

Determining an Optimal Geoid-Based Vertical Datum

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SUMMARY

As a part of modernizing the U.S. National Spatial Reference System, the North American-Geopotential Datum of 2022 (NAPGD2022) will be implemented in Terrestrial Reference Frames derived most likely from the planned ITRF2020. NAPGD2022 will serve as a vertical datum in the U.S. and will be the final product developed from a series of experimental gravimetric geoid models (xGEOIDs). NAPGD2022 should be a best fit to global Mean Sea Level (MSL), which can vary locally by up to two meters in some cases. This is due primarily to pressure, temperature and salinity variations that drive oceanic currents. Picking a geopotential value to serve as a geoid model for a vertical reference frame must account for this mean ocean dynamic topography (MODT). By determining the geopotential values at tide gauges and offshore buoys, estimates of this observed MODT are compared to modeled MODT to devise the best connection between the geoid, MODT, and the local MSL surface. Several MODT models were evaluated using xGEOID20-derived geopotential numbers to determine the (1) best fit and (2) an optimal geopotential surface to serve as a geoid for North America. This process will ensure a better tie between bathymetry and terrestrial elevations, improved forecasting of the extents of storm surge onshore, and enhanced coastal resilience.

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