
- Data doesn't get more accurate with manipulation only less

Solutions

- Metadata
 - Vague descriptions lead to assumptions!
- Education
 - GIS is science, there's a lot to learn!
- Training
 - Software tools are not always as simple as we would like; you have to know how to use them!



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THANKS!

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