

Issue 35 January 2024

# NSRS Modernization News

For all issues of **NSRS Modernization News**, visit:[geodesy.noaa.gov/datums/newdatums/TrackOurProgress.shtml](https://geodesy.noaa.gov/datums/newdatums/TrackOurProgress.shtml)

## SPROCET to Replace HTDP

NGS is building Software for **PR**ojecting **O**bservations, **C**onstraints and **C**ofactor matrices/**E**rrors through **T**ime (SPROCET), as a replacement for the Horizontal Time-Dependent Positioning (HTDP) utility in the modernized NSRS. Improvements include: (a) support for orthometric data, (b) use of GDY, (c) use of IFDM2022, (d) error propagation through time, as per [the multi-epoch least-squares adjustment \(ME-LSA\) problem](#), (e) distinct modules for 14-parameter Helmert transformations and deformation models, (f) use of a modern coding language, (g) bug fixes and model corrections. SPROCET will be capable of projecting geodetic information through time, and changing the geometric frame, and therefore will be a pre-processor for LASER, used in both the modernized version of OPUS and in REC adjustment projects.

## Multi-GNSS OPUS-S Available for Beta Testing

OPUS-S, the NGS service for processing GPS data for 2+ hour occupations, can now process all GNSS constellations. NGS has developed M-PAGES, our new multiple-constellation Global Navigation Satellite System (Multi-GNSS) software for position solutions. M-PAGES has been added to OPUS-S and is available for testing at <https://beta.ngs.noaa.gov/OPUS/>. This new version

of OPUS-S allows users to process data from all GNSS systems in operation today that have two or more frequencies (GPS, GLONASS, Galileo, Beidou, QZSS). We call on the community to help us test the new service during this BETA release.

## Multi-Epoch Least-Squares Adjustment Papers, Redux

Two new papers, providing details on the application of the Multi-epoch Least-squares adjustment (ME-LSA) problem have been published:

- [NOAA Technical Memorandum NOS NGS 95](#)
- [NOAA Technical Memorandum NOS NGS 96](#)

TM 95 discusses the complications of covariances that arise from using gridded deformation models, while TM 96 provides specific equations for observation types supported by NGS software, based on earlier ME-LSA papers.

## Where's the GRAV-D Progress Chart?

GRAV-D's airborne campaign has come to a close. All re-flights have finished, and the final data-set is being prepared for hand-off to the GEOID2022 team. With this success, the beloved GRAV-D progress chart has been happily removed from our newsletter.