

Analysis of a Geopotential Datum at Tide Gauge Stations

Daniel Roman and Xiaopeng Li (USA)

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SUMMARY

The United States will be updating its National Spatial Reference System

(NSRS) in 2022. Primary responsibility for maintaining and updating the NSRS resides with NOAA's National Geodetic Survey (NGS). NGS works with its counterpart agencies in Canada (NRCan), Mexico (INEGI) and other countries in North America and the Caribbean to ensure that this updated NSRS will be consistent with the principles of the United Nations Global Geospatial Reference Frame (UN GGRF). This update will include a realization of physical heights based on a geopotential datum based on the value of $62,636,856.00 \text{ m}^2/\text{s}^2$. IERS and IAU both adopted this value as the official value defining the shape of the Earth, but IAG has selected a different value. However, it was determined as the best fitting value based on a comparison of an earlier geopotential model

(USGG2012) at over 200 tide gauges throughout North America. This paper revisits that study based on newer and more comprehensive geopotential models to evaluate the selected datum. With INEGI and NRCan, NGS has developed a series of experimental gravimetric geoid models with the most recent being xGEOID19. These models incorporate all available satellite-gravity data as well as airborne gravity for the Gravity for Redefinition of the American Vertical Datum (GRAV-D) project. Hence,

xGEOID19 provides a much better basis for analyzing the tide gauge data in view of the adopted geopotential value. The old analysis based on

USGG2012 will be revisited and then updated based on comparison to xGEOID19. The primary difficulty relates to uncertainties in the available Mean Ocean Dynamic Topography (MODT)

models that describe variations in MSL based on pressure, temperature and salinity variations. Hence, available MODT models will also be assessed.

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