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NSRS Modernization News

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Reference Epoch Coordinates

In *Blueprint for the Modernized NSRS, Part 3: Working in the Modernized NSRS* (NOAA Technical Report NOS NGS 67), also called "BP3," NGS outlined plans for computing reference epoch coordinates, or RECs. These RECs will provide a snapshot of coordinates at reference epochs, with the first one being 2020.00. In the last two years, significant research has been done behind the scenes toward providing RECs, which is highlighted below.

RECs will resemble coordinates from NAD 83 (2011) epoch 2010.00, with many small differences and three significant ones. First, RECs will be geocentric, unlike NAD 83 coordinates. Second, random errors in the deformation model (IFDM2022) will be propagated into the observations as they are projected through time. (Contrast this with NAD 83 (2011) epoch 2010.00 where HTDP was treated as errorless.) Third, RECs will include orthometric heights, estimated by first adjusting all geometric data and then constraining the national leveling dataset to the geometric coordinates (using GEOID2022).

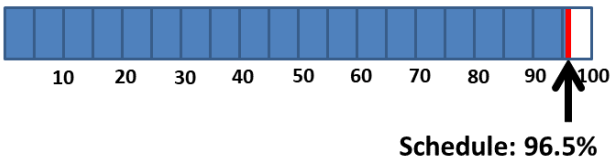
To address the issue of propagating errors in the deformation model, a number of research papers are being written. Central to these papers will be a multi-volume paper titled *The multi-epoch least-squares adjustment problem* (or ME-LSA) that derives the equations necessary to combine observations and constraints at multiple epochs into a single adjustment at one reference epoch, including rigorous propagation of errors from a deformation model. Another paper exploring the role of covariances in the ME-LSA problem will provide detailed equations for the cases when none, some. or all covariances are available within the deformation model.

The conclusions found in these papers, and others, have been applied to the TRANS4D model, transforming it into **IFDM2022 Beta v0.1**.

The availability of an early IFDM2022 model means that NGS can now perform some experimental national adjustments for the estimation of RECs. Some things will be entirely new, such as the geometric adjustment combining all data from the NGS IDB with the previously unintegrated data from the OPUS-Share database. When those adjustments are complete, they will be used as constraints in the first national leveling adjustment since the release of NAVD 88, 32 years ago.

In the next year, NGS will release all of the aforementioned papers, and preliminary "alpha" RECs. Stay tuned!

GRAV-D progress last quarter: up 0.4% to 96.8%
AHEAD OF **Schedule!**
Recently: LA, UT



Schedule: 96.5%

(Correction: Issue 30 had the right numbers, but an erroneous bar graph)